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World Trade Center Health Program best practices for diagnosing and treating chronic obstructive pulmonary disease

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Abstract

World Trade Center exposures may have the potential to cause or aggravate chronic obstructive pulmonary disease (COPD). The WTC Health Program covers the entire range of clinical services for COPD, following the 2021 diagnostic and treatment guidelines of the Global Initiative for Chronic Obstructive Lung Disease (GOLD).

Keywords

Chronic bronchitis; chronic obstructive pulmonary disease; occupational lung disease; smoke inhalation injury; World Trade Center Attack, 2001

Introduction

Chronic Obstructive Pulmonary Disease (COPD) was, in 2019, the 3rd leading cause of death worldwide.¹ The Global Initiative for Chronic Obstructive Lung Disease (GOLD), a collaboration between the National Heart, Lung, and Blood Institute of the National Institutes of Health and the World Health Organization has defined COPD as persistent airflow limitation.² It is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. In the past, it was often associated with a history of cigarette smoking but is now recognized by the GOLD guideline as being significantly associated with indoor and outdoor air pollution and occupational toxicant exposures. The three key symptoms of COPD include shortness of breath, chronic cough, and production of sputum. However, note that spirometry with bronchodilator response testing is presently required for a COPD diagnosis.

Given the latency between exposure and disease, COPD was, as expected, a fairly infrequent finding in clinical studies in the first decade after 9/11^{3,4} although the potential for development of new-onset COPD was anticipated in cohorts under longitudinal surveillance.⁵ In 2015, NIOSH and the WTC Health Program added new-onset COPD

to their list of covered health conditions (previously, the WTC Health Program covered only WTC-exacerbated COPD).⁶ Studies that use the GOLD COPD definition are in progress, and to date show no or modest associations with WTC exposure indicators among responders.^{7,8} Prevalence estimates of spirometrically-defined COPD in the WTC occupational cohorts vary between 3.6%⁹ and 3.3%.⁷ COPD severity was mild in 34% and moderate in 61%⁹ with about 40–50% of them having asthma COPD overlap (ACO).^{7,8,10} It needs to be noted that steadily decreasing active smoking rates^{9,11} may have helped prevent a higher prevalence (or severity) of COPD in WTC exposed subjects.^{12,13} Moreover, a sizable proportion of WTCHP members have a diagnosis of chronic nonspecific bronchitis, representing airway disease that does not meet either asthma or GOLD COPD diagnostic criteria.^{3,4} Additionally, the most frequent spirometric abnormality in the WTC occupational cohorts has been a reduction of the forced vital capacity (FVC) without obstruction (ie reduced FEV₁/FVC) or restriction (ie reduced total lung capacity, TLC),^{11,14} which is not diagnostic of either COPD or asthma. The low FVC pattern has received many names, is associated with obesity (more highly prevalent in the WTC cohorts than in the United States general population¹¹), but is also emerging as a fairly stable inflammatory airway disease pattern,^{3,4,9} may be an atypical manifestation of asthma, clinically classified as chronic nonspecific bronchitis, or infrequently evolve into COPD. Since a proportion of those with low FVC pattern are as symptomatic as patients with obstructive lung disease (eg COPD or asthma), they are often treated.

The WTC Health Program selected the GOLD guidelines because they met the quality requirements for best evidence-based clinical practice guidance for the diagnosis and treatment of COPD in persons covered by the program, and for this article series.¹⁵

Diagnosis

The diagnosis of COPD requires the presence of symptoms and fixed obstruction, and exclusion of other diagnoses (eg asthma). In adults, separating asthma from COPD can sometimes be difficult, especially in suspected mild COPD (ie post-bronchodilator FEV₁ 80% predicted). A complete evaluation thus includes (1) assessment of history, risk factors, and symptoms, including their intensity and the history of exacerbations; and (2) spirometric diagnosis of fixed obstruction, defined as a post-bronchodilator first-second forced expiratory volume less than 70% of the forced vital capacity (FEV₁/VC < 0.7), preferably on at least two different occasions, ideally after treatment implementation, and always based on good quality spirometry with bronchodilator testing.¹³ Additional functional and imaging evaluation is often recommended for further characterization, differential diagnosis, and/or assessment and/or exclusion of comorbidities.

Exacerbations are presently defined operationally as acutely worsening respiratory symptoms that require a change and/or additional treatment. Exacerbations are classified as mild (requiring treatment with short-acting bronchodilators), moderate (requiring short-acting bronchodilators, and oral corticosteroids and/or antibiotic treatment), and severe (requiring emergency room treatment or hospital admission).

Once the diagnosis is established based on good quality post-bronchodilator spirometry, the evaluation is completed with a classification of airflow limitation severity based on post-bronchodilator FEV₁ (grades I–IV), and of symptoms and exacerbation risk (groups A–D), and an assessment of comorbidities (details provided in the GOLD guideline). In diagnosing occupational COPD, it is particularly important to elicit a history of exposure to inhaled particulates, fumes, dusts, gases and/or vapors in the longest held occupation. Generally, the more intense and/or a longer exposure would favor a diagnosis of COPD, particularly in a non- or very light smoker (eg, 10 pack-years). Finally, it is very important to assess and grade impairment and/or disability, using accepted and applicable guidelines, and render appropriate public health and occupational surveillance reporting.

GOLD no longer refers to asthma and COPD overlap (ACO) but recognizes that in some patients the two diseases coexist, and that asthma may be a risk factor for COPD development. On the other hand, there is no accepted definition of ACO.¹⁶ For chronic nonspecific bronchitis, the diagnostic requirement includes the presence of symptoms and lung function abnormalities that fail to meet diagnostic criteria for asthma or COPD (eg with chronic nonspecific bronchitis there is neither bronchial hyperreactivity, nor variable or fixed obstruction). Given its association with morbidity and mortality similar to some COPD cases, GOLD is considering whether to include low FVC (also known as preserved ratio impaired spirometry, PRiSM, defined as reduced FEV₁ with normal FEV₁/FVC ratio) in their definition of COPD. GOLD is also reassessing the requirement for and/or the definition of fixed airflow obstruction for the diagnosis of COPD.

Treatment

The treatment of COPD (reviewed extensively in the GOLD guideline²) consists of smoking cessation, encouraging attainment of ideal body weight, adopting a healthy diet and habits, curtailment of hazardous occupational and environmental exposures, appropriate vaccinations, using stepwise treatment with inhaled long- and short-acting bronchodilators and small to moderate doses of preferably inhaled corticosteroids, phosphodiesterase inhibitors, treatment and/or prevention of disease worsening comorbidities, supplemental oxygen, noninvasive ventilation, and pulmonary rehabilitation when appropriate. In carefully selected cases of severe COPD, lung volume reduction surgery, bullectomy, bronchoscopic interventions, and lung transplantation may play a role. Lastly, palliative, and end-of-life care are part of the management of severely ill patients.

In patients with coexisting asthma and COPD, GOLD advises to treat the asthma component first (ie emphasize inhaled corticosteroid), and then the COPD component as outlined above. We are not aware of high-quality treatment guidelines for chronic nonspecific bronchitis; however, treatment generally relies on inhaled corticosteroids and bronchodilators.

Program coverage

The WTC Health Program can cover COPD treatment. For treatment to be covered, the WTC Health Program member's COPD must be certified. To receive certification, a CCE or NPN needs to submit a WTC-3 form (<https://www.cdc.gov/wtc/pdfs/Appendix->

WTC3.pdf). Among other things, on the WTC-3 form the CCE/NPN physician must attest that 9/11 exposures were substantially likely to have been a significant factor in aggravating, contributing to, or causing the enrolled WTC member's COPD.

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