African Journal of Emergency Medicine (2015) 5, 75–84

African Federation for Emergency Medicine

African Journal of Emergency Medicine

www.afjem.com
www.sciencedirect.com

CLINICAL REVIEW

# Chronic obstructive pulmonary disease: Emergency care in acute exacerbation

## *Maladie pulmonaire obstructive chronique: Prise en charge d'urgence dans les cas d'exacerbation aiguë*

**Tedd J. Welniak** [a], **Amy Panzenbeck** [b], **Alex Koyfman** [c,*], **Mark Foran** [b]

[a] *Department of Emergency Medicine, University of Nebraska College of Medicine, Omaha, NE, USA*
[b] *Department of Emergency Medicine, New York University School of Medicine, Bellevue Hospital Center, New York, NY, USA*
[c] *Division of Emergency Medicine, UT Southwestern Medical Center/Parkland Memorial Hospital, Dallas, TX, USA*

Received 22 January 2014; revised 3 May 2014; accepted 5 August 2014; available online 20 August 2014

Chronic obstructive pulmonary disease (COPD) is a preventable condition affecting more than 230 million people globally, and is expected to become the world's third largest cause of mortality by 2030. Despite this fact, it is thought to be widely underdiagnosed and underreported across the African continent. This presents a challenge to emergency medicine (EM) providers in the region, who are faced with treating large numbers of patients presenting with exacerbation of previously undiagnosed COPD. This is complicated by other factors, including lack of public awareness, high prevalence of other chronic respiratory illnesses, and difficulties in access to healthcare.

The purpose of this paper is to outline the current state of research and international guidelines surrounding the management of acute exacerbation of COPD in the emergency centre. Strict adherence to international guidelines for management of acute exacerbation of COPD may be difficult for many African providers given factors affecting diagnosis, treatment, and access to care for many Africans suffering from COPD. Research looking into the role of the African EM practitioner in providing more cost-effective means of diagnosis and treatment of COPD is limited.

La maladie pulmonaire obstructive chronique (MPOC) est un état évitable qui touche plus de 230 millions de personne dans le monde, et devrait devenir la troisième cause de mortalité la plus importante d'ici 2030. En dépit de ce fait, elle est généralement considérée comme mal diagnostiquée et sous-reportée sur le continent africain. Ceci pose un défi au personnel des services d'urgences dans la région, qui se trouvent confrontés à la nécessité de traiter un grand nombre de patients présentant une exacerbation de MPOC non diagnostiquée auparavant. D'autres facteurs viennent compliquer cette situation, notamment le manque de sensibilisation du public, la forte prévalence d'autres maladies respiratoires chroniques et les difficultés d'accès aux soins de santé.

L'objet de cet article est de mettre en avant l'état actuel de la recherche et les directives internationales relatives à la gestion de l'exacerbation aiguë de la MPOC au sein des services d'urgences. Le strict respect des directives internationales pour la gestion de l'exacerbation aiguë de la MPOC peut être difficile pour nombre de prestataires en Afrique en raison de facteurs affectant le diagnostic, le traitement et l'accès aux soins pour de nombreux Africains souffrant de MPOC. Les études consacrées au rôle des urgentistes africains dans la fourniture de moyens de diagnostic rentables supplémentaires et de traitement de la MPOC sont limitées.

### African relevance

- COPD prevalence and mortality in Africa are rising.
- COPD has a large economic burden on the individual and healthcare system.
- Disease prevention is possible with targeted efforts.

### Introduction

Chronic obstructive pulmonary disease (COPD) is defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) as 'a preventable and treatable disease characterised by airflow limitation which is not fully reversible.'[1] It is a disease responsible for substantial medical and economic burden globally. In this paper, we focus on the most common emergency centre (EC) presentation of COPD- acute exacerbation-aiming to outline current guidelines and highlight recent literature.

### Epidemiology

According to World Health Organization's (WHO) Global Burden of Disease Report in 2004, COPD accounts for 5%

* **Correspondence to Alex Koyfman**. akoyfman8@gmail.com

Peer review under responsibility of African Federation for Emergency Medicine.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.afjem.2014.08.002

of all deaths worldwide, and is predicted to become the world's third leading killer by 2030.[2]

In Cape Town, South Africa, the prevalence of COPD grade 2 or higher is 22.2% in males and 16.7% in females.[3] As studies regarding COPD prevalence in other parts of the continent are limited, it is thought that actual disease burden may be grossly underestimated and underreported.[4–6] This may be due in part to a lack of provider awareness of international guidelines, misdiagnosis, spirometric underutilisation, or widespread lack of access to healthcare. A small qualitative study conducted in rural Uganda found that knowledge of COPD and its risk factors was lacking among the general public, leading to a variety of misconceptions and stigmatisations surrounding the development of chronic respiratory symptoms (usually attributed to tuberculosis).[7] Furthermore, the link between exposure to smoke from biomass fuels and tobacco to the development of respiratory symptoms was found to be poorly understood.[7]

The association of COPD and smoking tobacco has been well established. However, the use of biomass fuels for indoor cooking/heating (a practice seen in up to 90% of rural households globally) has been described as a major risk factor, rivaling smoking, for acquiring the condition.[2,8–11] Biomass fuels consist of any material derived directly from plants or animals, such as wood, dung, and grasses, and are typically much more accessible in regions of Sub-Saharan Africa than other sources of energy.[11] As fuels, they tend to combust relatively inefficiently, releasing high levels of pollutants into the surrounding area. This may become problematic in homes where poorly functioning stoves or open fires in areas with inadequate ventilation expose individuals (often women and children) to circulating chemicals and particulate matter.[11]

This practice, coupled with a rising prevalence of smokers in low and middle income countries, suggests that the incidence of COPD is expected to rise in these areas, where mortality from COPD is already increased compared to nations with higher incomes.[12] Other contributors include exposure to chemical irritants, host genetics (i.e., alpha-1 protease inhibitor deficiency), infections (including pulmonary tuberculosis, HIV, severe/recurrent childhood respiratory infections), malnutrition, and socioeconomic status.[13]

## Pathophysiology

COPD represents a spectrum of progressive, partially reversible pulmonary disease in which inhalation of noxious irritants contributes to local release of proteases and free radicals, resulting in a characteristic inflammatory response and structural changes to the lung. These changes have been historically categorised as twofold: (1) destruction and enlargement of bronchioles and alveoli, leading to decreased efficiency of expiration (historically termed 'emphysema'),[14] and (2) chronic inflammation manifested by mucous hypersecretion and distal airway obstruction ('chronic bronchitis').[15] Together, these changes lead to progressively impaired efficiency of oxygenation and ventilation, which in turn can contribute to the development of pulmonary hypertension and right heart failure.[16]

Repeatedly damaged alveoli will eventually lose their elasticity and coalesce into large, emphysematous 'blebs' of lung tissue that are commonly seen in end-stage disease and are prone to spontaneous rupture.[17]

## Baseline disease

The diagnosis of COPD is typically confirmed and staged as an outpatient with the use of pulmonary function testing and/or spirometry, neither of which is particularly accurate or helpful in the setting of acute exacerbation.[1] Therefore, one must maintain a high degree of suspicion for the disease in patients presenting with progressive, chronic dyspnoea, prolonged expiratory time, cough, and/or increased daily sputum production, especially if significant risk factors are present.[1] Outpatient management of COPD is guided by staging and symptoms, and will typically consist of a combination of inhaled bronchodilators, inhaled corticosteroids, home oxygen, and risk factor reduction.[1]

## Exacerbations

An acute COPD exacerbation (AECOPD) is defined by GOLD as 'an event in the natural history of the disease marked by acute worsening of dyspnoea, cough, and/or sputum, outside of one's daily variant.'[1] Exacerbation frequency is found to correlate with increased rate of lung function decline as measured by peak expiratory flow (PEF) and FEV1, decreased quality of life, and increased mortality.[18–20] Each admission for AECOPD is associated with increased short and long-term mortality.[21] Several studies suggest that return to baseline lung function within 3 months does not occur in a significant portion of patients following AECOPD.[22] Prolonged disability impacts potential earnings, imposing great economic as well as physical burden.

## Causes

The majority of AECOPD are caused by tracheobronchial tree infections, usually viral or bacterial. Other common precipitants may include exposure to other non-infectious airway irritants, pulmonary embolus (PE), congestive heart failure (CHF), pneumothorax, pleural effusion, mucous plugging, and anxiety. As many as thirty percent of AECOPD causes are never identified.[1,23]

## Assessment

### *History and physical*

A number of clinical findings may be helpful in gauging the likelihood of underlying airway obstruction in the undifferentiated patient, as well as for the presence of other common mimics or underlying causes such as CHF or PE. In a 2011 guideline published by the American College of Physicians, American College of Chest Physicians, American Thoracic Society, and European Respiratory Society, a clinical review found that presence of the combination of three items: smoking history greater than 55 pack-years, wheezing on auscultation, and self-reported wheezing, all point towards a high likelihood of airflow obstruction (likelihood ratio [LR], 156).[24] The lack of all three of these risk factors had a LR of 0.02, essentially ruling out the presence of an obstructive process.[24]

Additionally, specific elements of a history are significant indicators of severity and prognosis; they may guide manage-