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Original Article

Update of Global Initiative For Chronic Obstructive Lung Disease (GOLD 2023)

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable lung disease. Based on GOLD 2023 COPD defined as heterogeneous lung condition characterized by chronic respiratory symptoms including shortness of breath, coughing, and increased sputum production due to airway disorders such as bronchitis or bronchiolitis and/or alveoli disease such as emphysema which causes prolonged, progressive symptoms and causes airflow obstruction breath. Its prevalence was related to the prevalence of smoking patients which results in increased morbidity and mortality worldwide. The global COPD incidence rate is 10.3%. The COPD morbidity increase over years of age and the increasing number of smoking patients will worsen the COPD mortality rate.

Keywords: *COPD, GOLD, emphysema, airway obstruction*

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INTRODUCTION

Globally, the prevalence of COPD is 10.3% and quite high in several aspects such as smokers, age ≥ 40 years, and male gender. In 2017 The Global Burden of Disease Study reporting an estimated COPD mortality rate was 42/100.000 and approximately 4.72% of all causes of death. The increasing prevalence of smokers and the elderly population in developed countries, the predicted mortality case caused by COPD will be more than 5.4 million deaths by 2060.[1]

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) is a collaboration program between the World Health Organization (WHO) and the National Heart, Lung and Blood Institute to address the impact, management, and prevention of COPD. The first report was published in 2001 "the Global Strategy for the Diagnosis, Management, and Prevention of COPD" which then progressed through research studies until the publication of the current GOLD 2023.[1,2] Updates in GOLD 2023 include definitions, epidemiologic variations, risk factors, and therapeutic strategies for stable cases and exacerbations [2]

REVIEW

In this GOLD 2023 update review, five subsections of COPD updates will be discussed. These sub-sections consist of definition and taxonomy, screening and case finding, diagnosis flow, stable COPD management (both pharmacological and non-pharmacological), and exacerbation management.

Definition and Taxonomy

According to GOLD 2022, COPD defined as "a common, preventable and treatable disease characterized by persistent respiratory symptoms and airflow limitation due to airway and/or alveoli abnormalities caused by significant exposure to harmful particles or gases influenced by host factors including abnormal disease progression". This definition revised in GOLD 2023 into "a heterogeneous lung condition characterized by chronic respiratory symptoms such as shortness of breath, cough, sputum production, and exacerbations due to airway abnormalities such as bronchitis or bronchiolitis and/or alveoli abnormalities such as emphysema that cause persistent and progressive airflow obstruction". [3,4]

Risk factors for COPD are related to the interaction between gene/genetic (G), environment (E), and lifetime (T). Genetic risk factors for COPD are caused by mutations of the Serine Protease Inhibitor (SERPINA) 1 gene and α-1 antitrypsin protein deficiency. Smoking, air pollution, and exposure to irritants in the work environment are environmental risk factors for COPD. Lifetime is influenced by gender, development, and degenerative changes in lung structure as well as a history of asthma, chronic bronchitis, and infection.[5]

Smoking history in GOLD 2022 is the main factor causing COPD, while in GOLD 2023 it is stated that the mechanism of COPD is expanded by the establishment of a taxonomy design that describes risk factors for COPD other than smoking. Table 1 describes the taxonomy of COPD divided into 6 factors, namely, genetics, developmental disorders from birth, environment, infection, asthma, and factors of unknown cause. Environmental factors are divided into 2, namely repeated exposure to cigarette smoke and exposure to irritants or substances from the work environment. Exposure to irritants comes from exposure to household pollution, air pollution, forest fires, and occupational exposure.[6]

Table. 1 Taxonomy of COPD

Classification	Description
Genetically Determined COPD (COPD -G)	• Alpha-1 antitrypsin deficiency (AATD) • Other genetic variations
COPD due to abnormal lung development (COPD-D)	Early life events, including premature birth and low birth weight, among others
Environmental COPD	
• Cigarette smoking COPD (COPD-C)	• Exposure to tobacco smoke, including in utero or via passiev smoking • Vaping or e-cigarette use • Cannabis
• Biomass and pollution exposure COPD (COPD-P)	Exposure to tobacco smoke, ambient air pollution, wildfire smoke, occupational hazards
COPD due to infections (COPD-I)	Childhood infection, tuberculosis-associated, HIV associated –COPD
COPD Asthma (COPD-A)	Particularly childhood asthma
COPD of unknown cause (COPD-U)	

Screening and Case Finding

Based on GOLD 2023, it is important to do screening and case finding before patients are diagnosed with COPD. Screening spirometry is not reccomended in asymptomatic individual without significant risk factor exposure. Spirometry examination only performed in patients with clinical COPD or whom have risk factors such as smoking > 20 packs/year, respiratory infection from thoracic photographs, and a history of lung disease since childhood. [7]

Diagnosis

The diagnosis is based on clinical and spirometry test which characterized by irreversible airflow limitation with VEP1/KVP values <0.7 post-bronchodilator. Pre-COPD begins when respiratory symptoms appear due to anatomical abnormalities such as emphysema and/or physiological abnormalities with low-normal VEP1 values, air trapping, hyperinflation, decreased lung diffusion capacity, and/or decreased VEP1 without airflow obstruction known as Preserved Ratio Impaired Spirometry (PRISm). PRISm defined as a condition in which the patient has normal ratios with abnormal spirometry result.[7,8]

Table. 2 Clinical Indicators for Considering a Diagnosis of COPD

Clinical	Description
• Dyspnea that is	• Progressive over time • Worse with exercise • Persistent
• Recurrent wheeze	-
• Chronic Cough	May be intermittent and may be unproductive
• Recurrent lower respiratory tract infections	-
• History of risk factors	• Tobacco smoke (including popular local preparations) • Smoke from home cooking and heating fuels • Occupational dust, vapors, fumes, gases, and other chemicals • Host factors (e.g genetic factors, developmental abnormalities, low birthweight, prematurity, childhood respiratory infections, etc)

The COPD clinical features including shortness of breath, wheezing, coughing with or

without sputum production, activity limitation, and acute exacerbation with increased respiratory symptoms. Shortness of breath is chronic and aggravated by physical activity. Cough with or without sputum production is a frequent symptom experienced by patients due to smoking and/or exposure to environmental factors. Sputum production may occur in periods of flare-ups interspersed with periods of remission. Increased sputum production can also potentially lead to bronchiectasis. Purulent sputum indicates an increase in inflammatory mediators.[9,10]

Table. 3 Additional Investigation

Inspection Criteria	Type of Inspection
Physiological Tests	• Lung Volume • *DLco* • Oximetry • Blood Gas Measurement • Exercise test and assessment of physical activity
Imaging	• Chest X-ray • Computed tomography (CT)
Other checks	• AATD • Composite Scores • Biomarkers • *Treatable Traits* (TTs)

The spirometry result that indicates airway obstruction is post-bronchodilator VEP1/KVP ratio <0.7. Current clinical experience is assessed through 2 validated questionnaire parameters, namely the modified Medical Research Council (mMRC) and the COPD Assessment Test (CAT).[11]

Airway obstruction examination results that do not match the patient's symptoms need to be examined as additional investigations focusing on pulmonary function examination, radiological examination, and other supporting examinations.[12]

One of the updates in GOLD 2023 is the Computed Tomography (CT) Scan of the thorax which is used to evaluate differential diagnosis, lung volumes, and cancer screening. Thoracic CT - Scan examination in COPD patients is considered for patients with persistent exacerbation, predicted VEP1 value < 45% with hyperinflation and meet lung cancer screening criteria.[12]

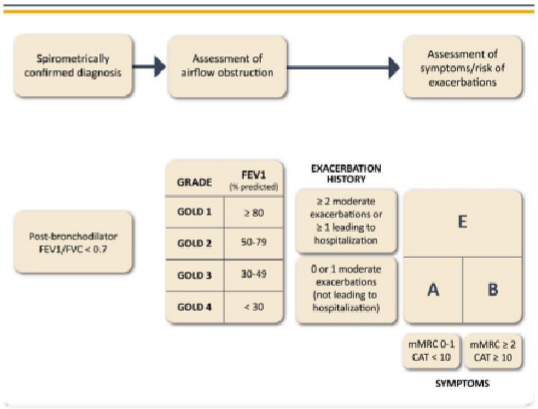

Figure 1.GOLD A-B-E Assessment Tool

GOLD 2023 also proposes changes the previous "ABCD" scoring system into "ABE" Scoring system (Figure 4). Group A and group B remained unchanged, but group C and group D were merged into a single entity called "group E" (Figure 4). This was done to emphasize the clinical relevance of exacerbations.[11,12]

Pharmacological and Non-pharmacological Therapy

The initial pharmacologic management determined by the patient symptoms according to the A-B-E classification (Figure 5).[26-30] Group A patients were given bronchodilator therapy, either short- or long-acting bronchodilators. Group B therapy was initiated using a combination of Long Acting Beta2-Agonists (LABA) and Long-Acting Muscarinic Antagonists (LAMA). A randomized clinical trial showed that in patients with 10, the use of LABA+LAMA was superior to the use of LAMA alone.[13]

Several meta-analysis journal reviews comparing the combination of two therapies with the use of long-acting bronchodilators showed that

LABA+LAMA has a better rating in reducing COPD exacerbations. LABA+LAMA is a good initial therapy option in group E patients. For Conditions that require indications for Inhaled Corticosteroid (ICS) administration, then LABA+LAMA+ICS shows superiority compared to LABA+ICS. The LABA+ICS combination therapy in COPD is still not recommended. Eosinophil results >300 cells/uL then consider giving LABA+LAMA+ICS. [13]

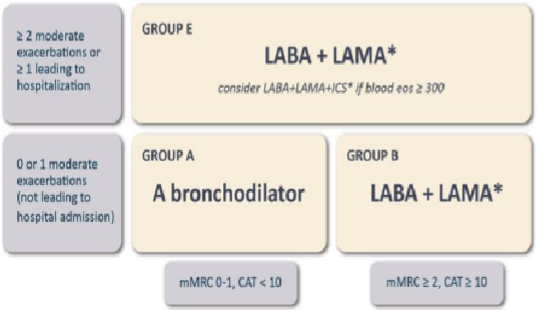

Figure 2. Initial Pharmacological Treatment

The non-pharmacological management complement the pharmacological management, which forming a comprehensive management for COPD. Non-pharmacological management emphasizes the importance of education about exposure to smoke-free environments, disciplined medication, ensuring proper inhaler use technique, regular physical activity or exercise, vaccination, and rehabilitation.[14,15]

Patient's follow-up play an important role as the lung function may deteriorate over time despite optimal treatment. Symptoms, exacerbations, and objective measures of airway obstruction should be routinely checked to determine when to modify management and also identify complications and/or comorbidities that may develop. In monitoring COPD patients, it is important to assess symptoms, exacerbations, adherence and appropriate medication use, smoking status, FEV1 measurements, imaging, and comorbidities. [14,15]

Exacerbation Management

A change in the definition of an exacerbation in Gold 2023 which is defined as an attack characterized by an increase in symptoms of shortness of breath and/or cough with increased and discolored sputum that worsens in <14 days followed by tachypnea and/or tachycardia due to local or systemic inflammation.[16]

There are three degrees of exacerbation: no respiratory failure, non-life-threatening acute respiratory failure, and life-threatening acute respiratory failure. [16]

Signs of exacerbation without respiratory failure are respiratory frequency ≤ 24 x/min, pulse frequency < 95x/min, no use of respiratory muscles, no change in mental status, hypoxemia improves with oxygen supplementation with FiO2 24 - 35%, and no increase in PaCO2. Signs of exacerbation of non-life threatening acute respiratory failure are respiratory frequency > 24 x/min, use of respiratory muscles, no change in mental status, hypoxemia improves with oxygen supplementation requiring FiO2 > 35%, and hypercarbia with an increase in PaCO2 of 50-60 mmHg. Signs of life-threatening acute respiratory failure are respiratory frequency >24 x/min, use of respiratory muscles, an acute decline in consciousness, hypoxemia that does not improve with oxygen supplementation or requires FiO2> 40%, and hypercarbia with an increase in PaCo2> 60% accompanied by acidosis with pH ≤ 7.25.[16,17]

Initial treatment in COPD exacerbation is the administration of bronchodilators, corticosteroids, and antibiotics. The recommended initial bronchodilator is SABA+SAMA. Corticosteroids that can be used are budesonide nebulization or IV methylprednisolones. Antibiotics (if indicated) are empirically given for 5-7 days. Additional therapy includes oxygen supplementation (Ventury Mask / HFNC / Non-mechanical ventilator / Mechanical ventilator). [35-37]

Oxygen supplementation should be titrated to address hypoxemia with a target saturation of 88-92%. Evaluation of oxygen titration is based on Arterial Blood Gas Analysis (ABG) to ensure the oxygen demand is achieved without carbon dioxide retention and/or worsening of acidosis. Oximetry is not as accurate as ABG in patients with ≤92% arterial oxygen saturation and it's not provide information such as $PaCO_2$ and pH. Thus, oxymetry is not reccomended as an evaluation parameter. A study showed that venous blood gas analysis has the accuracy of arterial blood gas analysis in assessing blood bicarbonate and pH levels. [16-18]

Surgical Therapy

Indications for surgery in COPD patients are structural changes in the airway and lung parenchyma. Unilateral or bilateral Lung Volume Resection Surgery (LVRS) can be considered in patients with emphysema and lung hyperinflation that are refractory to pharmacologic management. Bullectomy indicated if the bulla occupies >1/3 of the hemithorax and compresses the surrounding lung tissue.[16-18]

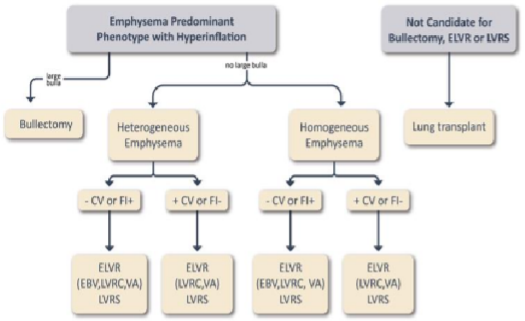

Figure 3. Surgical and Interventional Therapies in Advanced Emphysema

In a very severe COPD patients, lung transplantation can be considered as the last option. This management indications are: Bodymass, Obstruction, Dyspnea, Exercise (BODE) index > 7, VEP1 <15-20%, and have had ≥3 episode of severe exacerbations during the previous year, one severe exacerbation with hypercapnic respiratory failure, or a moderate exacerbation complicating into severe pulmonary hypertension. [17,18]

CONCLUSIONS

COPD is a heterogeneous lung disorder characterized by chronic respiratory symptoms such as shortness of breath, coughing, and increased sputum production resulting from abnormalities in the airways and/or alveoli resulting in persistent and progressive airflow obstruction. An exacerbation is an attack characterized by increased symptoms of shortness of breath and/or cough with increased and discolored sputum that worsens in <14 days followed by tachypnea and/or tachycardia. COPD risk factors occur through the relationship and interaction between host genetics (G) and various environmental risk factors (E) over the patient's lifetime (T).

The taxonomy of COPD in GOLD 2023 explains the risk factors for COPD apart from smoking factors which are then divided into 6 factors, namely, genetics, developmental disorders from birth, environment, infection, asthma, and factors of unknown cause. Currently, the classification system used is A-B-E. Thoracic CT scan is used to evaluate differential diagnosis, lung volume, and cancer screening. Management in COPD patients is tailored to the degree of airway obstruction, current clinical experience, history of exacerbations, and multimorbidity of the patient.

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