



## Treatment Regimens for Chronic Obstructive Pulmonary Disease

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**Abstract:** According to modern concepts, chronic obstructive pulmonary disease (COPD) is "a disease characterized by airflow limitation that is not fully reversible; airflow limitation is progressive and associated with a pathological inflammatory response of the lungs to the action of inhaled pathogenic particles or gases. The primary target of COPD is the respiratory organs. The main clinical manifestations of COPD are cough, sputum production and progressive dyspnea. External respiratory function in COPD is characterized by the emergence of slowly increasing airflow restrictions with progressive reduction of forced expiratory volume per second (FEV1) and Hensler index (FEV1/FEL) due to increased resistance in the airways with subsequent deterioration of gas exchange in the lungs. Complications of COPD are known: pulmonary hyperinflation (pulmonary emphysema), chronic respiratory failure, secondary pre-capillary pulmonary hypertension and chronic pulmonary heart disease, which should be considered as natural manifestations of the natural course of COPD.

**Keywords:** chronic obstructive pulmonary disease, principles and schemes of treatment.

**Introduction.** Chronic obstructive pulmonary disease (COPD) remains one of the most important problems of modern healthcare. According to experts' forecasts, by 2030 the disease will take the third place among the causes of death in the world [1]. COPD is a heterogeneous disease characterized by persistent respiratory symptoms and bronchial obstruction resulting from airway and/or alveolar pathology. The most frequent cause of these changes is significant exposure to damaging particles and gases [2]. The course of the disease is characterized by periodic exacerbations, leading to more rapid disease progression and being the leading cause of COPD patients seeking medical care, hospitalizations, and deaths [3, 4]. In the U.S. alone, the costs associated with the disease exceed \$50 billion per year, most of which are attributed to the treatment of exacerbations [5]. According to the results of the studies, there is a weak correlation between impaired ventilatory function and the frequency of COPD exacerbations; the best predictor of future exacerbations is their frequency in the past [6]. According to modern ideas, the most part of COPD exacerbations has infectious nature, however indications to prescription of antimicrobial preparations (AMP) and their choice in the given clinical situation often are a subject for discussions. This article is devoted to a discussion of these issues. Studies suggest that up to 70-80% of COPD exacerbations are due to bacterial and viral infection of the respiratory tract. The main noninfectious causes of exacerbations are: environmental exposure to aeropollutants, low adherence of patients to treatment, decompensation of cardiac activity, erroneous prescription of medications, etc. The key place in the development of infectious exacerbations of COPD is occupied by bacterial pathogens, among which the leading role belongs to untypable Haemophilus influenzae, Streptococcus pneumoniae, Moraxella catarrhalis, in severe COPD - Pseudomonas aeruginosa [8]. The structure of pathogens

largely correlates with the patient's ventilatory dysfunction. In severe bronchial obstruction penicillin-resistant *S. pneumoniae* (PRP),  $\beta$ -lactamase-producing strains of *H. influenzae* are more often isolated from sputum samples of patients. The presence of bronchiectasis is associated with colonization of the bronchial tree by *P. aeruginosa*, especially in combination with extremely severe bronchial permeability disorders. The etiological significance of the family Enterobacteriaceae and *Staphylococcus aureus*, despite the frequent isolation of these pathogens in bacteriological examination of sputum samples of patients with exacerbations of COPD, remains unclear. The role of "atypical" bacteria (*Chlamydia pneumoniae* and *Mycoplasma pneumoniae*) in the development of exacerbations seems to be quite modest: according to the results of the studies, these microorganisms are responsible for less than 5% of exacerbations [8].

It should be noted that views on the role of bacterial infection in the pathogenesis of COPD exacerbations have repeatedly changed: from acknowledging the leading role of infectious agents in the occurrence of exacerbations to denying the causal link between the detection of bacteria in airway secretions and increased severity of symptoms. It is known that structural changes in the bronchi, as well as violation of local anti-infective immunity in COPD create conditions for colonization of bacterial agents on the surface of airway epithelium (under normal conditions airways distal to the larynx are sterile), which results in progression of endobronchial inflammation. In previous years, transient worsening of clinical manifestations of the disease was mainly explained by periodically increasing "microbial load" on the airways. At the same time, there is evidence that the occurrence of COPD exacerbations is associated with the "acquisition" of new strains of bacteria to which the body has not yet acquired effective anti-infective immunity. The development of immunological reactions in this case is the factor leading to the clinical picture of exacerbation of the disease [9]. It should be noted that microbiological examination of sputum samples cannot distinguish between "colonizing" microorganisms and microorganisms responsible for the development of exacerbations, which limits the diagnostic value of this diagnostic method and determines its inexpediency for routine use in exacerbations of COPD. The study is recommended if a patient has risk factors for infection caused by *P. aeruginosa*, ineffectiveness of antibiotic therapy (ABT) in the presence of certainty in the infectious etiology of exacerbations, the presence or threat of acute respiratory failure.

### **Diagnosis of a bacterial exacerbation of COPD**

An exacerbation of COPD is an acute event characterised by worsening respiratory symptoms and leading to a change in the therapy used [2].

The main features that characterise an exacerbation include the criteria proposed by N.R. Anthonisen et al. [10]:

- The occurrence or increase in dyspnea;
- Increased volume of discharged sputum;
- Increased purulent sputum.

The presence of all three of the above criteria is described as type I, two of them as type II and one as type III.

The relevance of distinguishing bacterial-dependent exacerbations of COPD from exacerbations of other etiologies is determined primarily by the need to decide on the appropriateness of prescribing antibiotics. It has been shown that in types I and II of exacerbations there is a clinical advantage of ABT over placebo; in contrast, in type III no advantage of antibiotics over placebo has been demonstrated. Microbiological examination of sputum, as already noted, does not identify the type of exacerbation. Determination of biomarkers that are highly correlated with bacterial infection in pneumonia and sepsis (C-reactive protein, procalcitonin) has limited value in exacerbations of COPD. The presence of purulent sputum remains the easiest and most reliable indication of the bacterial nature of an exacerbation, as shown by studies. It is the clinical presentation of an exacerbation of COPD that is decisive in determining the management of patients.

It should be noted that a large proportion of bacterial exacerbations of COPD are characterized by spontaneous resolution of symptoms, which is associated with the peculiarities of inflammation and immunological reactions in this disease. However, COPD exacerbations have a significant medical and social significance associated not only with their impact on the quality of life of patients and the rate of disease progression, but also with high mortality of this category of patients. Thus, hospital mortality ranges from 4 to 10%, reaching 24% in patients in intensive care and intensive care units (ICU). The long-term prognosis of patients hospitalized for severe exacerbations of COPD is even more pessimistic, with mortality approaching 40% within the next year. Studies suggest that failure to prescribe timely AMIs for bacterial exacerbations of COPD is accompanied by an increased likelihood of therapeutic failure, hospitalizations, and relapses [1, 3].

## Conclusion

Thus, summarizing the current approaches to the management of patients with exacerbation of COPD, it should be noted that the main criterion for deciding on the necessity of prescribing an AMI is clinical presentation of the disease. One of the basic principles of antimicrobial therapy - prescribing antibiotics only in case of bacterial infection - should be strictly adhered to. The choice of a drug is determined by the presence or absence of risk factors for the etiological significance of resistant pathogens and the likelihood of therapeutic failure. In conditions of continuing growth of resistance of key respiratory pathogens to AMI, the evaluation of regional (and if possible, local) profile of antibiotic resistance of microorganisms is a necessary condition for correct choice of antibiotic.

## Literature

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