

# The Impact of the GOLD 2023 on Clinical Treatment in Northeast China

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Chronic obstructive pulmonary disease (COPD) is distinguished by a gradual decline in airflow, accompanied by a growing load of symptoms and economic consequences.<sup>1</sup> The Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines serve as the fundamental framework for directing the diagnosis, treatment, and management of COPD. The most recent significant revision, GOLD 2023, not only modified the disease assessment tool for categorization purposes but also revised the medication recommendations for each group. However, the ramifications of those alterations on the Chinese COPD population remain unexplored and warrant further investigation.

## Methods

This is a multi-center prospective cohort study. The investigation was conducted at the Department of Respiratory and Critical Care Medicine at hospitals with different levels in northeast China. The participants included individuals who sought medical attention for exacerbation of respiratory symptoms and were diagnosed with COPD within the timeframe of January 2018 to March 2021. COPD was defined as the presence of respiratory symptoms accompanied by evidence of airflow limitation, specifically indicated by a post-bronchodilator forced expiratory volume in one second (FEV<sub>1</sub>) to forced vital capacity (FVC) ratio of less than 0.70. The follow-up was conducted from April to September 2021, during a period of participant stability, ensuring the absence of acute exacerbations within a one-month timeframe. The follow-up questionnaire encompassed inquiries regarding medication usage and respiratory symptoms. The classification of COPD severity and the formulation of suitable treatment plans were established in accordance with the guidelines outlined in GOLD 2017 and GOLD 2023.<sup>1,2</sup> A comprehensive overview of the disparities in treatment recommendations between GOLD groups in GOLD 2017 and GOLD 2023 can be found in [Table S1](#).

## Results

A total of 986 participants were diagnosed with COPD, and 617 completed follow-up investigations. The mean age of the participants was 63.7 years, and the post-bronchodilator FEV<sub>1</sub> as a percentage of predicted normal was 51.3±18.6%. Of the participants, 358 (58.0%) were male. According to the GOLD 2017 criteria ([Table 1](#)), 105 (17.0%) participants were classified as GOLD A, 300 (48.6%) as GOLD B, 18 (2.9%) as GOLD C, and 194 (31.5%) as GOLD D. After one year of follow-up, only 312 (50.6%) of the patients used any form of COPD-related prescription drugs, and 280 (45.4%) used inhaled bronchodilator therapy. The most prevalent form of maintenance therapy was long-acting beta-agonist (LABA) + inhaled corticosteroids (ICS), accounting for 62.5% (175/280) of the cases, followed by long-acting antimuscarinic antagonist (LAMA)+LABA+ICS at 15.4% (43/280) and LAMA at 10.7% (30/280, 10.7%) ([Figure S1](#)). The utilization rate of appropriate treatment, as per the GOLD 2017 criteria, was 18.8%, slightly higher than the rate using the GOLD

**Table 1** Baseline Characteristics of Included Subjects

Variables	Total
No. of subjects	617
Age, mean $\pm$ standard deviation (SD)	63.7 $\pm$ 10.4
Gender, male, %	358(58.0)
Smoking status, %	
Non-smoker	152(24.6)
Passive smoking	104(16.9)
Active smoking	361(58.5)
Post-bronchodilator FVC, liter, mean $\pm$ SD	2.3 $\pm$ 0.8
Post- bronchodilator FVC, % predicted normal, mean $\pm$ SD	71.5 $\pm$ 20.2
Post-bronchodilator FEV <sub>1</sub> , liter, mean $\pm$ SD	1.3 $\pm$ 0.6
Post- bronchodilator FEV <sub>1</sub> , % predicted normal, mean $\pm$ SD	51.3 $\pm$ 18.6
Post- bronchodilator FEV <sub>1</sub> /FVC, %, mean $\pm$ SD	57.1 $\pm$ 11.5
Family history of respiratory disease, %	208(33.7)
History of respiratory disease, %	466(75.5)
Exposure to air pollution, %	63(10.2)
Exposure to dust from production and living, %	315(51.0)
CAT score in baseline, mean $\pm$ SD	18.1 $\pm$ 8.9
MMRC score in baseline, mean $\pm$ SD	2.0 $\pm$ 1.2
CAT score in follow-up, mean $\pm$ SD	11.3 $\pm$ 8.3***
mMRC score in follow-up, mean $\pm$ SD	1.4 $\pm$ 1.1***
GOLD 2017, %	
A	105(17.0)
B	300(48.6)
C	18(2.9)
D	194(31.5)
GOLD 2023, %	
A	105(17.0)
B	300(48.6)
E	212(34.4)

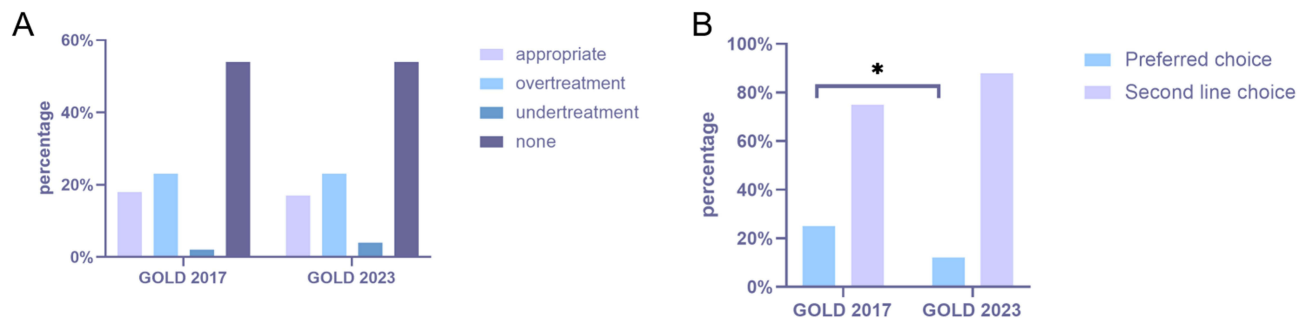
**Notes:** \*\*\*Compared with baseline CAT or MMRC scores,  $P < 0.001$ .

**Abbreviations:** GOLD, Global Initiative for Chronic Obstructive Lung Disease; CAT, COPD assessment test; mMRC, modified British Medical Research Council; SD, standard deviation; FVC, forced vital capacity; FEV<sub>1</sub>, forced expiratory volume in 1s.

2023 criteria at 17.5%, although this difference was not statistically significant ( $P=0.613$ ). Among patients receiving appropriate treatment according to the 2017 GOLD guideline, 25% adhered to the recommended preferred therapies. However, if the 2023 GOLD guideline is applied, the rate of preferred choices would decrease to 12.0% ( $P=0.013$ ) (Figure 1). The rate of preferred choices in Group B exhibited a statistically significant decrease following the transition from GOLD 2017 to GOLD 2023 (86.7% vs 13.3%,  $P < 0.001$ ). Conversely, Group A experienced a slight increase in preferred choices, although this difference was not statistically significant (42.9% vs 57.1%,  $P=0.706$ ). Additionally, the pooled rates of preferred choices in Groups C (0%) and D (12.3%) were marginally lower compared to Group E, but these differences did not reach statistical significance (11.5% vs 3.8%,  $P=0.065$ ) (Table S1).

## Discussion

In the present study, it was observed that only 50% of the patients utilized medications specifically targeting COPD, with the combination of LABA+ICS being the most frequently prescribed therapy for bronchodilation. This finding contradicts the recommendations outlined in the latest guidelines. If the treatment guidelines transition from GOLD 2017 to GOLD 2023, there will be a significant decrease in the adoption of the preferred-line maintenance therapy based on the



**Figure 1** Distribution of maintenance therapy adherence using GOLD 2017 and GOLD 2023 criteria. **(A)** Detailed distribution of adherence. **(B)** Distribution of preferred and second-line choices.

**Notes:** \*Compared with the adoption of the preferred-line maintenance therapy of GOLD 2017, the rate of the preferred-line maintenance therapy of GOLD 2023 was lower, with statistically significant differences ( $P < 0.05$ ).

**Abbreviation:** GOLD, Global Initiative for Chronic Obstructive Lung Disease.

current treatment status in China. The decline in the rate of preferred choices primarily stems from the shift from a single long-acting bronchodilator to a dual long-acting bronchodilator in Group B.

The treatment predicament for COPD in China involves patients discontinuing the use of maintenance medication during their stable phase, a problem that is also prevalent globally. Our study revealed that approximately half of the patients ceased using COPD-related medication after a median follow-up period of one year. A retrospective cohort study, utilizing data from a comprehensive national health plan, demonstrated that out of 230,442 COPD patients, 40.0% were utilizing COPD-related medications as a form of maintenance therapy during the 24-month post-index period.<sup>3</sup> A separate study analyzed treatment pathways utilizing a comprehensive database of general practitioners, revealing that a significant proportion (46.5%) of individuals discontinued long-term inhaled bronchodilator maintenance treatment within a span of 18 months.<sup>4</sup>

Furthermore, our analysis indicated that LABA+ICS was the most frequently prescribed bronchodilator. Additionally, data obtained from a nationwide outpatient survey focusing on COPD in China demonstrated that 72.2% of patients with a COPD Assessment Test (CAT) score of 10 or higher, 42.8% of patients with a modified Medical Research Council (mMRC) dyspnea scale score of 2 or higher, and 41.7% of patients were categorized into Groups C and D.<sup>5</sup> Given the substantial number of COPD patients with a high burden of disease symptoms and a heightened risk of exacerbations, it is reasonable for physicians to adhere to the GOLD guidelines and prescribe regimens that include ICS for these patients. Consequently, a significant proportion of COPD patients in China receive ICS-containing regimens. In a retrospective study conducted by Bloom et al, the prescription patterns for initial maintenance therapy in COPD patients were examined, revealing that 66.1% of patients in the United States initiated an ICS-containing regimen (49.3% LABA+ICS, 12.6% ICS, 4.2% LAMA+LABA+ICS).<sup>6</sup> A retrospective study in New Zealand utilizing the HealthStat general practice database revealed that the predominant treatment regimen for patients with COPD was the combination of LABA+ICS, accounting for 59.0% of cases, followed by the combination of LAMA+LABA+ICS, which constituted 26.7% of cases.<sup>7</sup> These findings suggest that the widespread prescription of regimens containing ICS is a global concern requiring immediate attention and improvement.

Compared to the GOLD 2017 guideline, the preferred treatment choice in GOLD 2023 has shifted from a short-acting bronchodilator to a long-acting bronchodilator in Group A, and from a mono-long-acting bronchodilator to a dual-long-acting bronchodilator in Groups B and D. This change has resulted in a lower rate of preferred treatment choice according to the 2023 GOLD guideline, primarily observed in Groups B, as indicated by the present real-world data. Furthermore, After conversion to GOLD 2023, the group exhibiting the greatest potential for improvement in the rate of preferred treatment choice was Group E, with a notable achievement of 96.2%; Group B, with a rate of 86.7%, Group A, with a rate of 42.9%. This phenomenon could potentially be associated with drug marketing, healthcare coverage policies, and the prescribing practices of healthcare professionals and patients. Altering the preferred treatment paradigm, conceptualization, and management of this condition necessitates substantial commitment from both physicians and

patients. Consequently, additional research is warranted to investigate the impact of implementing such measures specifically on Chinese COPD patients.

## Conference Presentation

The manuscript has not been and will not be submitted, in part or entirety, elsewhere for publication. There are no other submissions or publications that include material that is largely duplicative of that presented in the manuscript or derived from the same subjects.

## Data Sharing Statement

The datasets used and analyzed in this study are available from the corresponding author upon reasonable request.

## Ethics Statement

This study was approved by the Institutional Review Board of China Medical University ([2018]083), and all subjects gave informed consent to this study. This study was conducted in accordance with the Declaration of Helsinki.

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## Disclosure

The authors report no competing interests in this work.

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## References

1. GOLD. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease 2023 report [OL]; 2023. Available from: <https://goldcopd.org/wp-content/uploads/2017/02/wms-GOLD-2017-FINAL.pdf>. Accessed November 23, 2022.
2. GOLD. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease 2017 report [OL]. Available from: <https://goldcopd.org/>. Accessed November 23, 2022.
3. Li Y, Lim J, Stemkowski S, Kaila S, Renda A, Shaikh A. Initiation of triple therapy maintenance treatment among patients with COPD. *Am J Manag Care*. 2020;26(4):e106–e112.
4. Meeraus W, Wood R, Jakubanis R, et al. COPD treatment pathways in France: a retrospective analysis of electronic medical record data from general practitioners. *Int J Chron Obstruct Pulmon Dis*. 2019;14:51–63. doi:10.2147/COPD.S181224
5. Yang T, Cai B, Cao B, et al. Severity distribution and treatment of chronic obstructive pulmonary disease in China: baseline results of an observational study. *Respir Res*. 2022;23(1):106. doi:10.1186/s12931-022-02021-w
6. Bloom CI, Montonen J, Jöns O, Garry EM, Bhatt SP. First maintenance therapy for chronic obstructive pulmonary disease: retrospective analyses of US and UK healthcare databases. *Pulm Ther*. 2022;8(1):57–74. doi:10.1007/s41030-021-00179-0
7. Milea D, Yeo SH, Nam Y, et al. Long-acting bronchodilator use in chronic obstructive pulmonary disease in primary care in New Zealand: a retrospective study of treatment patterns and evolution using the HealthStat Database. *Int J Chron Obstruct Pulmon Dis*. 2021;16:1075–1091. doi:10.2147/COPD.S290887

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