

# Treatment Patterns for Chronic Obstructive Pulmonary Disease (COPD) in the United States: Results from an Observational Cross-Sectional Physician and Patient Survey

David Mannino<sup>1</sup>, James Siddall<sup>2</sup>, Mark Small<sup>2</sup>, Adam Haq<sup>2</sup>, Marjorie Stiegler<sup>3</sup> , Michael Bogart<sup>3</sup>

<sup>1</sup>Department of Medicine, University of Kentucky, Lexington, KY, USA; <sup>2</sup>Respiratory DSP Franchise, Adelphi Real World, Bollington, UK; <sup>3</sup>US Value Evidence and Outcomes, GlaxoSmithKline plc, Durham, NC, USA

Correspondence: Michael Bogart, US Value Evidence and Outcomes, GlaxoSmithKline plc, 5 Moore Dr, Research Triangle Park, Durham, NC, USA, Tel +19198897413, Email michael.r.bogart@gsk.com

**Purpose:** There is a high prevalence of chronic obstructive pulmonary disease (COPD) in the United States (US). Although guidelines are available for the treatment of COPD, evidence suggests that management of COPD in clinical practice is not always aligned with this guidance. This study aimed to further understand the current use of COPD maintenance medication in the US.

**Patients and Methods:** This study was an analysis of data from the Adelphi Respiratory Disease Specific Programme (DSP™) 2019. Point-in-time data were collected from participating US physicians and their COPD patients. Physicians were either primary care physicians (PCPs) or pulmonologists, with a minimum workload of  $\geq 3$  COPD patients per month. Patients were aged  $\geq 18$  years with a physician-confirmed diagnosis of COPD.

**Results:** In total, 171 physicians completed the survey (92 PCPs and 79 pulmonologists). Mean patient age was 66.4 years, 45% were female, with moderate COPD in 49.4% of patients and severe/very severe in 19.3%. Pulmonologists more frequently prescribed dual bronchodilation and triple therapy than PCPs, whereas inhaled corticosteroid/long-acting  $\beta_2$ -agonist was more frequently prescribed by PCPs than pulmonologists. For both physician types, the most common reason for prescribing their patients' current treatment was 24-hour symptom relief. The majority of PCPs (70.1%) and pulmonologists (71.9%) reported referring to COPD guidelines when making treatment decisions.

**Conclusion:** Prescribing patterns for COPD patients were found to differ between PCPs and pulmonologists. Improved physician understanding of how to tailor treatment for each patient, based on current symptoms and exacerbation risk, could help optimize patient care in COPD.

**Keywords:** COPD, inhaled corticosteroids, long-acting  $\beta_2$ -agonist, long-acting muscarinic antagonist, maintenance therapy, survey

## Plain Language Summary

Patients with COPD are usually treated by a primary care physician (PCP) and/or a specialist doctor (pulmonologist). These doctors typically follow guideline recommendations on how to choose the best treatment based on symptoms and frequency/severity of exacerbations experienced by each of their patients with COPD. We designed a study using data from a survey completed by pulmonologists and PCPs to understand what COPD treatments they prescribe and whether they follow guidelines when selecting treatments for their patients.

In total, 171 doctors completed the survey (92 PCPs and 79 pulmonologists) and provided anonymous information about 800 of their patients with COPD. The survey showed that patients treated by pulmonologists are more often prescribed combination treatments that have more recently been introduced and are now recommended by guidelines. Patients being treated by PCPs are more often prescribed an inhaled corticosteroid combined with a long-acting bronchodilator, irrespective of the patients' current COPD symptoms and risk of having an exacerbation. Both types of doctor indicated that their most common reason for prescribing

a treatment was to provide patients with 24-hour symptom relief. Most PCPs (70.1%) and pulmonologists (71.9%) reported referring to COPD guidelines when deciding on a treatment for their patients.

The study results suggest that some doctors may not follow guideline recommendations exactly when personalizing treatment regimens for patients with COPD. Personalizing the medication choice to properly treat each patient is important, and these guidelines can help doctors choose the best treatment that will control COPD and improve patients' daily lives.

## Introduction

Despite the availability of international and national treatment guidelines for chronic obstructive pulmonary disease (COPD), evidence suggests that available therapies may not be utilized to their full potential to optimize disease management and outcomes for patients.<sup>1–3</sup> COPD treatment guidelines are frequently updated, which presents a challenge for physicians managing patients with COPD. Furthermore, several new COPD medications have been approved in recent years.<sup>4,5</sup> Current recommendations from the Global Initiative for Chronic Obstructive Lung Disease (GOLD) indicate that each treatment regimen needs to be individualized, as the relationship between symptom severity, airflow limitation, and severity of exacerbations differs between patients.<sup>4</sup> Pharmacotherapy based on the patient's GOLD group (symptom severity and number/severity of exacerbations in the last year) can include a long-acting muscarinic antagonist (LAMA) or long-acting  $\beta_2$ -agonist (LABA), alone or in combination, with addition of an inhaled corticosteroid (ICS) if indicated by the patient's exacerbation history in the past year ( $\geq 2$  moderate or resulting in hospitalization). Triple inhaled therapy of LABA, LAMA, and ICS (ie LABA/LAMA/ICS) improves lung function, symptoms, health status, and reduces exacerbations compared with LABA/ICS, LAMA/LABA, or LAMA monotherapy.<sup>4</sup>

To ensure optimal management and outcomes for patients with COPD, it is important to understand how treatment guidelines are translated into real-world clinical practice and identify barriers to the implementation of best practice. Historical data from observational studies have shown that COPD management in routine clinical practice is not always aligned with guideline recommendations.<sup>6–11</sup>

COPD has a high prevalence in the US. During 2014–2015, 5.9% of adults (more than 15.9 million) reported having been told by their healthcare professional that they have COPD, and the average age-adjusted mortality rate for COPD was 39.7 per 100,000 population.<sup>12</sup> There is a lack of published evidence on current treatment patterns in real-world clinical practice in the US, and how these prescribing patterns align with COPD guidelines, such as GOLD.<sup>4</sup> In addition, little information is available on the reasoning behind prescribing behaviors for specific COPD medications and classes by US primary care physicians (PCPs) and pulmonologists.

This observational study used data from a 2019 survey of US PCPs and pulmonologists, and their patients, to better understand the current use of COPD maintenance medication and the factors guiding treatment choices.

## Methods

### Study Design

This analysis utilized secondary data created from a survey of COPD patients and their physicians in the US – the Respiratory Disease Specific Programme (DSP)<sup>TM</sup> (2019 version). The DSP is an independent, multi-subscriber, point-in-time physician and (voluntary) patient survey. The DSP methodology has been published and validated previously.<sup>13</sup> The DSPs are established, large, observational surveys of routine clinical practice, designed to capture cross-sectional real-world data, that accurately reflect current disease burden, patient characteristics, care pathways, and associated treatment practices for a range of common chronic diseases, including COPD.<sup>1,14,15</sup>

The DSP surveys were completed between July and December 2019. Each participating physician completed a patient record form for consecutive COPD patients. The patients were asked to complete a COPD Assessment Test (CAT) questionnaire, in which they provided their CAT score on the survey date. This score was used to derive their GOLD classification (A–D). No other patient-reported data were included in this analysis. Other information was recorded on the survey date from available medical history. No follow-up data were collected. Importantly, all data analyzed in this study were collected prior to the emergence of COVID-19.

The DSP survey was conducted in accordance with the amended Declaration of Helsinki, adhering to the ICC/ESOMAR International code on observational research, and Health Insurance Portability and Accountability Act (HIPAA) guidelines. The survey received ethical exemption determination by the Western Institutional Review Board, a central international review board for the US (Study Number: 1-1211337-1). Patients provided written consent before completing the questionnaire. All data from physicians and patients were anonymized.

## Physician and Patient Criteria

Data were collected from US PCPs and pulmonologists, and their patients. Target physicians were identified by Adelphi preferred and audited local US DSP fieldwork team from public lists of healthcare professionals according to pre-defined selection criteria. PCPs and pulmonologists were required to manage  $\geq 3$  COPD patients per month and be actively involved in the management of COPD patients. This screening criteria threshold was chosen to ensure that data were collected from a sample of physicians who regularly treat patients with COPD, whilst not limiting the sample of physicians to those who have a very high COPD workload/specialism. Patients were required to be aged  $\geq 18$  years with a physician-confirmed diagnosis of COPD (including emphysema and/or chronic bronchitis). Note, International Classification of Disease (ICD) codes were not captured in this study. Patients with a concomitant asthma diagnosis (as confirmed by the physician) were excluded from this analysis, as were patients currently enrolled in a clinical study. To avoid selection bias, physicians were asked to provide data for a consecutive series of patients; this was a pragmatic sample as the program criteria did not require patient samples to be representative of the population in terms of race, income, social class, or age.

## Study Outcomes and Data Sources

The analytical considerations for each of the research objectives are described below. The primary objective was to describe the current prescribing patterns for US PCPs and pulmonologists and their reasons for prescribing specific classes of COPD therapy. Data were extracted from the DSP dataset on the treatments prescribed to COPD patients by PCPs and pulmonologists, and the reasons, or combinations of reasons, given for prescribing each specific therapy class. Descriptive statistics were generated, and data tables produced showing the frequency and percentage of patients within each response. Patients could be treated by multiple physician types; however, the data on current treatments were grouped according to the physician type (PCP or pulmonologist) that provided data in the survey.

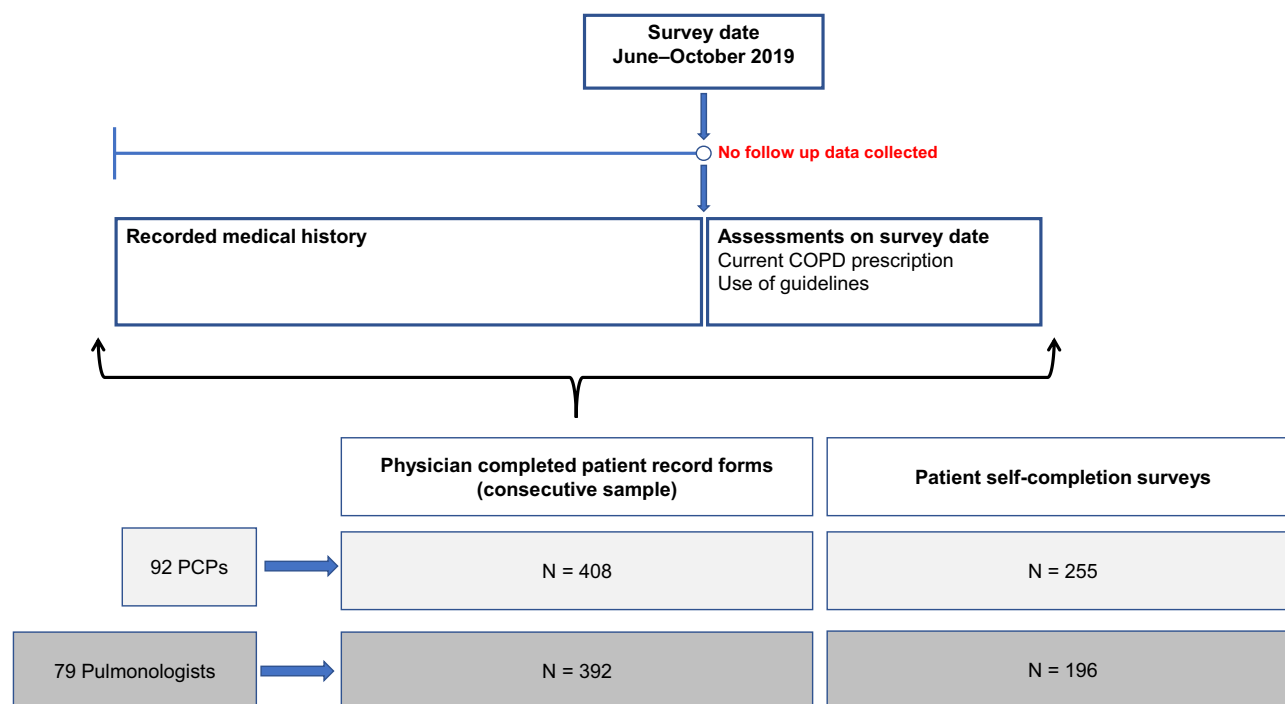
The secondary objectives were 1) to describe the patient types prescribed each class of COPD therapy and 2) to assess which treatment guidelines US physicians refer to, and whether their treatment choices are aligned with guideline recommendations. Data were extracted from the DSP dataset from physician-completed surveys, which provided demographic and clinical characteristics on the patients included. Where appropriate and depending on the variable, the timeframe for collection of information was either the survey date (for age, sex, employment status, physician-perceived severity of COPD) or based on available medical records (comorbidities, body mass index; Charlson comorbidity index, clinical COPD assessments).

To assess whether physicians align to guideline recommendations, physician responses to the following two questions in the DSP were extracted: “Have you referred to guidelines when treating COPD patients?”, with a nominal response of 1) Yes or 2) No. Those answering yes were asked a follow-up question: “What is the name of the guidelines you have referred to?”, with an open response requested in the survey. A subgroup of physicians was provided with four patient profiles related to symptom presentation and exacerbation history/risk and asked to provide their most likely treatment choice for each of the patients.

## Results

### Study Population Demographics and Disease Characteristics

Figure 1 shows the overall sample captured in the Respiratory DSP 2019 survey. Invitations to participate in the DSP were sent to 118 PCPs and 198 pulmonologists; 171 physicians completed the survey ( $n = 92$  PCPs,  $n = 79$  pulmonologists). In total, PCPs and pulmonologists completed record forms for 408 and 392 patients, respectively. Of the total sample of 800 patients,



**Figure 1** Respiratory DSP survey: population sampled and data captured.

**Abbreviations:** COPD, chronic obstructive pulmonary disease; DSP, Disease Specific Programme; PCP, primary care physician.

451 (PCP: 255, pulmonologist: 196) completed the voluntary patient self-completion questionnaire. [Table 1](#) summarizes patient demographics and disease characteristics for the overall patient population (N = 800) and according to the class of COPD treatment received. The overall mean age of the population was 66.4 years and 45% of participants were female. In total, 56% of patients were retired and 87% were current or former smokers. Almost half of the patients were judged by their physician to have moderate COPD (49.4%; [Table 1](#)), with severe/very severe in 19.3%. The physician-perceived severity of COPD ([Table 2](#)) was worse for pulmonologist patients than for PCP patients (more patients perceived as severe or very severe). Patient characteristics according to the physician type also showed that employment was affected by COPD in a higher proportion of pulmonologist patients than PCP patients ([Table 2](#)).

In total, 40.9% and 42.3% of patients on ICS/LABA only or LAMA only, respectively, were reported as having mild disease ([Table 1](#)). [Table S1](#) shows further details provided by physicians on their patients' COPD characteristics according to COPD treatment received.

## COPD Medications Prescribed According to Physician Type

[Table 3](#) summarizes the COPD medications that patients were receiving, according to physician type. A lower proportion of patients consulting a pulmonologist were prescribed ICS/LABA only, than those consulting a PCP (21.7% vs 31.4% of patients). Compared with PCPs, pulmonologists prescribed for a higher proportion of their patients LAMA/LABA only (16% vs 12% of patients), single-inhaler ICS/LAMA/LABA triple therapy (14.0% vs 7.1% of patients), and ICS/LABA + LAMA triple therapy (13.7% vs 15.6% of patients). Prescription of LAMA monotherapy was similar between patients treated by PCPs and pulmonologists (14.5% vs 11.5% of patients, respectively).

PCPs and pulmonologists provided information on the current COPD treatment regimens received by their patients and identified the type of provider initiating the treatment. [Figure 2](#) shows the prescriber type initiating the current treatment regimens received by patients. The majority of patients (58.8%) consulting a PCP had their current COPD treatment regimen initiated by a PCP. Current treatment regimens were initiated by a pulmonologist in only 31.9% of patients consulting a PCP. In total, 87.2% of patients consulting a pulmonologist had their current treatment regimen

**Table I** Patient and Disease Characteristics According to the Class of COPD Treatment Received

Characteristic	All patients N = 800	ICS/LABA only N = 213 (26.6%)	LAMA only N = 104 (13.0%)	LAMA/ LABA only N = 109 (13.6%)	ICS/LABA + LAMA only N = 117 (14.6%)	ICS/LAMA/ LABA only N = 84 (10.5%)
Age (years), mean (SD)	66.4 (10.9)	63.5 (11.0)	65.7 (10.9)	67.8 (10.3)	68.70 (8.8)	67.50 (10.5)
Female, n (%)	360 (45.0)	97 (45.5)	42 (40.4)	47 (43.1)	59 (50.4)	37 (44.1)
Employment status, n (%)						
Working full time	197 (24.6)	68 (31.9)	33 (31.7)	21 (19.3)	15 (12.8)	15 (17.9)
Working part time	66 (8.3)	26 (12.2)	8 (7.7)	5 (4.6)	9 (7.7)	6 (7.1)
On long-time sick leave	6 (0.8)	2 (0.9)	0 (0.00)	1 (0.9)	2 (1.7)	1 (1.2)
Homemaker	50 (6.3)	14 (6.6)	6 (5.8)	6 (5.5)	4 (3.4)	6 (7.1)
Retired	451 (56.4)	99 (46.5)	55 (52.9)	73 (67.0)	79 (67.5)	49 (58.3)
Unemployed	26 (3.3)	3 (1.4)	2 (1.9)	3 (2.8)	7 (6.0)	6 (7.1)
Unknown	4 (0.5)	1 (0.5)	0 (0.00)	0 (0.00)	1 (0.9)	1 (1.2)
Smoking status, n (%)						
Current smoker	174 (21.8)	54 (25.4)	21 (20.2)	26 (23.9)	20 (17.1)	17 (20.2)
Ex-smoker	523 (65.4)	127 (59.6)	71 (68.3)	74 (67.9)	87 (74.4)	59 (70.2)
Never smoked	90 (11.3)	26 (12.2)	11 (10.6)	8 (7.3)	9 (7.7)	8 (9.5)
Unknown	13 (1.6)	6 (2.8)	1 (1.0)	1 (0.9)	1 (0.9)	0 (0.00)
BMI (kg/m <sup>2</sup> ), mean (SD)	27.2 (5.8)	27.60 (5.4)	26.60 (4.9)	27.80 (6.8)	27.10 (5.5)	27.20 (5.0)
CCI, mean (SD)	0.5 (1.1)	0.4 (1.0)	0.6 (1.5)	0.4 (1.0)	0.6 (1.2)	0.7 (1.1)
Physician-perceived severity of current COPD, n (%)						
Mild	251 (31.4)	87 (40.9)	44 (42.3)	31 (28.4)	17 (14.5)	7 (8.3)
Moderate	395 (49.4)	109 (51.2)	55 (52.9)	64 (58.7)	53 (45.3)	44 (52.4)
Severe	111 (13.9)	13 (6.1)	3 (2.9)	13 (11.9)	33 (28.2)	28 (33.3)
Very severe	43 (5.4)	4 (1.9)	2 (1.9)	1 (0.9)	14 (12.0)	5 (6.0)

**Notes:** The table describes the 5 most commonly prescribed classes of maintenance treatment. Maintenance treatment classes may also include the use of short-acting treatments.

**Abbreviations:** BMI, body mass index; CCI, Charlson comorbidity index; ICS, inhaled corticosteroid; LABA, long-acting  $\beta_2$ -agonist; LAMA, long-acting muscarinic antagonist; SD, standard deviation.

initiated by a pulmonologist, and 8.2% of these patients had their treatment initiated by a PCP. According to subjective evaluation by PCPs and pulmonologists, PCPs reported that 70.3% of their patients were very or completely adherent to their current treatment regimen, compared with 69.9% of pulmonologist patients (Figure 3).

## Factors Influencing Physician's COPD Treatment Choices

The most common reasons given by pulmonologists and PCPs for their current treatment choice (Figure 4A) were symptom relief, including 24-hour symptom relief (80% of PCP-treated patients; 76% of pulmonologist-treated patients), improvement of shortness of breath (69% and 69%, respectively), and daytime symptom relief (59% and 64%, respectively).

The most common reason for a change to a patient's current treatment (Figure 4B) was lack of control of shortness of breath with the previous treatment (65.9% of PCP-treated patients and 76.3% of pulmonologist-treated patients).

## Treatment Decisions According to Treatment Guidelines and Patient Profiles

A randomly assigned subset of physicians (n = 43 PCPs, n = 32 pulmonologists) were surveyed about their use of COPD treatment guidelines and treatment choices for different patient profiles. Physicians were presented with four patient profiles: patient 1: maintenance-naïve, symptomatic COPD (no asthma), significant exacerbation risk; patient 2: maintenance-naïve, symptomatic COPD (no asthma), recent exacerbation history; patient 3: symptomatic COPD (no asthma), no exacerbations in the past 12 months, moderate dyspnea; patient 4: symptomatic COPD (no asthma),

**Table 2** Patient and Disease Characteristics According to Physician Type Providing Data in the Survey

Characteristic	PCP patients N = 408 <sup>a</sup>	Pulmonologist patients N = 392 <sup>b,c</sup>
Age (years), mean (SD)	67.3 (10.6)	65.5 (11.1)
Female, n (%)	187 (45.8)	173 (44.1)
Unemployed/retired/sick leave due to COPD, n (%)		
Yes	11 (4.7)	29 (11.6)
Smoking status, n (%)		
Current smoker	108 (26.5)	66 (16.8)
Ex-smoker	237 (58.1)	286 (73.0)
Never smoked	57 (14.0)	33 (8.4)
Unknown	6 (1.5)	7 (1.8)
CCI, mean (SD)	0.6 (1.2)	0.4 (1.0)
Exacerbation frequency in last 12 months, mean (SD)	0.9 (1.2)	0.9 (1.1)
Physician-perceived COPD severity, n (%)		
Mild	163 (40.0)	88 (22.5)
Moderate	195 (47.8)	200 (51.0)
Severe	40 (9.8)	71 (18.1)
Very severe	10 (2.5)	33 (8.4)
CAT score, mean (SD)	19.3 (8.5)	19.6 (9.3)
GOLD group, n (%)		
A	31 (12.8)	29 (15.8)
B	112 (46.1)	65 (35.3)
C	4 (1.7)	4 (2.2)
D	96 (39.5)	86 (46.7)

**Notes:** <sup>a</sup>n = 243 for CAT score and GOLD groups; <sup>b</sup>n = 185 for CAT score; <sup>c</sup>n = 184 for GOLD group.

**Abbreviations:** CAT, COPD assessment test; CCI, Charlson comorbidity index; COPD, chronic obstructive pulmonary disease; GOLD, Global Initiative for Chronic Obstructive Lung Disease; PCP, primary care physician; SD, standard deviation.

no exacerbations in the past 12 months, severe dyspnea. Table 4 shows the most common treatment choices selected by PCPs and pulmonologists when presented with these four different profiles. Pulmonologists' treatment choices differed markedly across the four patient profiles. By contrast, PCPs most frequently selected ICS/LABA for each of the four patient profiles.

Among physicians responding to questions about their use of treatment guidelines (Figure 5), 79.1% of PCPs and 71.9% of pulmonologists reported that they refer to guidelines when making treatment decisions. The majority of physicians who reported referring to guidelines stated that they most frequently consult the GOLD guidelines (PCPs 79.4%; pulmonologists 91.3%).

## Discussion

This study analyzed a real-world dataset of physicians and their patients with COPD and provides new insights into the use of COPD maintenance therapies in the US. COPD treatment patterns were found to vary by prescriber type: pulmonologists were more likely to prescribe dual bronchodilation and triple therapy than PCPs. This difference in prescribing patterns is perhaps explained by the fact that pulmonologists likely deal with a more severe caseload of COPD patients.

GOLD treatment guidelines currently recommend the use of ICS treatment in combination with one or two long-acting bronchodilators, only in patients with a history of severe exacerbations and those with  $\geq 2$  moderate COPD exacerbations during the last year. ICS is, however, also recommended for patients whose symptoms are suggestive of asthma and for patients with a COPD and asthma overlap. For COPD patients with dyspnea, guidelines recommend the use of a LAMA/LABA combination over LABA or LAMA monotherapy. Guidelines recommend escalation to triple therapy with ICS/LAMA/LABA in patients with a history of one or more severe exacerbations in the past year.<sup>4,5</sup> Despite



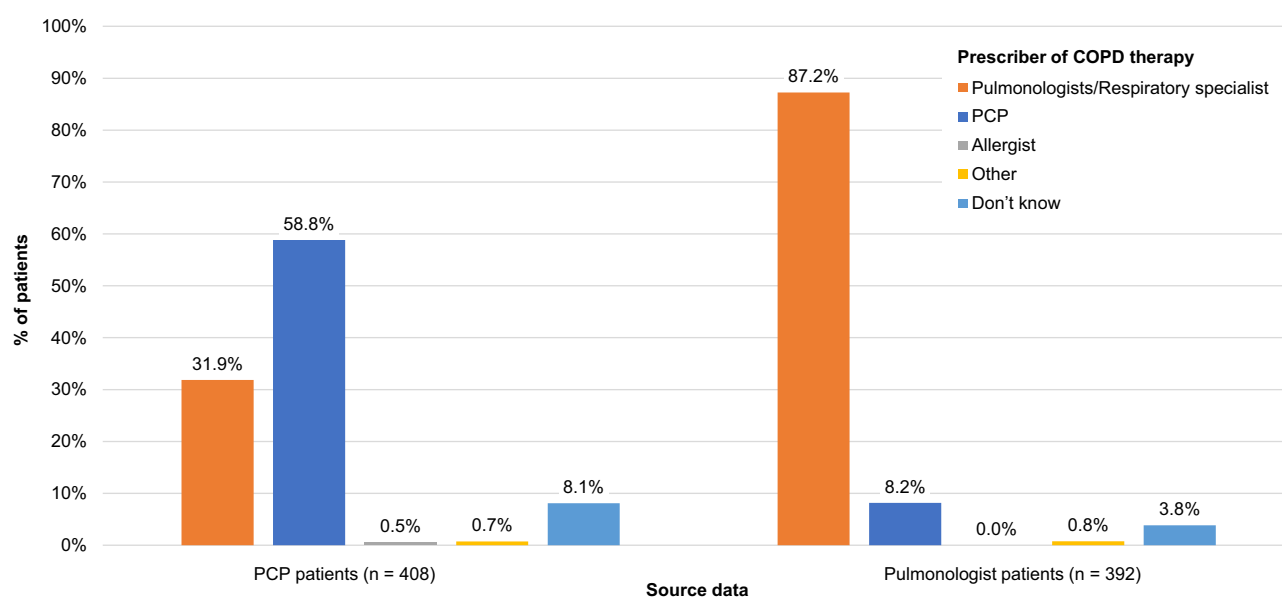
**Table 3** COPD Medications Prescribed by Pulmonologists and Primary Care Physicians

Currently prescribed COPD treatment, n (%)	PCP patients N = 408	Pulmonologist patients N = 392
ICS/LABA only	128 (31.4)	85 (21.7)
LAMA only	59 (14.5)	45 (11.5)
LAMA/LABA only	47 (11.5)	62 (15.8)
ICS/LABA + LAMA	56 (13.7)	61 (15.6)
ICS/LAMA/LABA only	29 (7.1)	55 (14.0)
Short-acting only	34 (8.3)	24 (6.1)
ICS only	6 (1.5)	8 (2.0)
LABA only	2 (0.5)	11 (2.8)
LABA + LAMA	3 (0.7)	3 (0.8)
ICS + LABA	1 (0.3)	5 (1.3)
ICS + LAMA/LABA	3 (0.7)	3 (0.8)
ICS + LAMA	3 (0.7)	3 (0.8)
LAMA/LABA + LAMA	3 (0.7)	0 (0.0)
ICS + LABA + LAMA	0 (0.0)	5 (1.3)
ICS/LABA + ICS	1 (0.3)	3 (0.8)
LAMA/LABA + ICS/LABA	1 (0.3)	0 (0.0)
Other	32 (7.8)	19 (4.9)

**Notes:** patients could be treated by multiple physician types; however, the data in this table are grouped according to the physician type who provided the information via the survey. Classifications with a slash (/) indicate combination medications, a plus (+) indicates separate inhalers. Maintenance treatment classes may also include the use of short-acting treatments.

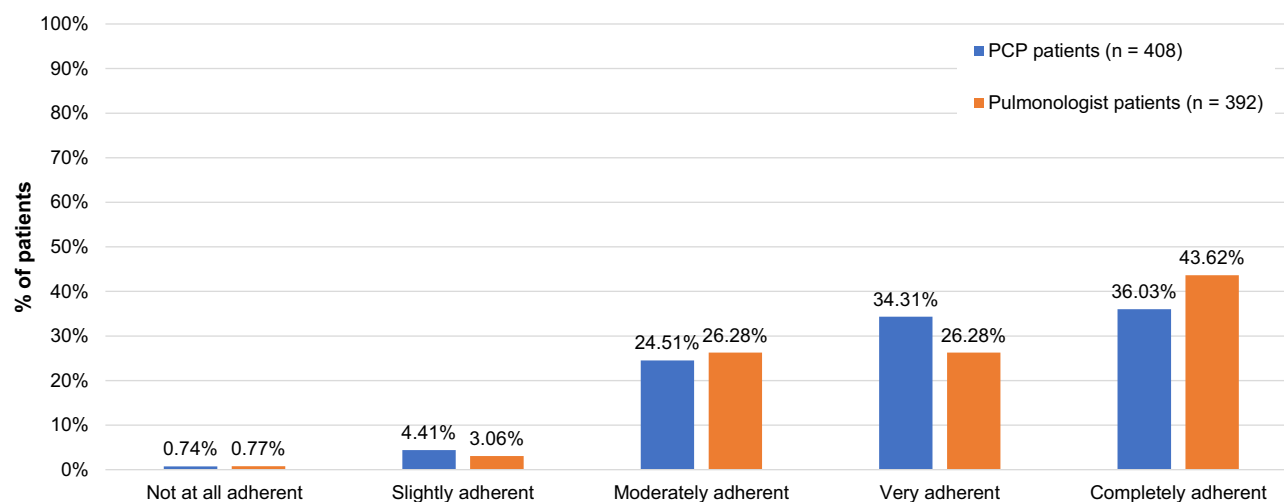
**Abbreviations:** COPD, chronic obstructive pulmonary disease; ICS, inhaled corticosteroid; LABA, long-acting  $\beta_2$ -agonist; LAMA, long-acting muscarinic antagonist; PCP, primary care physician.

these guideline recommendations, our study shows that an ICS-containing regimen was prescribed for the majority of patients and at a similar rate by PCPs and pulmonologists. This could be due to the PCPs' familiarity and experience using ICS/LABAs, which have been long-standing treatment options in COPD, or possibly an uncertainty among PCPs in applying symptoms/exacerbation history to guide treatment choice or use of newer treatment options.

**Figure 2** Prescriber of patients' current COPD treatment regimen.

**Note:** As patients could be treated by multiple physician types, the figure refers to the physician type (PCP or pulmonologist) who provided data in the survey.

**Abbreviations:** COPD, chronic obstructive pulmonary disease; PCP, primary care physician.



**Figure 3** Patient adherence to prescribed COPD treatment (physician reported).

**Abbreviations:** COPD, chronic obstructive pulmonary disease; PCP, primary care physician.

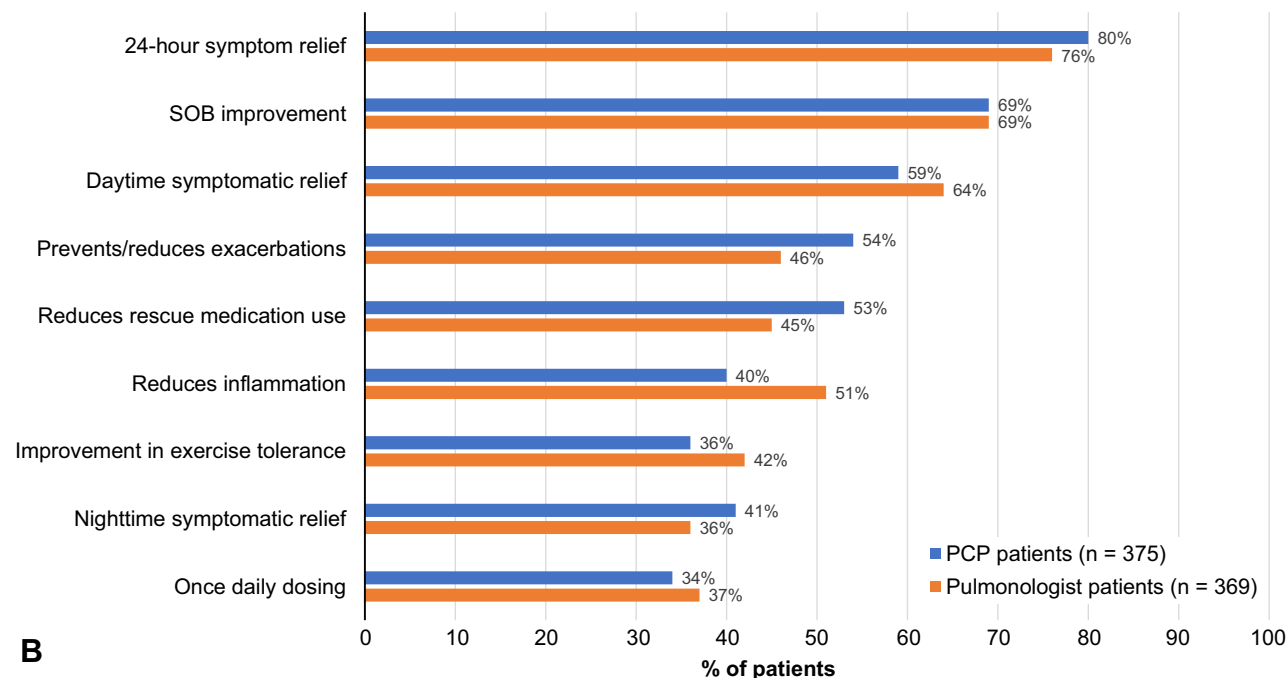
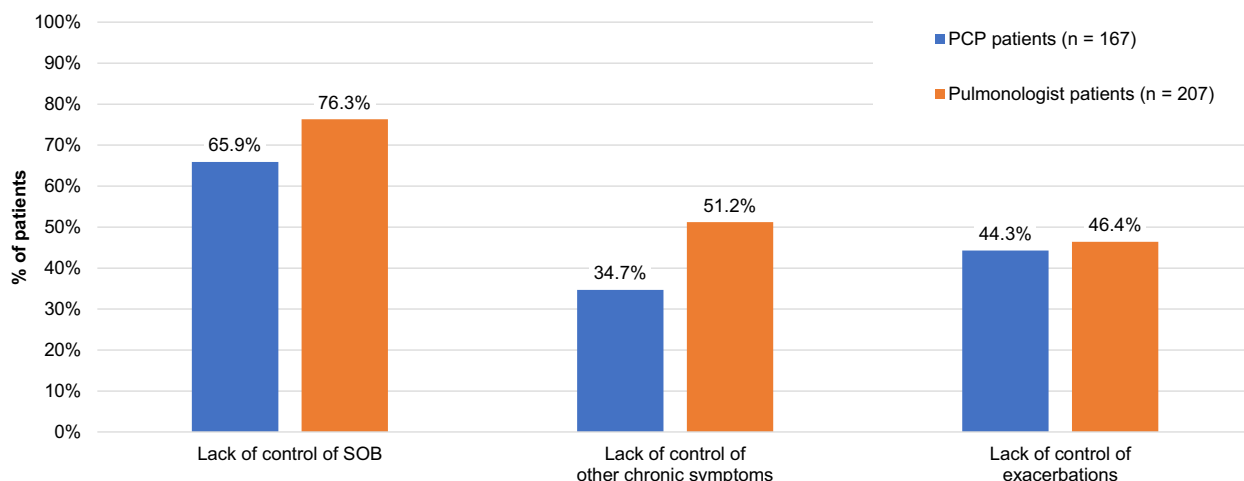
For most patients consulting a PCP at the survey date, their current COPD treatment was initiated by a PCP, rather than a pulmonologist, indicating that COPD patients in the US are more likely to be seen outside of specialist care. Many PCPs do not have easy access to pulmonary function testing to aid in the diagnosis and classification of COPD patients. The uptake of tools for patient-reported outcomes, such as the CAT or modified Medical Research Council scale, may also be low among PCPs. Therefore, they may not have the information needed to stratify patients and comply with best-practice treatment from evidence-based guidelines.<sup>4</sup>

The drivers of treatment decisions among the physicians sampled were related to sustained symptomatic control and improvement; improvement of dyspnea was a frequent reason identified by physicians for the current treatment choice and also for a change to a current treatment. It was surprising that exacerbation was not more highly used as a factor guiding treatment decisions, as a patient's exacerbation history is an important factor in predicting and managing their future exacerbation risk.<sup>4</sup> This highlights a potential need for further education among physicians on the importance of proactively managing exacerbation risk to provide continued protection from exacerbations. Current guidelines recommend that physicians should direct treatment to the predominant 'treatable COPD trait' rather than COPD severity.<sup>4</sup> This highlights the importance of treatment based upon individual patient factors and uncovers another potential educational gap. Medication cost should also be considered, as treatment affordability may also play a role in treatment decisions, however, in this study, cost was not included in the list of factors influencing COPD treatment choices provided to the physicians. As well as physician factors, for example awareness of guideline recommendations, patient factors may also influence the management of their disease. In some cases, patients may be resistant to a change in COPD medication, possibly due to poor understanding of their disease or the severity of their symptoms.<sup>16</sup> Treatment adherence is also an issue. Patients using their medication sporadically and lack of education on inhaler technique have been identified as possible factors contributing to clinical inertia in COPD.<sup>16</sup>

The results of this study also suggest a potential disconnect between physician perception of adherence to guidelines, and their actual prescribing patterns. The high rate of ICS use suggests that the guidelines are not being closely adhered to, despite many physicians reporting referral to guidelines in treatment.

Results from the patient profile scenarios also confirmed that treatment decisions, particularly by PCPs, do not always align with treatment guidelines. Pulmonologists' treatment choices differed markedly across the four patient profiles, whereas PCPs most frequently selected ICS/LABA for each of the four patient profiles, irrespective of whether the patient was treatment-naïve, had symptom presentation, and had exacerbation risk. This suggests that further education among PCPs may be needed to highlight the importance of understanding of patient types when prescribing the most appropriate COPD therapy. It should also be noted that all four of the patient profile scenarios were classified as



**A****B**

**Figure 4** Most common reasons (>25% of responses) cited by PCPs and pulmonologists for (A) choice of current prescribed treatment and (B) a change to current treatment.

**Abbreviations:** COPD, chronic obstructive pulmonary disease; PCP, primary care physician; SOB, shortness of breath.

'symptomatic COPD, no asthma'. However, as previously mentioned, a 'no asthma' characterization may not be clear cut in a real-world clinical practice setting. For example, patients may have a large degree of bronchodilator responsiveness, large variability in symptoms, or other characteristics that are suggestive of asthma and COPD overlap, or comorbid asthma.

This study has provided valuable insights into current treatment practices and adherence to guidelines among US physicians treating patients with COPD. In the future, it may be of value to repeat the survey at multiple time points to monitor new prescribing trends and further explore the barriers to optimizing care for patients with COPD, especially as new treatments are approved.

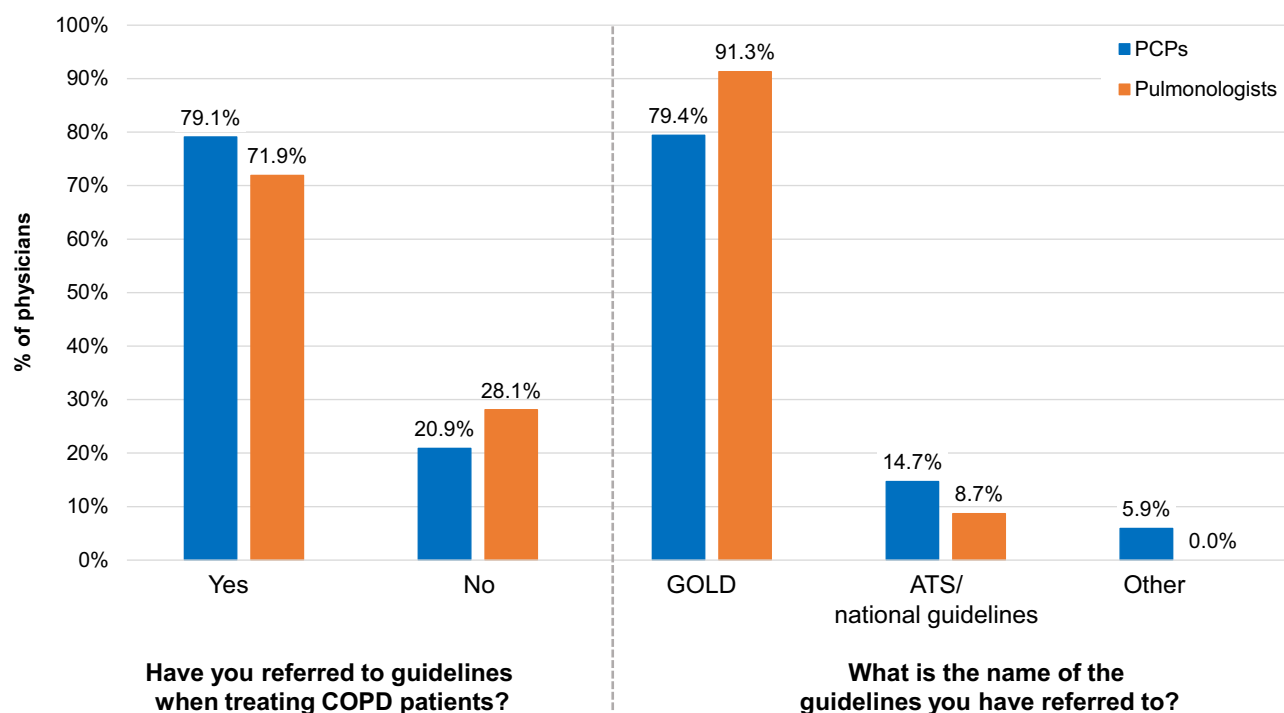
**Table 4** Patient Profiles and Most Frequently Selected Classes of COPD Therapy (in >5% of Patients in Either Arm)

Therapy class chosen for patient type, n (%)	PCP patients N = 43	Pulmonologist patients N = 32
<b>Patient 1: Maintenance-naïve, symptomatic COPD (no asthma); significant exacerbation risk</b> Treatment choices, %	ICS/LABA (53.5%) LAMA (32.6%) LAMA/LABA (18.6%) ICS/LAMA/LABA (4.7%) SABA (4.7%) PDE4i (2.3%) LRA (0%)	ICS/LAMA/LABA (37.5%) ICS/LABA (28.1%) LAMA/LABA (15.6%) LAMA (15.6%) SABA (6.3%) LRA (9.4%) PDE4i (6.3%)
<b>Patient 2: Maintenance-naïve, symptomatic COPD (no asthma); recent exacerbation history</b> Treatment choices, %	ICS/LABA (55.8%) LAMA/LABA (44.2%) LAMA (37.2%) ICS/LAMA/LABA (7.0%) SABA (7.0%) OCS (7.0%)	LAMA/LABA (40.6%) ICS/LAMA/LABA (28.1%) ICS/LABA (28.1%) LAMA (21.9%) SABA (9.4%) OCS (3.1%)
<b>Patient 3: Symptomatic COPD (no asthma); no exacerbation in last year; moderate dyspnea</b> Treatment choices, %	ICS/LABA (39.5%) LAMA (30.2%) LAMA/LABA (23.3%) ICS/LAMA/LABA (16.3%) ICS (9.3%)	ICS/LABA (37.5%) LAMA/LABA (34.4%) LAMA (31.3%) ICS/LAMA/LABA (0%) ICS (0%)
<b>Patient 4: Symptomatic COPD (no asthma); no exacerbation in last year; severe dyspnea</b> Treatment choices, %	ICS/LABA (55.8%) LAMA (30.2%) ICS/LAMA/LABA (23.3%) OCS (20.9%) LAMA/LABA (18.6%) PDE4i (11.6%) SABA (9.3%)	LAMA/LABA (43.8%) ICS/LABA (28.1%) LAMA (18.8%) ICS/LAMA/LABA (12.5%) LABA (6.3%) PDE4i (6.3%) OCS (0%)

**Note:** physicians were not limited to one choice of medication class for each patient profile.

**Abbreviations:** COPD, chronic obstructive pulmonary disease; ICS, inhaled corticosteroid; LABA, long-acting  $\beta_2$ -agonist; LAMA, long-acting muscarinic antagonist; LRA, leukotriene receptor antagonist; OCS, oral corticosteroid; PCP, primary care physician; PDE4i, phosphodiesterase-4 inhibitor; SABA, short-acting bronchodilator.

This study has a few limitations that should be mentioned. Patient and physician participation in the survey was not truly random; a willingness to participate and pragmatic geographical considerations may have influenced the sample. As a result, patients participating in the DSP may not reflect the general COPD population. Exclusion of patients with comorbid asthma also limits the generalizability of the findings. In addition, although COPD diagnosis was confirmed by a physician, spirometry testing was not confirmed, and it is possible that a small number of patients were incorrectly diagnosed. Physicians were asked to provide data for a consecutive series of patients to avoid selection bias; however, no formal patient selection verification procedures were in place. Finally, missing data on the clinical history of COPD and treatment history limit the conclusions that can be drawn about factors influencing treatment choices.



**Figure 5** Physician-reported referral to COPD guidelines. Responses from PCPs (n = 43) and pulmonologists (n = 32) surveyed.

**Note:** The righthand figure includes responses from the 34 PCPs and 23 pulmonologists who said they referred to guidelines when treating COPD patients.

**Abbreviations:** ATS, American Thoracic Society; COPD, chronic obstructive pulmonary disease; GOLD, Global Initiative for Chronic Obstructive Lung Disease.

## Conclusions

Prescribers utilize treatments for COPD at different rates; pulmonologists were more likely to prescribe dual bronchodilation and triple therapy than PCPs. When considering patient profiles, choices differed markedly for pulmonologists, whereas ICS/LABA was chosen by the highest proportion of PCPs regardless of patient symptom presentation and exacerbation risk. Physician education and improved understanding of patient types that benefit from each treatment pathway could help optimize patient care in COPD, particularly in the primary care setting.

## Abbreviations

BMI, body mass index; CAT, COPD assessment test; CCI, Charlson comorbidity index; COPD, chronic obstructive pulmonary disease; DSP, Disease Specific Programme; GOLD, Global Initiative for Chronic Obstructive Lung Disease; HIPAA, Health Insurance Portability and Accountability Act; ICD, International Classification of Disease; ICS, inhaled corticosteroid; LABA, long-acting  $\beta_2$ -agonist; LAMA, long-acting muscarinic antagonist; LRA, leukotriene receptor antagonist; OCS, oral corticosteroid; PCP, primary care physician; PDE4i, phosphodiesterase-4 inhibitor; SABA, short-acting bronchodilator; SD, standard deviation.

## Data Sharing Statement

The datasets supporting the results reported in this manuscript are not publicly available. Access to the raw data may be granted on reasonable request to the corresponding author dependent on the intended use and subject to third-party agreements.

## Ethics Approval and Informed Consent

The survey received ethical exemption determination by the Western Institutional Review Board (study number: 1-1211337-1). Patients provided written consent before completing the voluntary patient self-completion. The survey

was conducted in accordance with the amended Declaration of Helsinki and adhered to the ICC/ESOMAR International code on observational research, and Health Insurance Portability and Accountability Act (HIPAA) guidelines.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare the following conflicts of interest during the last three years in relation to this article: DM is a former employee of GlaxoSmithKline and holds stocks/shares in GlaxoSmithKline; reports royalties from UpToDate and personal fees as a consultant for AstraZeneca. JS, M Small, and AH are employees of Adelphi Real World. Adelphi Real World received research funds from GlaxoSmithKline in relation to this study. M Stiegler and MB are employees of GlaxoSmithKline and hold stocks/shares in GlaxoSmithKline. The authors report no other conflicts of interest in this work.

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