

# Assessment of prescription practices according to international chronic obstructive pulmonary disease guidelines on Egyptian doctors

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**Background and objectives** Chronic obstructive pulmonary disease (COPD) is defined as 'a preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in individual patients'. Its pulmonary component is characterized by airflow limitation that is not fully reversible. There is a wide variation in physicians' management of the condition, and this may be ascribed to nonadherence to the guidelines. Adherence to COPD guidelines in clinical practice in most countries is not satisfactory.

**Aim** The aim of this work is to assess the prescription pattern and clinical practice attitudes toward Egyptian COPD patients managed by chest physicians and internal medicine physicians in Abbassia Chest Hospital and Ain Shams University Hospitals during the period from February 2013 to January 2014.

**Patients and methods** In this study, one questionnaire was specifically directed to physicians. Sixty doctors were at Abbassia Chest Hospital, 63 at Ain Shams University Hospitals, and six doctors at Ministry Hospitals. Doctors were chest residents (29.5%), chest physicians with masters degree (33.3%), chest physicians with MD (13.2%), or internal medicine doctors (34%).

**Results** Only 53 physicians performed spirometry. Most of the physicians prescribed antibiotics and systemic steroids to

their patients in exacerbations. Macrolides, cephalosporins, and quinolones were the most commonly prescribed antibiotics by physicians in COPD exacerbations. Only 46 physicians used noninvasive ventilation in hypercapnic respiratory failure. Only 33 physicians were following GOLD 2013 guidelines.

**Conclusion** Doctors' awareness of guidelines is suboptimal; major deviations from the GOLD guidelines were in the form of underuse of spirometry, smoke cessation programs, and of noninvasive ventilation in exacerbations and lack of use of pulmonary rehabilitation treatment.

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**Keywords:** chest physicians, chronic obstructive pulmonary disease, GOLD guidelines

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## Introduction

In developing countries where smoking continues to be extremely prevalent, the health and economic burdens are higher than in developed nations [1]. Exacerbations contribute to overall disease severity and extra-pulmonary effects impact on the cardiovascular, muscular, skeletal systems, and metabolic syndrome [2], contributing to a range of comorbidities such as diabetes [3]. Despite the availability of international guidelines, primary care physicians often manage chronic obstructive pulmonary disease (COPD) in a manner that is discordant with recommendations. Yet even among physicians who have some guideline familiarity, practice patterns are often inconsistent with guideline recommendations [4].

## Aim

The purpose of the present study is to assess to what extent the international guidelines differ from the existing practice among Egyptian COPD patients managed by pulmonologists or other physicians.

## Patients and methods

One hundred and twenty nine doctors were selected from Abbassia Chest Hospital, Ministry Hospitals, and Ain Shams University Hospitals during the study period from February 2013 to January 2014. In this study, one questionnaire was specifically directed to physicians. Ain Shams University Hospitals and Abbassia Chest Hospital both are classified as tertiary hospitals according to the Egyptian Ministry of Health Medical System. In this study, doctors were classified into chest residents, chest physicians with masters degree, chest physicians with MD, and internal medicine doctors. In this study, some residents with less than 3 months of clinical practice in residency could not perform the questionnaire because of nonawareness of Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease

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(GOLD) guidelines; also, some internal medicine doctors refused to have the questionnaire, as they always refer COPD patients to a pulmonologist. Consequently, all those doctors were excluded from this study.

Each doctor who participated in this study was subjected to the following questionnaire:

- (1) How many patients treated for COPD do you see on average during a normal month of activity in the outpatient clinic?  
Less than 20 patients; 20–40 patients; more than 40 patients.
- (2) How many of these patients needed hospitalization?  
Less than 10 patients; 10–20 patients; more than 20 patients.
- (3) How many new COPD cases do you diagnose per month?

Less than 20 patients; 20–40 patients; more than 40 patients.

- (4) XXX
  - (a) Do you perform spirometry to your COPD patients?  
Yes; no.
  - (b) If no, it is because of (you can choose more than one answer):  
Nonavailability; patient health problems; depending on clinical diagnosis; patients' finance problems; others (specify).
- (5) On your daily prescription for COPD patients, do you follow:  
GOLD 2013; other GOLD (specify); others (specify).
- (6) Do you use any of the following therapies for a stable COPD patient? (If you do not follow GOLD 2013 patient classification, you can choose your answer according to COPD severity):

Drugs	Yes	No	If yes, in which patient group do you use this drug? (You can tick more than one answer)	If yes, according to which degree of COPD severity you use this drug? (You can tick more than one answer)
SABA			Patient group A	Mild COPD
			Patient group B	Moderate COPD
			Patient group C	Severe COPD
			Patient group D	Very severe COPD
LABA			Patient group A	Mild COPD
			Patient group B	Moderate COPD
			Patient group C	Severe COPD
			Patient group D	Very severe COPD
Theophyllines			Patient group A	Mild COPD
			Patient group B	Moderate COPD
			Patient group C	Severe COPD
			Patient group D	Very severe COPD
SAMA			Patient group A	Mild COPD
			Patient group B	Moderate COPD
			Patient group C	Severe COPD
			Patient group D	Very severe COPD
Mucolytics			Patient group A	Mild COPD
			Patient group B	Moderate COPD
			Patient group C	Severe COPD
			Patient group D	Very severe COPD
LABA+ICS			Patient group A	Mild COPD
			Patient group B	Moderate COPD
			Patient group C	Severe COPD
			Patient group D	Very severe COPD
LAMA			Patient group A	Mild COPD
			Patient group B	Moderate COPD
			Patient group C	Severe COPD
			Patient group D	Very severe COPD

LABA, long-acting  $\beta$ 2 agonist; LABA+ICS, long-acting  $\beta$ 2 agonist+inhaled corticosteroid; LAMA, long-acting muscarinic agonist; SABA, short-acting  $\beta$ 2 agonist; SAMA, short-acting muscarinic agonist.

	Yes	No
Increase the dose of bronchodilators		
Mucolytics		
Physiotherapy		

- (7) XXX  
 (a) Do you prescribe inhaled steroids to your COPD patients?  
 Yes; no.  
 (b) If yes, on what basis? (You can tick more than one answer):  
 Patient with frequent exacerbation (exacerbation is a sudden worsening of COPD symptoms (shortness of breath, quantity, and color of phlegm) that typically lasts for several days. It may be triggered by an infection with bacteria or viruses or by environmental pollutants); severe or very severe COPD patients; other causes (specify).
- (8) XXX  
 (a) Do you prescribe systemic corticosteroids in COPD exacerbation?  
 Yes; no.  
 (b) If yes, for how long?  
 Less than 1 week; from 10 to 14 days; more than 14 days.
- (9) XXX  
 (a) Does your hospital offer a structured rehabilitation program to COPD patients?  
 Yes; no.  
 (b) If yes, how many patients did you admit into these programs?  
 Less than 20 patients; 20–40 patients; more than 40 patients.
- (10) Do you prescribe any of the following therapies in case of COPD exacerbation?
- (11) XXX  
 (a) Do you prescribe antibiotics in COPD exacerbation?  
 Yes; no.  
 (b) If yes, at which degree? (You can tick more than one answer):  
 Mild exacerbation; moderate exacerbation; severe exacerbation.  
 (c) Which type of antibiotics do you prescribe? (You can choose more than one answer):  
 Broad-spectrum penicillins; macrolides; tetracycline; third-generation cephalosporins; respiratory quinolones; according to culture; others (specify).
- (12) XXX  
 (a) Do you give noninvasive ventilation to a patient who suffers from acute hypercapnic respiratory failure but without hypotension or reduced level of consciousness?  
 Yes; no.  
 (b) If no, it is because of (you can tick more than one answer):

Nonavailability; patient's noncompliance; other causes.

- (13) XXX  
 (a) Do you admit your COPD patient to smoking cessation programs? yes; no  
 (b) How many patients per year do you admit to such programs?  
 Less than 50 patients; 50–100 patients; more than 100 patients.
- (14) Do you have in service a structured educational program concerning COPD?  
 Yes; no.
- (15) Personal data: name; age; sex: male, female; years of practice; specialty; university of graduation; and place of work.

### Statistical analysis

The collected data were revised, coded, tabulated, and introduced to a PC using statistical package for the social science (SPSS, 15.0.1 for Windows; SPSS Inc., Chicago, Illinois, USA). Data were presented and suitable analysis was done according to the type of data obtained for each parameter.

### Descriptive statistics

The descriptive statistics were as follows:

- (1) Mean $\pm$ SD, and minimum and maximum values (range) for numerical data.
- (2) Frequency and percentage of non-numerical data.

### Analytical statistics

- (1)  $\chi^2$ -test was used to examine the relationship between two qualitative variables:
  - (a) *P*-value: level of significance.
  - (b) *P*-value greater than 0.05: nonsignificant.
  - (c) *P*-value less than 0.05: significant.
  - (d) *P*-value less than 0.01: highly significant.

### Results

This study included 129 doctors with a mean age of 33.94 $\pm$ 9.561 years. The minimum age was 24 years, whereas the maximum age was 67 years old. There were 89 men and 40 women. Most of the selected doctors had graduated from Faculty of Medicine, Ain Shams University (72.9%). About 46.6% of doctors worked at Abbassia Chest Hospital, whereas about 48.8% of them worked at Ain Shams University Hospitals, as in Table 1. Doctors were mainly from the age group between 24 and 29 (43.4%) years and 30 and 40 years (31.8 years), as shown in Table 2.

**Table 1 Description of doctors according to personal characteristics**

Doctors	N (%)
Sex	
Male	89 (69)
Female	40 (31)
Age	
Mean±SD	33.94±9.561
Range	24–67
Place of work	
Abbassia chest hospital	60 (46.6)
Ain Shams University Hospital	63 (48.8)
Ministry Hospital	6 (4.6)
University of graduation	
Ain Shams	94 (72.9)
Others	35 (27.1)

**Table 2 Distribution of doctors as regards age frequency**

Age (years)	N (%)
24–29	56 (43.4)
30–40	41 (31.8)
41–50	13 (10.1)
51–60	15 (11.6)
>60	4 (3.1)
Total	129 (100)

Most of the doctors participating were chest physicians with masters degree (33.3%) and chest residents (29.5%), as shown in Table 3. Most of the doctors had less than 4 (48.8%) years of practical experience, as shown in Table 4. Most of the doctors examined between 20 and 40 (52.7%) COPD patients per month in outpatient clinic, as shown in Table 5. Most of the doctors diagnosed less than 20 (74.7%) new COPD patients per month in the outpatient clinic, as shown in Table 6. Most of the doctors agreed that between 10 and 20 (58.1%) COPD patients who are seen in the outpatient clinic per month needed hospitalization, as shown in Table 7. Most doctors (75.2%) did not admit smoker COPD patients to smoke cessation programs, and doctors who did were five internists and 27 chest physicians, as shown in Table 8. Most of the doctors (95.3%) did not have a structured educational program. Six (4.7%) doctors (only five chest doctors and one internist) provided a structured education to COPD patients at outpatient clinic visits, as shown in Table 9. Most of the doctors (58.9%) did not perform spirometry to their patients, as shown in Table 10.

Depending on clinical diagnosis (55 doctors) and nonavailability (45 doctors) were the most common causes for not performing spirometry to patients, and 16 doctors were not doing so because of patients' finances, as shown in Table 11. There was a high

**Table 3 Description of doctors as regards specialty**

Specialty	N (%)
Chest residents	38 (29.5)
Chest doctors with masters degree	43 (33.3)
Chest doctors with MD	17 (13.2)
Internal medicine doctors	31 (24)

**Table 4 Description of doctors according to years of practice**

Years of practice	N (%)
<4	63 (48.8)
4–10	29 (22.5)
11–20	14 (10.9)
>20	23 (17.8)

**Table 5 Description of doctors according to number of chronic obstructive pulmonary disease patients seen per month in the outpatient clinic**

Number of patients	N (%)
Less than 20 patients	30 (23.3)
20–40 patients	68 (52.7)
More than 40 patients	31 (24)
Total	129 (100.0)

**Table 6 Description of doctors according to the number of new chronic obstructive pulmonary disease patients diagnosed per month in the outpatient clinic**

New COPD patients	N (%)
Less than 20 patients	96 (74.4)
20–40 patients	33 (25.6)
Total	129 (100.0)

COPD, chronic obstructive pulmonary disease.

**Table 7 Description of doctors according to number of chronic obstructive pulmonary disease patients who needed hospitalization per month in the outpatient clinic**

CODP patients	N (%)
Less than 10 patients	53 (41.1)
10–20 patients	75 (58.1)
More than 20 patients	1 (0.8)
Total	129 (100.0)

COPD, chronic obstructive pulmonary disease.

**Table 8 Distribution of doctors as regards admitting chronic obstructive pulmonary disease patients to smoke cessation programs**

Admitting patients	N (%)
No	97 (75.2)
Yes	32 (24.8)
Total	129 (100)

statistically significant difference between doctors' place of work and performing spirometry to patients; most of the doctors in Abbassia Chest Hospital did not perform spirometry (78.33%), whereas in Ain Shams University Hospitals only 36.5% and in Ministry

**Table 9 Distribution of doctors as regards having structured educational programs to chronic obstructive pulmonary disease patients in service**

Structured education	N (%)
No	123 (95.3)
Yes	6 (4.7)
Total	129 (100.0)

**Table 10 Distribution of doctors according to performing spirometry to chronic obstructive pulmonary disease patients**

Performing spirometry to patients	N (%)
No	76 (58.9)
Yes	53 (41.1)
Total	129 (100.0)

**Table 11 Description of doctors according to reasons for not performing spirometry to chronic obstructive pulmonary disease patients**

Doctors causes	Number
Nonavailability	45
Depending on clinical diagnosis	55
Patients' finances	16

Hospitals 100% did not perform spirometry, apart from Abbasia Chest Hospital, as shown in Table 12.

There is a highly significant correlation between doctors' years of practice and following GOLD guidelines in daily practice, being least in doctors who had more than 20 years of practice (GOLD 2010, 13% and GOLD 2013, 34.8%) and doctors who had less than 4 years of practice (GOLD 2010, 28.6% and GOLD 2013, 6.3%), as shown in Table 13. Most of the doctors (90.7%) prescribed systemic steroids in COPD exacerbations, as shown in Table 14. Most of the doctors prescribed systemic steroids mostly for less than 14 days, less than 1 (46.2%) week, and from 10 to 14 (45.3%) days, in case of COPD exacerbations, as shown in Table 15.

All doctors were increasing the dose of bronchodilators, with one internist not giving treatment at all; only 48.4% of doctors ordered physiotherapy to COPD patients and 99.2% were prescribing mucolytics in exacerbations, as shown in Table 16.

All doctors prescribed antibiotics for COPD patients in exacerbation in this study, except one internist. Most of the doctors prescribed antibiotics in moderate and severe exacerbations (59.4%), whereas the others (40.6%) prescribed antibiotics in mild, moderate, and severe exacerbations, as shown in Table 17.

**Table 12 Comparison between doctors' place of work and performing spirometry to chronic obstructive pulmonary disease patients**

Place of work	Performing spirometry to COPD patients [N (%)]		Total [N (%)]
	No	Yes	
Ain Shams University Hospitals	23 (36.5)	40 (63.5)	63 (100.00)
Abbassia Chest Hospital	47 (78.33)	13 (21.67)	60 (100.00)
Ministry	6 (100)	0 (0)	6 (100.00)
Total	76 (58.9)	53 (41.1)	129 (100.00)
Fisher's exact test			
Fisher			26.7
P-value			0.001

COPD, chronic obstructive pulmonary disease.

**Table 13 Relation between doctors' years of practice and daily prescription following GOLD guidelines**

Years of practice	Your daily prescription following [N (%)]			Total [N (%)]
	GOLD 2010	GOLD 2013	Practical experience	
<4	18 (28.6)	4 (6.3)	41 (65.1)	63 (100.00)
4-10	2 (6.9)	11 (37.9)	16 (55.2)	29 (100.00)
11-20	0 (0)	10 (71.4)	4 (28.6)	14 (100.00)
>20	3 (13)	8 (34.8)	12 (52.2)	23 (100.00)
Total	23 (17.8)	33 (25.6)	73 (56.6)	129 (100.00)
Fisher exact				
Fisher				33.918
P				0.0001

**Table 14 Distribution of doctors as regards prescribing systemic steroids in chronic obstructive pulmonary disease exacerbations**

Prescribing systemic steroids	N (%)
No	12 (9.3)
Yes	117 (90.7)
Total	129 (100.0)

**Table 15 Distribution of doctors as regards duration of prescribing systemic steroids in chronic obstructive pulmonary disease exacerbations**

Duration	N (%)
Less than 1 week	54 (46.2)
From 10 to 14 days	53 (45.3)
More than 14 days	10 (8.5)
Total	117 (100)

The most common antibiotics prescribed by doctors in COPD exacerbations were macrolides (66.6%), third-generation cephalosporins (53.5%), respiratory quinolones (38%), and broad-spectrum penicillins

**Table 16** Distribution of doctors as regards treatment given to chronic obstructive pulmonary disease patients in exacerbations

Treatment	N (%)
Increase the dose of bronchodilators	128 (100)
Physiotherapy	62 (48.4)
Mucolytics	127 (99.2)

**Table 17** Distribution of doctors as regards prescribing antibiotics according to exacerbation severity

Exacerbation severity	N (%)
Moderate and severe	76 (59.4)
Mild, moderate and severe	52 (40.6)
Total	128 (100.0)

(28%), as shown in Table 18. Only 46 doctors (35.7%) used noninvasive ventilation in patients with hypercapnic respiratory failure, as shown in Table 19.

Patient noncompliance and nonavailability (36.7% for each) were the two most common causes for not using noninvasive ventilation in COPD patients, as shown in Table 20. The results show a highly significant correlation between doctors' specialty and performing spirometry to patients, being lowest in internal medicine doctors (83.9%) followed by chest residents (65.8%), as shown in Table 21. The results show a highly significant correlation between doctors' specialty and following GOLD guidelines in daily prescription, which was highest in chest doctors with MD (GOLD 2013, 76.5%) and lowest in internal medicine doctors (12.9% for GOLD 2010 and 19.4% for GOLD 2013), as shown in Table 22.

Most doctors (89.8%) prescribed inhaled corticosteroids to COPD patients as recommended by guidelines for patients with frequent exacerbation and severe or very severe COPD patients, and 10.2% of doctors for severe or very severe COPD patients. One internist did not give inhaled corticosteroids and one MD gave inhaled corticosteroids according to physician experience, as shown in Table 23 and Fig. 1.

## Discussion

COPD has emerged as the most important respiratory disease globally, and its prevalence and impact on the society is expected to increase until it becomes the third ranking cause of death by 2030 worldwide [6]. The GOLD report is one of the most frequently used documents for managing COPD patients worldwide

**Table 18** Distribution of doctors according to type of commonly prescribed antibiotics in chronic obstructive pulmonary disease exacerbations

	N (%)
Broad-spectrum penicillin	
No	93 (72)
Yes	36 (28)
Total	129 (100.0)
Macrolides	
No	43 (33.3)
Yes	86 (66.6)
Total	129 (100.0)
Tetracycline	
No	128 (99.2)
Yes	1 (0.8)
Total	129 (100.0)
Oral antipseudomonal	
No	125 (96.9)
Yes	4 (3.1)
Total	129 (100.0)
According to culture	
No	93 (74.1)
Yes	36 (25.9)
Total	116 (100.0)
Respiratory quinolones	
No	80 (62)
Yes	49 (38)
Total	129 (100.0)
Third-generation cephalosporins	
No	60 (46.5)
Yes	69 (53.5)
Total	129 (100.0)

**Table 19** Distribution of doctors according to using noninvasive ventilation in chronic obstructive pulmonary disease exacerbations with hypercapnic respiratory failure

Using noninvasive ventilation	N (%)
No	83 (64.3)
Yes	46 (35.7)
Total	129 (100.0)

**Table 20** Distribution of doctors as regards reasons for not using noninvasive ventilation in chronic obstructive pulmonary disease exacerbations with hypercapnic respiratory failure

Causes	N (%)
Nonavailability	36 (38.7)
Patient noncompliance	36 (38.7)
Do not work in ICU	21 (22.5)

[5]. Stratification of patients according to COPD severity is a crucial aspect in initiating treatment. Appropriate COPD management could reduce its impact on patients' quality of life and health service costs [5]. For the first time, the revised GOLD guidelines published in 2011 suggest a combined assessment of symptoms, the degree of airflow limitation as measured by spirometry, and the risk

**Table 21 Comparison between doctors' specialty and performing spirometry to chronic obstructive pulmonary disease patients**

Specialty	Performing spirometry to COPD patients [N (%)]		Total [N (%)]
	No	Yes	
Chest residents	25 (65.8)	13 (34.2)	38 (100.00)
Internists	26 (83.9)	5 (16.1)	31 (100.00)
Chest masters	22 (51.2)	21 (48.8)	43 (100.00)
Chest MD	3 (17.6)	14 (82.4)	17 (100.00)
Total	67 (57.76)	49 (42.24)	116 (100.00)
$\chi^2$		21.74	
P-value		0.0001	

COPD, chronic obstructive pulmonary disease.

**Table 22 Comparison between doctors' specialty and daily prescription following GOLD guidelines**

Scientific degree	Your daily prescription following [N (%)]		Practical experience [N (%)]	Total [N (%)]
	GOLD			
	2010	2013		
Chest residents	10 (26.3)	3 (7.9)	25 (65.8)	38 (100.00)
Internists	4 (12.9)	6 (19.4)	21 (67.7)	31 (100.00)
Chest masters	9 (20.9)	11 (25.6)	23 (53.5)	43 (100.00)
Chest MD	0 (0)	13 (76.5)	4 (23.5)	17 (100.00)
Total	23 (17.8)	33 (25.6)	73 (56.6)	129 (100.00)
$\chi^2$			32.15	
P-value			0.0001	

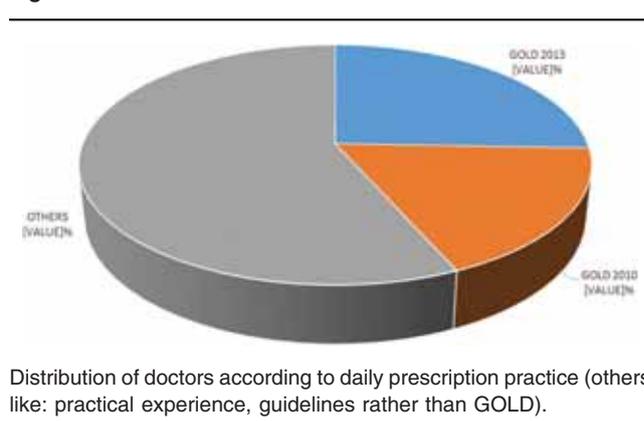
of exacerbation, with patients grouped into four different classes. Many studies showed that the adherence to treatment guidelines is low, especially in the less developed countries [7–10]. Another recent study shows low rates of adherence to gold guidelines in COPD treatment [11]. Adherence to clinical guidelines shows considerable variability in outpatient clinics managing COPD patients [12]. Another study shows that adherence to GOLD guidelines is only partially met by general practitioners in their general practice and shows higher prescription appropriateness by pulmonologists [13].

This study was conducted to evaluate COPD patients' management according to GOLD guidelines and aspects of clinicians' deviations from these guidelines in daily practice. On the other hand, 129 physicians accepted to participate in the current study: 60 of them were from Abbassia Chest Hospital and 32 were from the Chest Department of Ain Shams University Hospitals, whereas the other 31 were from the Internal Medicine

**Table 23 Distribution of doctors according to prescribing inhaled corticosteroids to chronic obstructive pulmonary disease patients**

Prescribing inhaled corticosteroids	N (%)
Patients with frequent exacerbation and severe or very severe COPD	114 (89.8)
Severe or very severe COPD patients [5]	13 (10.2)
Total	127 (100)

COPD, chronic obstructive pulmonary disease.

**Figure 1**


Distribution of doctors according to daily prescription practice (others like: practical experience, guidelines rather than GOLD).

Department of Ain Shams University Hospitals and six were from Ministry Hospitals. Most of the physicians included in the current study had graduated from Faculty of Medicine, Ain Shams University (72.9%).

Doctors who participated were 38 chest residents, 43 chest physicians having masters degree, 17 chest physicians having MD, and 31 internal medicine doctors. However, in a similar study conducted to evaluate prescription practices of antibiotics in respiratory tract infections according to guidelines at Ain Shams University Hospitals, the chest physicians were 20 (35.1%) MBBCh, 15 (26.3%) with masters degree, and 22 (38.6%) MD, whereas the internal medicine physicians were 16 (37.2%) MBBCh, 15 (34.9%) with masters degree, and 12 (27.9%) MD [14]. The mean age of physicians who participated in this study was 33.94±9.561 years. This is nearly the same found in a study conducted to assess physicians' understanding, adherence, and barriers to implementation of GOLD guidelines in Nigeria where the mean age of participating physicians was 34±5 years. The physicians' sample was characterized by young age; most of the physicians were in the age group of 24–29 (43.4%) years and 30–40 (31.8%) years [15]. In contrast, a guideline-based survey of outpatient COPD management by pulmonary specialists in Germany revealed that physicians were mainly in the 41–50 (41%) age group and 51–60 (38%) age group [16]. The results showed that 69% of

physicians who participated in the current study were male. This matched with a study that assessed physician and patient perceptions in COPD in USA, where only 34% of participated physicians were female [17]. The current study showed that 48.8% of physicians had less than 4 years of practical experience. However, in a study conducted among 590 pulmonary specialists in Germany, 35.4% of physicians had 11–20 years of practical experience, 20.8% had 5–10 years, and 25.8% had less than 5 years of practice [16]. In this study, about 52.7% of physicians examined 20–40 COPD patients per month in the outpatient clinic, 58.1% of physicians stated that 10–20 of COPD patients seen monthly in the out patient clinic (OPC) needed hospitalization, and 74.4% of doctors diagnosed less than 20 new COPD patients per month. However, one study found that 48% of chest specialists reported treating 101–200 COPD patients per month and 61% of physicians stated that less than 5% of their COPD patients had at least one exacerbation-related hospitalization per year [16], whereas in one study, a national survey among Belgian physicians, the pulmonologists saw on average 65 COPD patients per month and 109 new COPD patients per year [18].

In the present study, 43.4% of doctors followed GOLD guidelines in daily prescription practice (33 doctors followed new GOLD, whereas 23 followed old GOLD). These results matched with a study during a cross-sectional survey of internal and family medicine in Nigeria; 90 (57.7%) of the participating physicians were aware of the COPD guidelines [15]. However, in another study conducted in Germany, the most followed guidelines of COPD were the national guidelines (51%), and then GOLD guidelines (40%) [16]. In a study conducted in Italy to observe COPD patient management, 89.9% of general practitioners declared knowing national/international guidelines for COPD management [19]. However, a study found that the leading barriers to the nonadherence to the COPD guidelines were lack of familiarity (39.8%), lack of awareness (23.1%), and lack of time (19.2%), whereas 22 (14.1%) participants cited disagreement with the guidelines as a barrier to nonadherence [15].

In the present study, only 53 doctors perform spirometry to their COPD patients; the most cited reasons for not performing the test were depending on clinical diagnosis followed by nonavailability and low economic status of the patient. The same was found in a US study conducted to assess attitudes and barriers to COPD guideline usage by primary care physicians [20]. When COPD is suspected the diagnosis

should be confirmed by spirometry. Despite that 69.2% of doctors agreed with the guidelines, only 23.6% ordered spirometry when patients reported symptoms that lead to expected COPD. Primary care physicians who participated in that study indicated that there were considerable external barriers to obtaining confirmatory spirometry use such as lack of a working spirometer onsite (46.8%), cost of spirometry testing to patient (33.0%), lack of spirometry testing nearby (18.4%), and patient reluctance to be tested with a spirometer (42.4%). This matched with the current study where there was a statistically significant difference between doctors' place of work and performing spirometry to COPD patients; 47 chest physicians at Abbassia chest hospital did not perform spirometry to patients, which could be because of nonavailability.

In this study, there was a statistically significant difference between doctors' years of practice and performing spirometry to COPD patients; most doctors with less than 4 years of practical experience did not perform the test. This could be because most of those doctors (65.1%) do not follow GOLD guidelines in daily practice.

In the current study, all doctors stated that they do not have available structured rehabilitation programs for COPD patients in their hospitals, whereas only five chest physicians claimed offering a structured educational program to their COPD patients in the form of repeated instructions at the outpatient clinic visits. Moreover, only 24.8% of physicians (27 chest physicians and five internists) admitted their COPD patients to a smoke cessation program. Most of them admitted less than 50 COPD patients per year in such a program. This is nearly similar to a study conducted in Belgium to investigate to what extent COPD guidelines differed from the existing practice among physicians: only 44% of the pulmonologists had a structured rehabilitation program for their patients and only 34% of them had a structured smoking cessation program and they on the average only admitted three patients per week to it [18].

Inhaled steroids are appropriate in patients with severe or very severe COPD or in patients with frequent exacerbations not adequately controlled by long-acting bronchodilators [21]. In the present study, 92.2% of doctors claimed prescribing inhaled corticosteroids according to previous recommendations.

The combined assessment proposal [22] is expected to reflect the complexity of COPD better than the unidimensional (forced-expiratory volume for 1 s)

analysis previously used for staging the disease [23], and is therefore a potentially important step forward toward a more personalized approach to COPD [24]. However, in this study only 31 physicians prescribed medication according to new GOLD guidelines. Physicians followed new GOLD-prescribed short acting bronchodilators (SABDs) in all patient groups (A, B, C, and D). LABDs were prescribed mainly in patients who belonged to groups B, C, and D and long-acting  $\beta_2$  agonist with inhaled corticosteroid were prescribed only in C or D patient groups, whereas theophyllines and mucolytics were prescribed mainly in patients who belonged to groups C and D. The new GOLD guidelines includes a wider choice of respiratory medications and different other possible treatments that could be prescribed alone or in combination with first-choice drugs, making prescription adherence to guidelines more possible to physicians. On the other hand, 93 physicians prescribed treatment according to COPD severity level. Short-acting  $\beta_2$  agonist, theophylline, and mucolytics were the more frequently prescribed drugs, whereas LAMAs were the least frequently prescribed drugs and long-acting  $\beta_2$  agonist and inhaled corticosteroid were prescribed mainly in moderate and severe or very severe disease stages. These results may reflect that doctors' prescription could be affected by the economic status of the COPD patient.

In case of treating COPD exacerbations, the results showed that 90.7% of doctors prescribed systemic steroids for COPD patients with exacerbation. About 46.2% of doctors prescribed it for less than 1 week duration, whereas 44.3% of them prescribed it from 10 to 14 days. All doctors increased doses of bronchodilators, whereas only 48.4% of them ordered physiotherapy to their patients. In this study, all doctors prescribed antibiotics for COPD patients with exacerbation, 59.4% of physicians prescribed antibiotics in moderate and severe exacerbation, whereas 40.6% prescribed them in mild, moderate, and severe exacerbations. However, a study conducted among Belgium physicians to assess COPD patient management according to GOLD guidelines revealed that the first treatment for an exacerbation was increased doses of bronchodilator (75%), followed by systemic steroids (69%), physiotherapy (40%), and antibiotics (35%) [18].

The results showed that the most common antibiotics prescribed by physicians to COPD patients in exacerbations were macrolides (66.6%), third-generation cephalosporins (53.5%), respiratory quinolones (38%), extended penicillins (28%), or according to culture (25.9%), whereas a study conducted at Ain Shams University Hospitals to evaluate prescription practices of

antibiotics in respiratory tract infections showed that broad-spectrum penicillins were the most frequently prescribed antibiotics for COPD and acute exacerbation (AE) (39%), followed by cephalosporins (24%) and macrolides (23%), whereas the least frequently prescribed antibiotics were quinolones (14%) [14].

Several studies have shown that noninvasive positive-pressure ventilation improves respiratory acidosis, improves respiratory rate, decreases need to invasive mechanical ventilation, and increases survival time [25–27]. In cases of COPD patients who suffer from acute hypercapnic respiratory failure but without hypotension or reduced level of consciousness, noninvasive ventilation was used only by about 35.7% of physicians. The results showed that this could be mainly because of patient noncompliance followed by nonavailability.

In the current study, there was a statistically significant difference between doctors' specialty and following guidelines in daily prescription. Most of the chest residents and internal medicine doctors did not follow GOLD recommendations in daily prescription. In a similar study conducted in Nigeria, 57.7% of doctors were aware of the COPD guidelines; these comprised all the pulmonologists and internists, 54 (65.1%) internal medicine residents, two (50%) family physicians, 22 (46.6%) medical officers, and six (37.5%) family medicine residents [15].

In this study, the results showed correlation between doctors' specialty and performing spirometry to COPD patients: 82.4% of chest physicians with MD and 48.8% of chest physicians with masters degree performed spirometry to patients because most of them followed GOLD guidelines in daily practice.

### Recommendations

Educational interventions are required to achieve optimal care for COPD patients according to GOLD guidelines. The appropriate use of COPD medications is both cost-effective and clinically beneficial for patients. In addition, evidence-based comparative studies should be carried out in our country between recommended first-choice drugs, alternative choice drugs, and other possible treatments mentioned in new GOLD pharmacologic management recommendations. Spirometry should be widely available in hospitals and public health system with trained medical staff. Doctors should order spirometry to COPD patients every 6 months to follow up airway obstruction level. Changes in healthcare systems must include more effective ways to transfer knowledge into clinical

practice. In teaching hospitals and specialized chest hospitals, there should be an integrated medical team that consists of well-trained nurses, well-trained chest physicians, psychiatrists, nutrition specialists, and physiotherapists to achieve optimal management of COPD patients. The different means of media should increase the awareness of the community to COPD and its relation to smoking habit and air pollution. However, as real life often demands an individualized treatment approach, the contribution of other factors to COPD treatment (comorbidities, access to healthcare facilities, patient educational level) also needs to be investigated in the future. Despite a broad international consensus on the basic principles for treating COPD, different national healthcare systems, economies, and medical tradition may influence the actual medical practice and drug prescription attitudes. Therefore, some deviations from the gold standard are to be expected.

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### Conflicts of interest

There are no conflicts of interest.

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