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COPD FOUNDATION GUIDE

Introducing the COPD Foundation Guide for Diagnosis and Management of COPD, Recommendations of the COPD Foundation

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Abstract

The increasing number of treatment options for managing patients with chronic obstructive pulmonary disease (COPD) promises to improve the outcomes for COPD patients. However, determining which treatments are appropriate for individual patients has become increasingly complex. The COPD Foundation Guide for Diagnosis and Management of COPD was developed to be a practical, easy to use tool for clinicians. The Guide includes specific recommendations for diagnostic studies and treatments based on specific diagnostic criteria. This manuscript describes the rationale for the development of the Guide, the process used, the rationale for the specific recommendations and the plans for further development. The current recommendations of the COPD Foundation have been summarized in the form of Pocket Cards, which may be obtained from the Foundation at no charge (1-866-316-COPD (2673), www.copdfoundation.org).

Introduction

Chronic obstructive pulmonary disease (COPD) refers to a set of multifactorial, diverse diseases that share the feature of progressive airflow limitation as disease advances in addition to a variety of other important clinical features. Distinct subtypes include emphysema or airways disease, either of which may be predominant (1). Spirometry, which can determine the presence of airflow limitation and measure its severity, is a central diagnostic element. However, airflow limitation is only one manifestation of COPD. Symptoms, which may be varied, exacerbations, hypoxemia and extra-pulmonary co-morbidities as well as the presence of emphysema or airways disease, can affect clinical decision making. Management of the individual COPD patient, therefore, requires an organized diagnostic and therapeutic approach and so characterization of each person's COPD requires assessments in addition to spirometry.

The COPD Foundation Pocket Guide for the Diagnosis and Management of COPD was designed to be a practical tool to assist the practicing clinician manage the diagnosis and treatment of COPD patients. The Guide was designed to aid in identifying patients for whom spirometry should be performed, how patients should be classified based on spirometry, what additional assessments should be performed and when and how these diagnostic evaluations should influence therapy.

COPD is an extremely common problem, with nearly 15 million patients diagnosed in the United States (2–4). COPD is a problem frequently encountered by the clinician (Table 1) (4). However, COPD is often unappreciated, with at least half of patients with COPD in the United States being undiagnosed

Keywords: COPD, spirometry, diagnosis, treatment

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Table 1. Prevalence of COPD in a "Typical" Practice

Number of diagnosed patients*	147
Clinic visits for COPD**	every 2.8 days
Emergency visits for COPD**	every 2.9 weeks
Hospitalization for COPD**	every 6 weeks
Death from COPD**	every 4 months

*Based on a 2,500 patient practice perfectly distributed across the US population.
**COPD as a primary diagnosis. COPD as a concurrent condition is much more common.
Based on data from Ford (4) and (2).

(5). When diagnosed, COPD is often undertreated, with studies reporting 30–70% of diagnosed patients receiving no treatment (6, 7), and treatments, when used, are often sub-optimal (8). The heterogeneity of the COPD patient population and the increasing number of effective interventions further complicates disease management.

Several efforts, including the National Heart Lung and Blood Institute's program, "Learn More, Breathe Better" (9), the National Lung Health Education Program's "Test your lungs, know your numbers" (10), and the COPD Foundation's program "Drive for COPD" (11), have been developed to increase public and health care professional awareness of COPD and to increase detection of unrecognized disease. At the same time, a variety of resources have been developed as aids to the clinician caring for COPD patients. These materials have addressed a number of needs, but have not been as useful for the practicing clinician as might be hoped. The COPD Foundation Guide was designed to address this need. Specifically, the Guide assists the clinician in recognizing undiagnosed COPD and in providing optimal therapy to individual patients in this heterogeneous group. To this end, the Guide has been designed to provide clear, practical recommendations for the diagnosis and management of COPD patients. It has been specifically formatted to be easy to reference and to omit information not currently relevant to clinical decision making.

The Guide is one part of the COPD Foundation program to provide support materials for clinicians caring for COPD patients. Three versions of the Guide have been prepared (Figure 1). These include: (1) a "skinny" two panel version with only the diagnostic and therapeutic recommendations included, (2) a full six-panel version with all drugs listed using generic names, and (3) a full six-panel version with all drugs listed using brand names. In addition to the Guide, a smartphone application will be developed that will include the information in the Guide together with several easily accessible tiers of additional supporting information and will allow active calculation of Spirometry Grade (SG), the modified Medical Research Council (mMRC) and COPD Assessment Test (CAT) scores.

Finally, the Foundation will support a discussion blog for clinicians that will provide a platform for an open interaction relating to COPD management. The entire program is supported as a public service by the COPD Foundation, which is committed to making the Guide, the smartphone applications, the blog and any other materials that may be developed available without charge.

The current manuscript describes the rationale for the development of the Guide, the process by which it was developed and plans for its ongoing support. In addition, we provide the rationale for the information included in the Guide and evidence supporting the recommendations made.

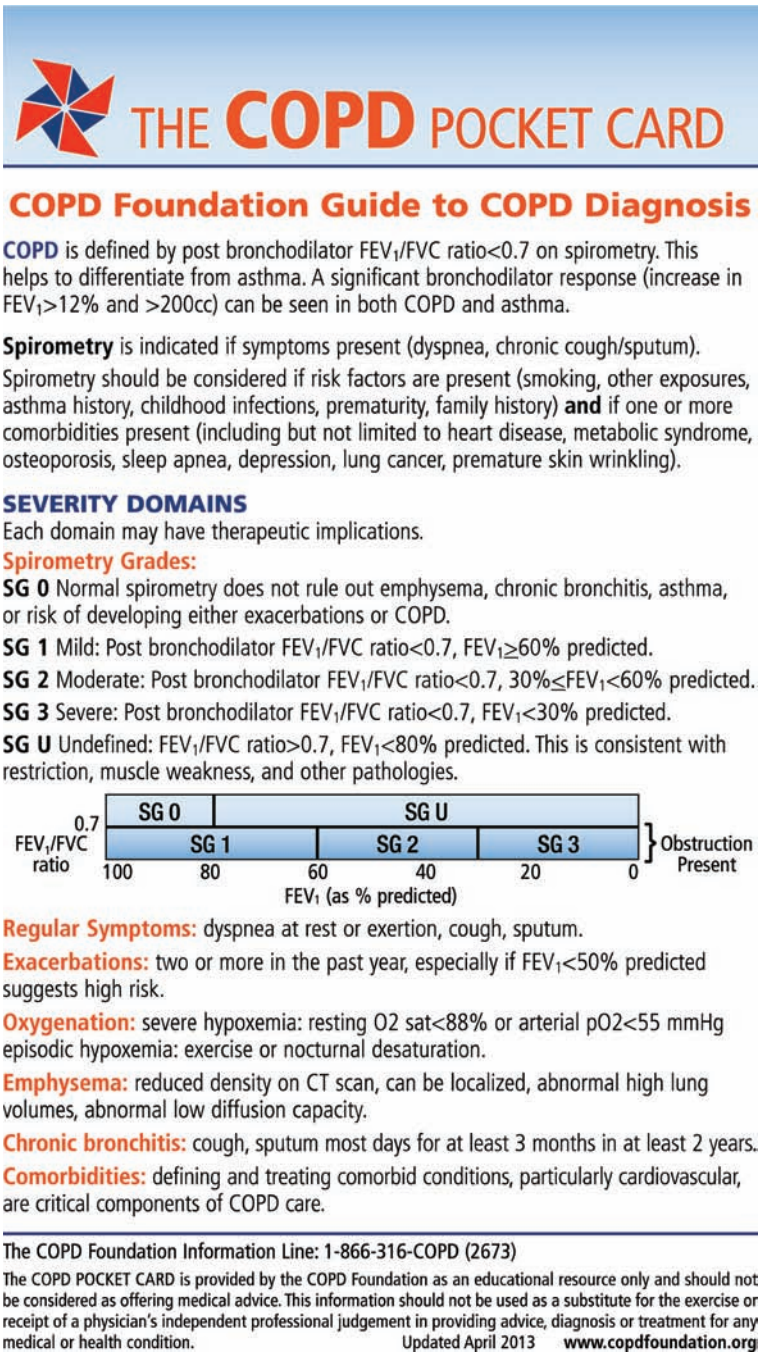
Unmet needs

Guidelines have been developed by a variety of groups to provide recommendations in a number of therapeutic areas. A formal methodology has evolved for the preparation of these documents, which is both labor intensive and expensive (12–28). As a result, many organizations have prepared summary recommendations with simplified methodology and have used "consensus statements," "position paper," "guidance," or other names to describe the recommendations. Several such documents are available for COPD: GOLD (a consensus statement) (29, 30), the ATS/ERS Standards (a position paper) (31, 32) and NICE (a guidance) (33) are among the most widely referenced. A Guideline has also been prepared by a collaboration of the ACP/ACCP/ATS/ERS (34). In general these documents are extensively researched and referenced, but are too long for practical use by most clinicians. Even the summary statements for the longer documents are often too long for ready reference in the setting of a busy clinical practice (35) (Table 2). In addition, while strict guideline methodology produces an evidence-based set of recommendations, too often there are insufficient data to resolve important clinical questions that must be addressed daily in practice. Therefore, evidence-based guidelines may not always help the clinician who is often faced with making decisions for which such evidence is not available. The Guide was designed to provide practical recommendations for the problems that are frequently encountered in clinical practice and to do so in a format that could be readily used in the context of a busy clinical practice.

A second limitation of most sets of recommendations is that they are developed by relatively small groups. They are often reviewed and approved by somewhat larger groups. Nevertheless, the content

Table 2. Selected recommendation documents and summaries: Length

	Full document	Ref.	Summary	Ref.
GOLD	76 pages	(29)	19 pages	(30)
ATS/ERS Standards	80 pages	(31)	15 pages	(32)
NICE	673 pages	(33)	20 pages	(36)
ACP/ACCP/ATS/ERS	13 pages	(34)		



THE COPD POCKET CARD

COPD Foundation Guide to COPD Diagnosis

COPD is defined by post bronchodilator FEV_1/FVC ratio<0.7 on spirometry. This helps to differentiate from asthma. A significant bronchodilator response (increase in FEV_1>12% and >200cc) can be seen in both COPD and asthma.

Spirometry is indicated if symptoms present (dyspnea, chronic cough/sputum).

Spirometry should be considered if risk factors are present (smoking, other exposures, asthma history, childhood infections, prematurity, family history) **and** if one or more comorbidities present (including but not limited to heart disease, metabolic syndrome, osteoporosis, sleep apnea, depression, lung cancer, premature skin wrinkling).

SEVERITY DOMAINS

Each domain may have therapeutic implications.

Spirometry Grades:

SG 0 Normal spirometry does not rule out emphysema, chronic bronchitis, asthma, or risk of developing either exacerbations or COPD.

SG 1 Mild: Post bronchodilator FEV_1/FVC ratio<0.7, $FEV_1 \geq 60\%$ predicted.

SG 2 Moderate: Post bronchodilator FEV_1/FVC ratio<0.7, $30\% \leq FEV_1 < 60\%$ predicted.

SG 3 Severe: Post bronchodilator FEV_1/FVC ratio<0.7, FEV_1<30% predicted.

SG U Undefined: FEV_1/FVC ratio>0.7, FEV_1<80% predicted. This is consistent with restriction, muscle weakness, and other pathologies.

Regular Symptoms: dyspnea at rest or exertion, cough, sputum.

Exacerbations: two or more in the past year, especially if FEV_1<50% predicted suggests high risk.

Oxygenation: severe hypoxemia: resting O2 sat<88% or arterial pO2<55 mmHg episodic hypoxemia: exercise or nocturnal desaturation.

Emphysema: reduced density on CT scan, can be localized, abnormal high lung volumes, abnormal low diffusion capacity.

Chronic bronchitis: cough, sputum most days for at least 3 months in at least 2 years.

Comorbidities: defining and treating comorbid conditions, particularly cardiovascular, are critical components of COPD care.

The COPD Foundation Information Line: 1-866-316-COPD (2673)

The COPD POCKET CARD is provided by the COPD Foundation as an educational resource only and should not be considered as offering medical advice. This information should not be used as a substitute for the exercise or receipt of a physician's independent professional judgement in providing advice, diagnosis or treatment for any medical or health condition. Updated April 2013 **www.copdfoundation.org**

Figure 1. COPD Foundation Guide for the Diagnosis and Management of COPD.

usually reflects the analysis of relatively few individuals. This is less of a problem where the evidence base is strong, but may be increasingly problematic when recommendations must rely on expert opinion. The Guide was developed by a similar approach. However, it is the intent of the Foundation to use the Guide as a platform to engage a much larger group in the discussion of COPD management. Although not yet an "open source-derived" document, it is hoped that the blog that will support the Guide will be a means to engage the larger clinical community in developing recommendations and identifying areas in need of additional recommendations.

Another limitation of many consensus recommendations is that their purpose, the intended audience and outcomes are seldom stated explicitly. It is widely assumed that the documents are written to inform primary care physicians, who care for most COPD patients, and that the intended result is to improve the outcomes of COPD management. This common failure to identify the target audience and intended outcomes might explain why the guidelines so often fail to meet the hopes of their authors (37).

Despite widespread adoption by academic specialists, translating this consensus knowledge into improved practice patterns and outcomes has been

COPD Foundation Guide for COPD Treatment

All patients should receive: Smoking cessation; vaccination for influenza, pneumococcus, pertussis

	short acting bronchodilator	LAMA or LABA or LAMA plus LABA	ICS/LABA	roflumilast	oxygen	exercise/ pulmonary rehabilitation	lung volume reduction surgery	azithromycin‡
Spirometry Grade SG1 Mild	first line as needed	possibly						
SG 2/3 Moderate/Severe	first line as needed	first line	yes	yes*				
Regular symptoms	first line as needed	first line	yes			first line		
Exacerbation risk high		first line†	first line†	yes*				yes
Oxygenation severe hypoxemia episodic hypoxemia					yes possibly			
Emphysema							In selected cases	
Chronic bronchitis				yes*				
Comorbidities	Evaluate and treat identified comorbid conditions							

LAMA: Long-Acting Anticholinergic, LABA: Long-Acting Beta 2 Agonist, ICS/LABA: Inhaled Glucorticosteroid plus Long-Acting Beta2 Agonist.
† LAMA, ICS/LABA, LAMA plus LABA or LAMA plus ICS/LABA all potential options depending upon frequency of exacerbations and severity of COPD.
* Indicated if chronic bronchitis, high exacerbation risk, and spirometry grades 2/3 all present.
‡ Off label use.

Therapy guided by **diagnosis** and **assessment of severity domains**

- Each Domain requires separate treatment consideration. For example, if regular symptoms are present an exercise program needs to be considered regardless of what other domains are present. First line therapy is red. Second line choices are green. The various treatments can generally be combined as needed, but fixed combinations should not be combined with equivalent individual components.
- Short acting bronchodilators are rescue medications for acute dyspnea. Frequent use suggests the need for addition of a long acting bronchodilator or other adjustments in therapy.
- Theophylline may be an additional option for some patients potentially improving lung function and symptoms.

Panel A. 2-panel version (front and back). The version includes the diagnostic summary and therapeutic table based on diagnostic features.

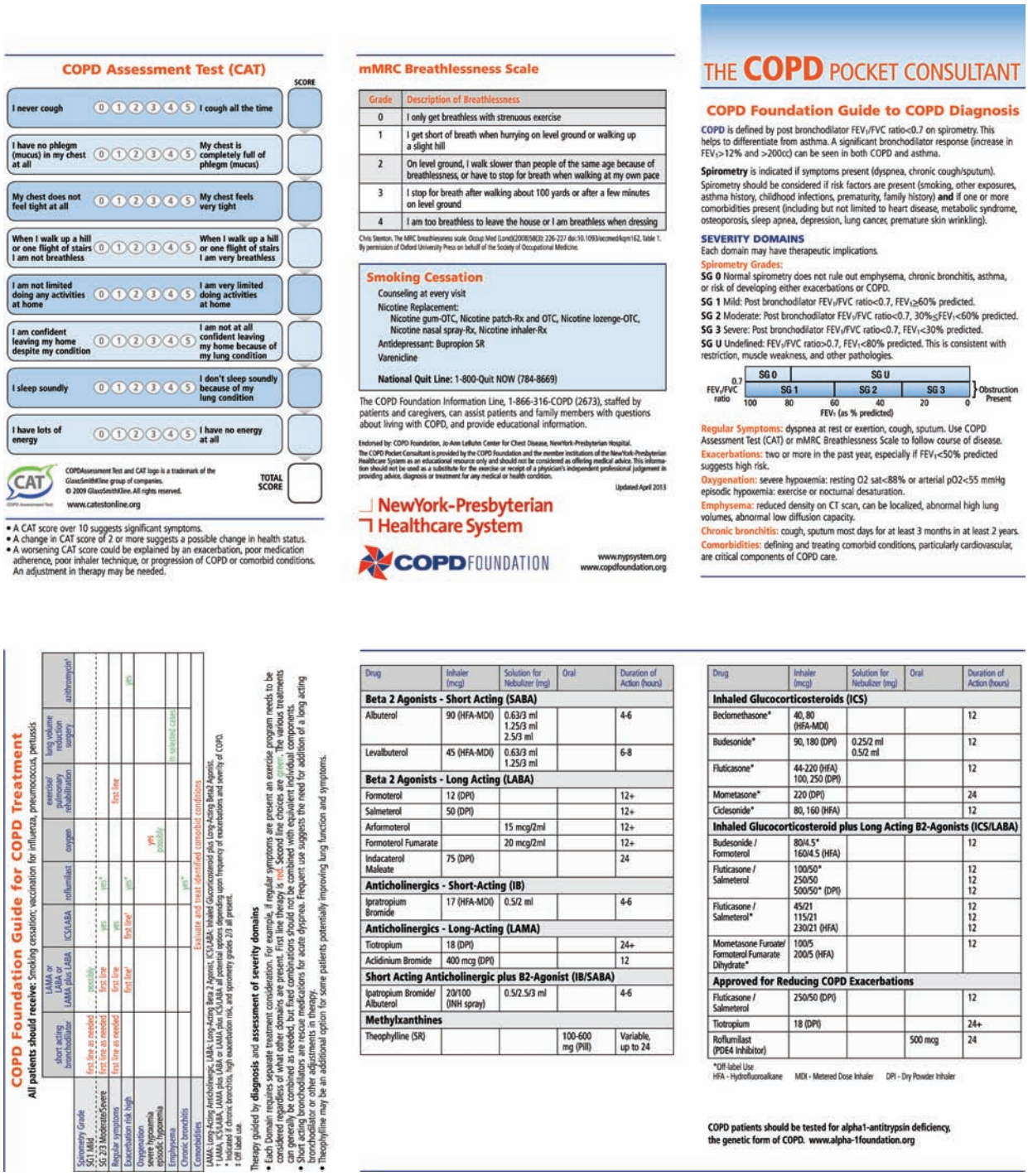
less successful than might be hoped. The COPD Foundation Guide is a tool specifically designed to put the core recommendations for COPD diagnosis and treatment into a more accessible format. Combined with the planned web and smartphone technology, this may greatly facilitate dissemination and rapidly bring the recommendations directly into the hands of clinicians in day-to-day practice.

Process

Recognizing that currently available tools were overly large, contained much information that was valuable for understanding the disease but not immediately relevant to clinical practice, an ad hoc committee (listed as authors) was organized through the COPD Foundation with the goal of developing a practical guide. The Guide was based on the prior management card (The COPD Pocket Consultant) developed by the COPD Foundation and NewYork-Presbyterian Healthcare System. For the current version, funding from donor funds made possible the drafting of mock ups for initial critiques and revisions. These versions were reviewed by members of the COPD Foundation Medical and Scientific Advisory Council and additional selected reviewers (see acknowledgment).

Prior versions of the management card were felt to do some things well and others poorly. Its size and format were easy to use and straightforward to reference. In addition, it could be produced and distributed within the financial resources available to the COPD Foundation. Over the last half dozen years, this consultant card has been updated multiple times, and over a quarter of a million cards have been distributed to healthcare providers nationwide at no charge. On the other hand, a key diagnostic recommendation, when to use spirometry to diagnose COPD, was not clearly defined. This has remained a somewhat controversial issue. Although there is general agreement that spirometry is indicated if symptoms are present, the consensus statement from ACP, ACCP, ATS, and ERS published in 2011 strongly recommended against performing spirometry in those at risk but without specific symptoms (34).

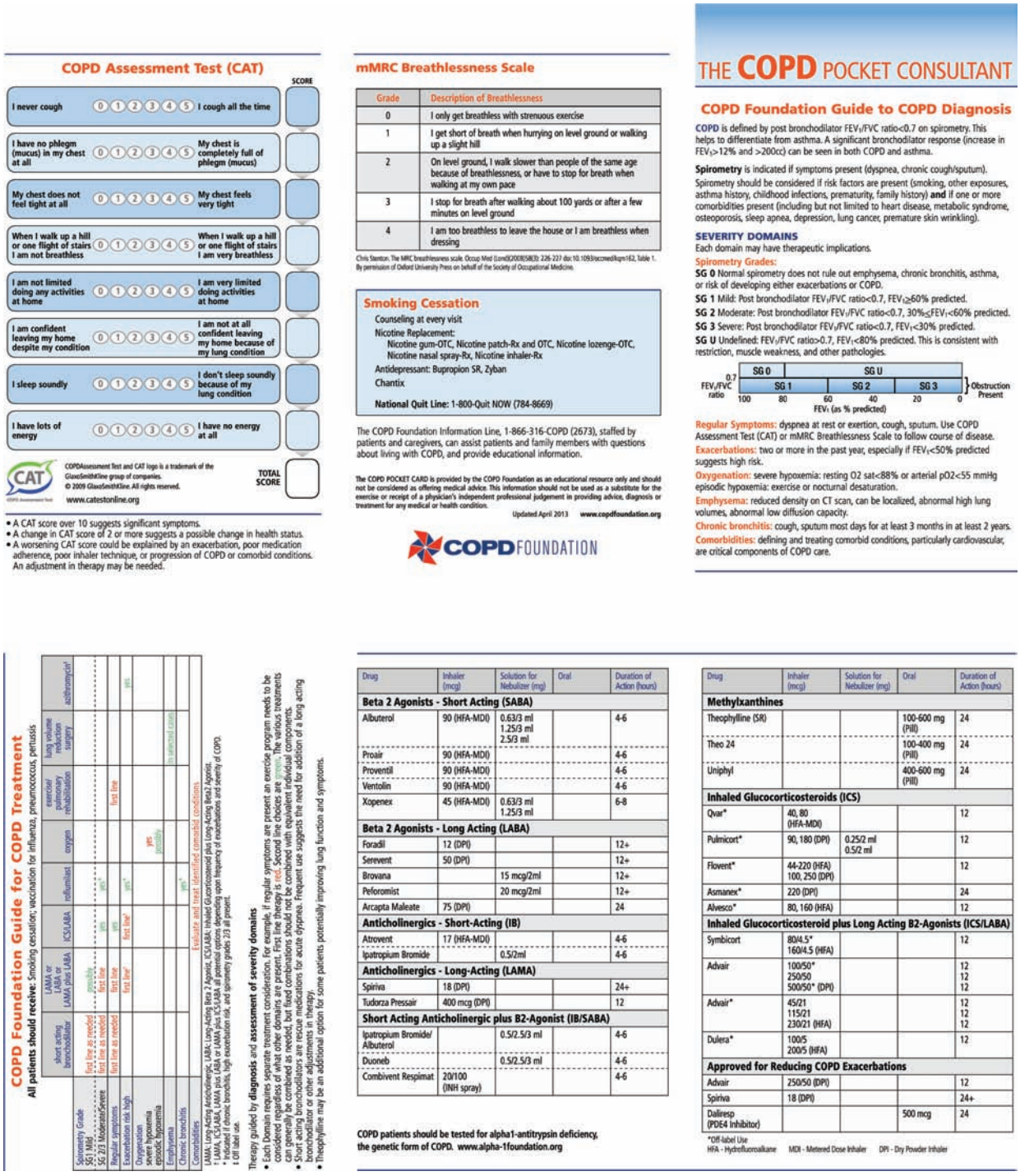
One concern with that recommendation is that symptoms, particularly early symptoms, may be ignored or incorrectly self-diagnosed. A chronic cough may be viewed as an allergic cough or a "normal smoker's cough" and self treated with over-the-counter medications. Progressive shortness of breath may be explained by "getting old, being overweight or out of shape." In the limited time available during health care visits, these issues may never be discussed. Limiting spirometry to those complaining of symptoms may miss many of the reported 12 million with COPD but as yet undiagnosed (2–4). Better delineation of which patients should have spirometry is needed and was the subject of an NHLBI workshop (38) and a subsequent RFA (39). Ongoing research, in which the COPD Foundation collaborates, looks to develop a new validated questionnaire linked with peak flow testing that may provide a better approach. In the interim, recognizing that comorbidities are extremely common in COPD (29–33, 40) and



Panel B. 6-panel version, generic (front and back). This version adds details on the mMRC and CAT symptom scores, specific information on medications commonly used to treat COPD and information relating to smoking cessation.

that evidence suggests that COPD is an independent risk factor for a number of these conditions, the Guide suggests that spirometry should be considered in those with symptoms, and those at risk who have one or more co-morbid condition, e.g., smokers with cardiovascular disease, consistent with recommendations from a recent ATS/ERS report (41).

A strict definition of COPD remains controversial, although the defining feature is airflow limitation (42–45). In part, this is because the "definition" has mostly been used for epidemiological rather than clinical purposes (46). Reduced airflow is most easily measured as a reduction in the forced expiratory volume in one second (FEV_1). With obstructive disease, the FEV_1 decreases more than the forced vital capacity (FVC). As a result, the FEV_1/FVC ratio has been used to define obstruction and to distinguish it from restriction, in which the FEV_1 and FVC decrease in proportion. With aging, both FEV_1 and FVC decline, but the FEV_1 declines faster (42–45).



Panel C. 6-panel version, brand names. This version is identical to the generic version, except that brand names are used (front and back).

As a result, on a population basis, the "normal range" for FEV_1/FVC ratio, based on the population distribution decreases. For rigorous population studies, the lower limit of normal defined statistically on population-based sampling has been suggested as an appropriate definition for categorizing individuals as having COPD. In clinical practice, this value, which is not easy to reference and is undetermined for many populations, is difficult to use. For this reason, many consensus recommendations suggest a ratio of FEV_1/FVC of 0.7 as a cutoff, with values below this level indicating the presence of COPD (29, 31, 33, 34). Because this is easy to implement in clinical practice and provides information that allows clinicians to make reasonable decisions, this value and approach was adopted for the Guide.

Assessment of airflow is important. In addition to defining the presence of obstruction, the severity of airflow limitation can be gauged. As with other recommendations, the FEV_1, expressed as a percentage of that predicted based on height, age and gender, is used in the

Guide. Thus, those with obstruction ($FEV_1/FVC < 0.7$) can be categorized into severity categories, and the Guide defines three spirometric grades (SG) of obstruction. These are: mild obstruction (SG 1, $FEV_1 \geq 60\%$), moderate obstruction (SG 2, FEV_1 between 30 and 60%) and severe obstruction (SG 3, $FEV_1 < 30\%$) and were designed to follow the therapeutic recommendations provided in other consensus recommendations (29, 31, 33, 34). These labels and groupings were chosen as they are already in use, are straightforward to implement and provide adequate classification to support recommendations for clinical decision making.

The Guide adds two additional spirometric grades, SG 0 and SG U. Those with SG 0 have normal spirometry. The majority of SG 0 individuals will be normal. However, normal spirometry does not rule out the presence of chronic bronchitis, emphysema, or other lung disease. SG U represents those with a normal FEV_1/FVC ratio but low FEV_1. Classically this group has been described as having "restrictive" disease. However data from COPDGene suggests that emphysema can be seen in this group and that SG U is very common. Up to 10% of the COPDGene population has emphysema without obstruction (47). Although neither SG 0 nor SG U lead to specific therapeutic options now, that may well change as we learn from ongoing studies. Including these in the spirometric grading system allows all patients to be given an SG classification.

COPD has been defined in terms of airflow, but the disease processes that cause the obstruction, which are extremely heterogeneous, can be active before the airflow limitation is present. In addition, clinical manifestations of COPD are only weakly related to airflow limitation and likely reflect other consequences of COPD as well (29, 31, 33, 34). For these reasons, it was felt that a more global assessment of the COPD patient was required. In practice, decisions on what therapies should be initiated depend both on spirometry and, more commonly, on other assessments (29, 31, 33, 34).

Several distinct parameters, termed "domains" in the Guide, were felt crucial to assess in addition to airflow. These include the presence of symptoms, a history of exacerbations, adequacy of oxygenation, presence of emphysema, presence of chronic bronchitis and presence of co-morbidities. These domains need to be evaluated in order to develop a comprehensive therapeutic plan, although not all are required in all COPD patients.

Recommendations

Symptoms—Should be assessed in all patients

The cardinal symptoms of COPD are dyspnea, particularly with exertion, cough and sputum. Spirometry should be performed when these symptoms are troubling to the patient. Often, patients may minimize symptoms. If activity has become progressively limited because it would precipitate dyspnea, spirometry should be performed. Conversely, when spirometry is assessed due to smoking and co-morbidities such as cardiovascular disease, it is important to carefully assess the presence and severity of COPD-related symptoms. Two symptom scores, the mMRC that assesses only dyspnea (48), and the CAT that assesses a range of symptoms including cough, wheezing, and fatigue (49), are provided in the Guide. Both can be used to track the course of disease. A score of ≥ 10 on the CAT is regarded as a significant indicator of respiratory disease that is impacting the patient (49). A score of ≥ 2 on the mMRC has been suggested to have similar importance, but is not well-validated (29). These scores can help guide diagnostic and therapeutic decisions.

Exacerbations—Should be assessed in all patients

Exacerbations, particularly frequent exacerbations, defined as two or more per year, are major contributors to morbidity, mortality, and cost (29, 31, 33, 34, 50, 51). A major advance in COPD management is the recognition that COPD exacerbations can be prevented and that individuals at risk for first or recurrent exacerbations can be identified. The strongest predictor of risk is a prior history of exacerbations followed by the severity of lung function impairment (52). Moderate and severe patients by the Guide classification (SG 2 and SG 3) would include those at highest risk of exacerbation based on FEV_1. Treatment of COPD patients with either of these criteria is warranted, and numerous inhaled agents including LAMA (long acting anticholinergic) (53), LABA (long-acting beta 2 agonist), and LABA/ICS (inhaled glucocorticosteroid) combinations (54), have been shown to decrease exacerbation rates and are approved for this indication. Data also suggest that theophylline (55) and certain antibiotics (56–58) may also decrease exacerbation rates, although these are not uses that are approved by the FDA. In addition, the presence of chronic bronchitis identifies a subgroup of SG 2 and SG 3 patients whose exacerbations can be prevented with roflumilast, which is approved for this use (59, 60). These diagnostic features have been integrated into the therapeutic recommendations of the Guide.

Adequacy of oxygenation—Should be assessed in all patients with $FEV_1 < 60\%$ predicted

For individuals with hypoxemia at rest ($pO_2 < 55$ mmHg), supplemental oxygenation prolongs life (61, 62). It is now standard of care to provide supplemental oxygenation to these individuals. The Guide recommends oxygen supplementation for either $pO_2 < 55$ mmHg or percutaneous oxygen saturation $< 88\%$. These are roughly equivalent values, but the oxygen saturation is somewhat more variable. Some published recommendations do not include percutaneous saturation, although this is accepted by payors and Medicare in the United States (63). Recognizing that percutaneous oximetry is readily

performed in clinical practices and requirement for an arterial blood gas would likely lead to under-diagnosis, under-treatment and preventable mortality, the Guide accepts either percutaneous oximetry as a convenient assessment that can be supplemented by arterial blood gas assessment when needed.

In contrast to the clear data regarding mortality for oxygen therapy in individuals hypoxemic at rest, there are several important topics related to oxygen therapy that are controversial. These include whether treatment is indicated for individuals with episodic hypoxemia that may occur with exercise (64). The Guide makes no recommendations on these topics. It is common practice to treat such individuals. An ongoing study (NCT00692198) addressing this question should help clarify the issue. We expect to include some discussion in the smartphone application and hope there will be a lively discussion when the blog is activated.

Presence of emphysema—Should be assessed in all patients with $FEV_1 < 30\%$ predicted or with very severe dyspnea

There are several ways to determine if emphysema is present. A low diffusion capacity that is not explained by reduced lung volume or anemia in a patient with obstruction is strongly suggestive, but may not be very sensitive. Computed tomography (CT), in contrast, provides a quantitative assessment of emphysema severity, determines emphysema location and can distinguish several distinct subtypes of emphysema (65, 66). These assessments are not theoretical. CT scan is required to identify individuals who are appropriate for volume reduction surgery (67), which can improve functional status, quality of life and reduce mortality in selected individuals with severe disease (68). This treatment is drastically under-utilized, however. Because of the importance of recognizing individuals who may be candidates for this treatment option, the Guide recommends assessing whether emphysema is present in selected cases.

Presence of chronic bronchitis—Should be assessed in all patients

As noted above, individuals with chronic bronchitis have increased risk of COPD exacerbations (52). In addition, they represent a subset of COPD patients whose exacerbations are responsive to treatment with roflumilast (59). For this reason, it is important to identify whether chronic bronchitis is present. The most commonly used definition of chronic bronchitis, symptoms of cough and sputum for most days for three months in two successive years, was initially proposed as a "tentative" definition until something more definitive could be developed (69). It remains in use as nothing "more definitive" has been proposed. However, the assessment of chronic bronchitis is inherently a clinical impression, with the key feature of persistent cough with or without sputum.

Presence of co-morbidities—Should be assessed in all patients

It is now recognized that many extra-pulmonary conditions are associated with COPD (Table 3) (29–33, 40). These are present in the COPD patient with a higher frequency than would be expected based on chance alone. Not all COPD patients are affected with the co-morbidities, but many have multiple co-morbidities (70, 71). As may be expected, the presence of these co-morbidities adversely affects prognosis and may be the dominant problems patients face.

Because the treatment of co-morbid conditions in the COPD patient population is generally the same as treatment in the broader population, there was considerable discussion on whether to include this in "COPD diagnosis." However, the key issue most commonly faced by clinicians is whether to pursue diagnostic studies to evaluate the presence of these co-morbidities.

As the presence of COPD should increase the "index of suspicion," it was felt that inclusion in the Guide was warranted. It is hoped that more aggressive diagnosis will lead to reduced morbidity from these associated conditions, which are often unrecognized but are frequently treatable. The smartphone application will include additional information on this topic together with appropriate links. It is also hoped that there will be lively discussion on the blog.

The Guide recommends testing all patients for alpha 1 anti-trypsin deficiency. The "classic" presentation of alpha 1 anti-trypsin deficiency is basilar emphysema in a young patient with modest smoking history. However, patients with alpha 1 deficiency may present at any age

Table 3. Co-morbidities and COPD

Cardiac
Infarction
Arrhythmia
Failure
Aortic aneurysm
Hypercoagulability
Stroke
Pulmonary embolism
Deep vein thrombosis
Atrophic
Osteoporosis
Muscle weakness
Weight loss
Skin wrinkling
Anemia
Diabetes/metabolic syndrome
Fluid retention
Depression
Lung cancer

and with any pattern of emphysema. Many are misdiagnosed as asthma for many years. As replacement therapy may slow disease progression, a high index of suspicion for alpha 1 anti-trypsin deficiency is warranted (72).

The Guide also includes some general treatment recommendations. Vaccination for influenza, pneumococcal pneumonia and pertussis was felt to be warranted based on available data and clinical practice. In addition, smoking cessation is always warranted (29, 31, 33, 34). Although this is true not only for COPD patients but for all smokers, there is an incorrect but frequent attitude that COPD patients may be "hard core" and refractory to intervention. Specific recommendations for use of nicotine replacement therapy, buproprion and varenicline, all of which are approved for use to aid with cessation and have been documented to have efficacy in COPD patients (73–75), were provided.

In addition, the freely available tobacco quit line, (1-800-QUITNOW), which has demonstrated efficacy (76), was specifically mentioned. Additional information and links relating to smoking cessation will be provided in the App. While tobacco smoking is not the only risk factor for COPD (1), no specific recommendations related to other risk factors were felt to be justified at this time. Exercise is recommended as first line therapy for all patients with symptoms and pulmonary rehabilitation in patients with SG 2/3 disease (77, 78). Unfortunately, pulmonary rehabilitation is not widely available at the present time and may not be adequately covered by payors. Nevertheless, its benefits for symptomatic COPD patients are supported by the highest levels of evidence (77, 78). Rehabilitation may also decrease hospitalizations and improve disease-related health status (quality of life).

Goals and next steps

The Guide was created to be a practical and easily used tool that can aid clinicians with the diagnosis and management of COPD patients. As such, it is hoped that COPD diagnosis will improve and become more accurate: unrecognized COPD patients need a proper diagnosis, and misdiagnosed COPD patients need their diagnosis corrected. Diagnosis is only part of the difficulty clinicians face in COPD management. Properly selecting a therapeutic regimen appropriate for individual patients is becoming more difficult. COPD treatment options are increasing, and novel treatments, many of which are in development, are desperately needed. However, COPD is also extremely heterogeneous, and most treatments are appropriate for subsegments of the COPD population. It is hoped the Guide will provide clinicians with a practical and easily used tool for selecting treatments appropriate for individual patients.

The Guide can have additional uses. The diagnostic and therapeutic recommendations of the Guide represent "best practice" as recognized by the COPD Foundation. As such, the Guide has the potential to be used as a benchmark to gauge COPD management. The unambiguous and easy-to-apply recommendations included in the Guide could also serve as clear performance measures and be used as a basis for quality of care assessments.

The Guide was designed to be short and extremely practical. However, dissemination and implementation of any new physician tool such as the Guide requires careful planning (79). The COPD Foundation Guide to COPD Diagnosis and Management has the potential to allow the end user to feel more confident and competent in the up-to-date management of COPD and may also allow the physician to be more efficient in managing patients. Development of a smartphone version will facilitate the use of the Guide by all interested health professionals. In addition, an electronic format is greatly preferred by many physicians.

For these reasons, the COPD Foundation will develop a smartphone application. It will include all of the information that is in the print version of the COPD Pocket Consultant Guide with additional information for using the diagnostic categories and for implementing the therapeutic recommendations together with expanded descriptions of the severity domains. Hyperlinks will be provided to external resources.

Expanded topics will include: smoking cessation, oxygen therapy, management of co-morbid conditions, pulmonary rehabilitation, and management of exacerbations. It will also allow physicians to record patients' COPD Assessment Test (CAT) or mMRC results in real-time along with spirometry values and exacerbation history to assist in determining appropriate therapy based on the Therapy Chart. The software will also be able to flag patients for whom assessment of oxygenation or CT scan would be appropriate. The full medications list will contain brief details of medications, including a hyperlink to the FDA website for additional drug information. Hyperlinks will be provided to consensus guidelines for management of COPD associated co-morbidities.

Development of an electronic version of the Guide, however, creates new and important opportunities in eHealth. It is the intention of the COPD Foundation to develop a dynamic website that will facilitate eHealth interactions. To this end, a patient smartphone application will also be developed with active links to the physician resource. Interested patients would be able to register to receive features such as incentive reminders, updates or practice "tips and tricks". In a recent study using a BlackBerry smartphone as a daily COPD symptom diary, over 99% of daily symptom diaries were recorded from a cohort of 100 COPD patients over a 3-year period, some of whom admitted to have never turned on a computer before (80). The development of the internet-based tools, which have the potential to greatly advance the management of COPD patients, is a major commitment of the COPD Foundation.

The management of COPD has improved substantially over the last 10 years. It is hoped that even greater improvements will emerge in the years ahead. This is likely to include the development of new treatments and refined ways of utilizing current treatments. Because COPD

patients have varied social and economic challenges as well as a complex and varied pattern of other medical problems, management of COPD patients requires many skills best described as the "art of medicine."

Preparation of consensus statements and guidelines is most commonly done by experts. Individuals who are primarily clinicians are much less likely to be contributors. It is hoped that the planned blog: the COPD Foundation Management Discussion Group, will help address this. The blog is being designed to serve as a platform for the open discussion of COPD management. It will be organized around the recommendations made in the Guide. It is hoped that the discussions in the Blog will help with subsequent revisions to the Guide. Similarly, discussions in the blog will help determine which content areas in the App need revision.

It is the commitment of the COPD Foundation that the Guide and supporting activities be freely available to all clinicians. It is hoped that these resources will help clinicians provide optimal care to COPD patients.

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