GLOBAL INITIATIVE OF CHRONIC OBSTRUCTIVE LUNG DISEASE: PRIMARY CARE INTEGRATION

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Abstract

Problem: COPD is a public health challenge and accounts for significant morbidity and mortality worldwide. Management of COPD in primary care is inconsistent and known factors are inconsistent use of COPD terminology, lack of standard diagnostic measurements, and poor patient assessment. Practice guidelines are updated annually based on the current evidence based (EB) research. However, only 25% of providers report adhering to guidelines.

Intervention: A COPD template was developed with 3 major components of EB guidelines and implemented in a primary care setting (PCS).

Methods: Descriptive statistics evaluated the percent of tool usage and intervention adherence by the provider, and assessed population demographics. Secondary outcomes were measured by chi-square analysis to evaluate for a correlation between the number of pharmacological treatment that met GOLD recommendations and if pharmacological treatment could be changed based on symptom assessment and exacerbation history.

Findings: The COPD tool was successfully implemented in a PCS at 100%. There was an association between current medications that met GOLD recommendations and if medications could be changed.

Conclusion: This quality improvement project provided a simple process using GOLD recommendations for COPD management in the PCS. The project is sustainable due to its simple assessment process.

Keywords: *COPD, GOLD, EBP, quality improvement*

Acknowledgements

T. Ramsey would like to thank the stakeholder serving on the front lines to make this project happen: Melanie Hensley, FNP. Special thanks to Ari Sigal for your huge role in editing this Quality Improvement project.

GOLD: PRIMARY CARE INTEGRATION

Introduction

In the United States (US), chronic obstructive lung disease (COPD) is the third leading cause of death among people 65 and older and the fourth leading cause in individuals aged 45 to 64 (Han et al., 2018). Nearly 15 million individuals in the US have a diagnosis of COPD, with an estimated 24 million who are undiagnosed (Han et al., 2018). COPD is defined as a lower respiratory tract disease characterized by persistent airflow limitation and chronic inflammatory response (Koblizek et al., 2016). The most common reported symptoms include chronic cough, excess mucus production, breathlessness, and decreased ability to perform physical activity (Koblizek, et al., 2016). COPD exacerbations contribute to overall disease severity and, if left untreated, COPD will progressively deteriorate and result in significant impairment of quality of life and ability to complete activities of daily living. COPD is a preventable and manageable disease by reducing patients' risk factors and implementing appropriate non-pharmacologic and pharmacological therapies.

Problem

Many providers do not use current COPD evidence-based guidelines for diagnosis and management. Failure to use recommended guidelines has resulted in treatment inconsistencies in clinical practice. The primary reasons providers give for not using guidelines include varying COPD terms, time constraints, lack of symptom instruments, and not having guideline knowledge.

Available Knowledge

COPD is an important public health challenge and accounts for significant morbidity and mortality worldwide (Donohue, 2018). While mortality from other chronic illness (e.g., heart disease and cerebrovascular accidents) have declined over the last decade, COPD prevalence and

mortality has steadily risen (Kochanek et al., 2016). COPD is one of the most costly economic and social burdens on healthcare and is associated with increased disability and reduced workforce participation (Iheanacho et al., 2020).

The mean number of annual primary care visits varied according to COPD severity. Subgroups within the Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification are classified by airflow limitation based on spirometry measurements. The mean number of visits/patient/year ranged from 2.33- 12.99 for mild cases to 2.33-13.0 for moderate ones. Patients with severe and very severe COPD reported more visits to their PCS (2.8 - 15.06/yr.). The highest visits reported were among the group of patients with two or more exacerbations per year, regardless of severity classification. This project enabled providers to recognize high-risk patients, controlling symptoms, and preventing exacerbations more effectively.

Diagnosing and managing COPD has been inconsistent in outpatient PCS settings (Ho et al., 2019). Known factors contributing to treatment inconsistencies are variable use of COPD terminology, lack of standard diagnostic measurements, and poor patient assessment (Ho et al., 2019). COPD remains poorly managed until the disease is advanced, resulting in severe pulmonary impairment and the need for a pulmonologist (Koblizek et al., 2016).

Llordes et al. (2015) performed a population-based epidemiological study in the PCS where approximately 24% of the subjects had a documented COPD diagnosis and another 57% had symptoms and spirometry values that were consistent with COPD but did not have a diagnosis. Approximately 9.7% of patients met COPD diagnostic criteria. Of those subjects 81.4% did not have a documented diagnosis. Lamprecht et al. (2015) and Hangaard et al. (2017)

demonstrated that factors contributing to under-diagnosis are related to underuse of spirometry, poor access to spirometry, and lack of expertise in spirometry interpretation.

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) was formed to improve provider management of COPD by compiling all current evidence-based data annually. The GOLD organization is an international organization that "works with health care professionals and public health officials around the world to raise awareness of COPD and to improve prevention and treatment of this lung disease" (GOLD, 2021).

GOLD guidelines standardized global COPD terms, diagnostic criteria, and treatment plans to increase consistency of provider management in outpatient settings. Guidelines are updated annually and incorporate a simple classification system and treatment algorithm based on three key indicators: spirometry values, exacerbation history, and subjective patient symptoms. Adherence to the GOLD recommendations have decreased patient's symptoms, exacerbations, and hospitalizations (GOLD, 2020).

The GOLD committee has changed the way it determines COPD severity and treatment and now considers the patient symptoms and exacerbation frequency as primary determinants of management (Gayle et al., 2018). The refined ABCD assessment tool uses patient symptoms and history of exacerbations to assign letter categories which gives the clinician more precise treatment recommendations(GOLD, 2020).

COPD impacts the patient beyond just dyspnea and requires a formal symptomatic assessment to guide pharmacological and non-pharmacological treatment (GOLD, 2020). To understand the impact of COPD on an individual a symptom assessment, spirometric classification, and risk of exacerbation must be performed. The assessment of patient symptoms should be evaluated regularly for maintenance therapy to improve clinical outcomes through

reduction of inappropriate prescribing and economic burden of exacerbations and potential hospitalizations (Sorge & DeBlieux, 2020).

GOLD endorses two symptom assessment instruments. Only one is needed to complete the Refined ABCD assessment tool. The letter group provides data regarding the disease burden and potential risk of exacerbation to guide pharmacological therapy. The COPD assessment tool (CAT) is a patient completed instrument that quantifies the impact COPD has on patient's health. The CAT is an evidence-based and validated 8-item questionnaire that is used to assess the health status of patients with COPD status (Fakharian et al., 2015). The second instrument is the Modified MRC (mMRC) dyspnea scale that is completed by the patient. This scale quantifies the impact of shortness of breath on the patient's daily activities using a five-point scale. Scores are associated with dyspnea, morbidity, and risk of hospitalization (Meek et al., 2012).

The GOLD guidelines provide a pharmacological algorithm used to decrease burden of symptoms, improve activity tolerance, and prevent exacerbations. First line pharmacological therapy is patient specific and dependent upon their current GOLD classification using spirometry, symptoms, and exacerbation history. Integrating the guidelines will ensure sustainability and ensure the patient is receiving a quality level of care and appropriate treatment interventions, thereby improving symptom management and quality of life (Rubio et al., 2017).

Rationale

The Coordinated Implementation Model (Lomas, 1993) was used to implement the DNP project. The process included synthesizing and appraising current evidence related to GOLD recommendations to identify patient symptoms and appropriately diagnosis and treat COPD by utilizing established tools (White et al., 2016). The next step was to implement recommended tools to measure subjective symptoms, including the CAT and the *Modified Medical Research*

Scale (mMRC). All recommended components from GOLD were used to develop a simple template for provider use and documentation. Potential obstacles that were considered in the practice included: electronic health record (EHR) implementation, time constraints, and affordability. In coordination with key stakeholders, the GOLD template was integrated into the EHR and used during scheduled office visits.

Specific Aim

The purpose of this project was to implement a COPD template to simplify managing and treating patients with COPD by ensuring utilization of major components of GOLD recommendations. This project provides the following benefits, as a standardized COPD template was given to all clinicians to aid their ability to accurately assess and reassess patient's disease severity in the following ways:

- The provider will have increased confidence in the treatment goals and direction because templates incorporate all data required for appropriate treatment with suggested pharmacological options.
- Improved and synchronized workflow for provider assessment and treatment.
- Increased efficiency and time-savings as COPD template provides the GOLD recommendations and treatment options.
- Use of the resultant template data will give the provider an overall risk assessment of the patient to prevent future exacerbations, possibly decreasing patient's office and/or hospital visits.

The collaborative quality improvement (QI) project was created to determine if the use of an evidence-based COPD template could improve provider adherence to and utilization of GOLD recommendations for managing stable COPD patients. The primary outcome measure

was provider adherence to the COPD template, which incorporated all components of GOLD recommendations needed for accurate assessment and treatment interventions (i.e., spirometry values, reported symptoms, exacerbation history, and current pharmacological treatment). PCPs will group disease severity using the GOLD-refined ABCD assessment tool showing the patient's current health status. Using these guidelines in clinical practice has been proven to improve patient symptoms and decrease the risk of exacerbation (Gold, 2020). The COPD template will simplify managing stable COPD patients by matching each grouping category to the appropriate treatment algorithm.

Methods

Context

Data collection occurred at a rural practice in Western North Carolina. The healthcare provider in the practice is a board-certified family nurse practitioner and a supervising physician. The practice is dedicated to providing evidence-based care to effectively manage chronic conditions such as COPD. Providers in the office advocate for quality improvement initiatives to optimize patient outcomes. Often in rural regions, access to specialty care is difficult to obtain and primary care stakeholders recognize the need for a standardized assessment and treatment to efficiently manage chronic disease.

Interventions

A PowerPoint presentation was presented to participating health care providers to review GOLD guidelines, standardized instruments, and the COPD template. The healthcare providers, nurse, and medical assistants (MAs) were educated on the standardized instruments, which were the mMRC, CAT, and the Refined ABCD Assessment Tool. Providers were given a laminated copy of the Assessment Tool with the corresponding treatment algorithms and a common

medication chart for quick reference. The COPD template was developed in accordance with the most current evidence-based practice and GOLD recommendations (see Appendix A).

Patients with the diagnosis of COPD received a paper copy of the COPD-focused health assessment instruments after they were checked in for their appointment. The mMRC instrument consisted of 8 graded questions and a 6-point Likert scale that measured breathlessness, health status, and mortality risk. The CAT instrument consisted of a 5-point Likert scale that provided a quantifiable value for comprehensive assessment of symptoms.

The MAs collected and recorded mMRC and CAT scores on the COPD template during the triage assessment. No identifying information was included on the assessment tools. The provider obtained spirometry results from the medical record and documented the value on the COPD template. The provider used the template to group the patient with the refined ABCD assessment tool using spirometry values, mMRC and CAT scores, and exacerbation history. The refined ABCD instrument specified appropriate treatment options for optimal disease management. The provider then used clinical judgement to determine if the patient was receiving optimal treatment. The provider distributed an information packet with their individualized COPD plan.

Study of the Intervention

The primary outcome was evidence of provider tool usage. The secondary outcome was used to measure an association whether current pharmacologic treatment followed GOLD guidelines and if pharmacological changes were needed. Additional secondary outcomes measured were population demographics.

Measures

GOLD Board of Directors appointed a Science Committee to keep GOLD documents current by evaluating published research and the impact on the management recommendations and by updating the document annually. GOLD guidelines, created by the GOLD Science Committee, is composed of international experts recognized for their COPD research and clinical practice. The committee has internationally distinguished professionals from multiple disciples that review COPD systematic literature and double-blind reviews to develop annual recommendations.

The COPD assessment tool (CAT) is a patient completed instrument that quantifies the impact COPD has on patient's health. The second instrument is the Modified MRC (mMRC) dyspnea scale that is completed by the patient. This scale quantifies the impact of shortness of breath on the patient's daily activities (ADLs) using a 5-point scale. Scores are associated with dyspnea, morbidity, and risk of hospitalization (Meek et al., 2012).

COPD exacerbations are associated with increased hospitalizations, mortality, and morbidity rates. Exacerbations has a strong influence over patient's perceived quality of life. One moderate exacerbation will increase the risk of future hospitalization by 21%, and are related to disease progression and poor management.

Analysis

A quantitative analysis was used for this three-month QI prospective project implementing a COPD template. The primary outcomes were measured with descriptive statistics to evaluate percentage of template usage for scheduled appointment and percentage of all three components documented. Descriptive analysis further evaluated population demographics and the assessment of whether the patient's current pharmacological treatment met GOLD's criteria.

A chi-square test of independence was conducted to examine whether there is a dependence between two nominal or ordinal variables. There were two levels in the variable "template completed" and two levels in gender. All assumptions were met.

A Spearman correlation analysis was conducted among CAT, mMRC, and exacerbation history. Cohen's standard evaluated the relationship strength between the three variables and all assumptions were met.

Ethical Considerations

The Institutional Review Board at Lenoir-Rhyne University approved the study. There were no present or potential risks identified that could be incurred by participating in the study. Informed consent is not required for providers to implement the COPD template in their practice. Participation in the project was voluntary and refusal to participate did not result in any penalty.

Results

The study used a convenience sample of providers at a rural primary care practice. Eligibility required the provider be employed by the project implementation site and perform routine office visits with patients 18 and older. Providers not employed by the primary care office were excluded. The passive secondary population was measured with a convenience sample of 120 established patients that were 18 years and older and diagnosed with COPD. Exclusion criteria were patients outside the age range and patients who did not have a known diagnosis of COPD.

Data was collected from the EHR for office visits from October 2020 to January 2021. The sample included patients ages 40-85, and consisted of 52.5% females (*n*=63) and 47.5% males (*n*=57). The majority of patients were age 50-59 (31%), age 60-69 (33.3%), and age 70-79 (25.8%). Population by race was Caucasian (77.5%), African American (14.2%), and Hispanic

(8.3%). All patients with a diagnosis of COPD that had a visit during the project implementation timeframe had a documented template by the provider. Of the 120 patients seen during the intervention, 70 (58.3%) templates had all three components completed and 50 (41.7%) templates had two components completed (see Table 1).

Table 1.

Provider Adherence and Component Completion

Variable	*n*	*%*
Provider Adherence to Template		
Yes	120	100.00
Missing	0	0.00
Completion of 3 Required Components		
No	50	41.67
Yes	70	58.33
Missing	0	0.00

The patient's current pharmacological treatment was compared to the GOLD guidelines pharmacological recommendations. Patients' current treatment corresponded with the GOLD guidelines 43.3% of the time (*n*=52) or did not 56.7% of the time (*n*=68). Approximately 56.7% of patients met criteria to change their current medication regimen based on symptom assessment and exacerbation history (see Table 2).

Table 2.

Treatment and Medication

Variable	*n*	*%*
Current Treatment meets GOLD		
Yes	52	43.33
No	68	56.67
Missing	0	0.00
Treatment Change Indicated		
No	52	43.33

Yes	68	56.67
Missing	0	0.00

A chi-square analysis was significant at α=0.05. The *p*-value of <.001 indicated a dependence between the two variables. If current pharmacological regimen did not meet GOLD grouping, then it was associated with a medication change. If current treatment met GOLD grouping, then it was associated with no change to pharmacologic regimen (see Table 3).

Table 3.

Chi-Square Results using All Patients

	Treatment Change Indicated				
Current Treatment meets GOLD	No	Yes	χ^2	*df*	*p*
Yes	51[22.53]	1[29.47]	111.99	1	< .001
No	1[29.47]	67[38.53]			

A filter was applied to separate patients with and without documented spirometry. Chi-square was significant at α=0.05 for both groups. The *p*-value of <.001 indicated dependence between the variables (see Table 4).

Table 4.

Chi-Square Results from Patients with and without Spirometry

	Treatment Change Indicated				
Current Treatment meets GOLD (with spirometry)	No	Yes	χ^2	*df*	*p*
Yes	29[12.86]	1[17.14]	62.07	1	< .001
No	1[17.14]	39[22.86]			

	Treatment Change Indicated				
Current Treatment meets GOLD (w/o spirometry)	No	Yes	χ^2	*df*	*p*
Yes	22[9.68]	0[12.32]	50.00	1	< .001

No	0[12.32]	28[15.68]

Results of a Spearman correlation (r_s) were examined based on the alpha value of 0.05. The *p*-value of <.001 indicated a significant positive correlation between CAT and mMRC. The r_s was 0.74, indicating a large effect size. The greater the effect size, the more significant the relationship among variables. A significant positive correlation was also observed between CAT and exacerbation history. The r_s=0.32 indicating a moderate effect size. There was no significant correlation observed between mMRC and exacerbation history (Table 5).

Table 5.

Spearman Correlations for CAT, mMRC, and Exacerbation History

Combination	r_s	95% CI	*p*
CAT + mMRC	0.74	[0.65, 0.81]	< .001
CAT + Exacerbation History	0.32	[0.14, 0.47]	< .001
mMRC + Exacerbation History	0.14	[-0.04, 0.31]	.134

Discussion

Summary

Implementing the COPD template into scheduled primary care office visits provided a way to follow evidence-based guidelines for COPD assessment. GOLD guidelines were used due to their rigorous development that incorporated meta-analyses and Cochrane protocols. The major findings from the intervention verify the usefulness of this quality improvement project and align with its specific aims.

Interpretation

This study was a retrospective chart review conducted through the EHR that included patients with COPD (*n*=120) who had an office visit at a rural primary care office in the

specified three-month project period. This study sought to simplify and update the management of stable COPD by incorporating a COPD template into the primary care practice. The primary outcome measured provider adherence to using the COPD template with patients having a COPD diagnosis. It was found that the provider completed a COPD template for all COPD patients seen at an office visit during the project implementation timeframe.

For optimal management of COPD, the major components of GOLD guidelines (i.e., spirometry values, current symptoms, and exacerbation history) should be evaluated. The COPD template reminded the provider of the three required components for accurate assessment of COPD management. After three months, a review of the EHR was completed to determine if providers ensured that all components were documented. Approximately 42% of patients did not have spirometry records. This missing component should have prompted the provider to order pulmonary function tests. Only 43.33% of the patients' pharmacological treatment met GOLD recommendations. The provider could have made medication changes in the remainder of the population. The disease process of COPD should be evaluated at least annually with up-to-date spirometry, symptom assessment, and exacerbation history to ensure the current medications are appropriate. Based on the progression of COPD, patients may need a drug class change and/or medication escalation or de-escalation.

Assessing population demographics (age, race, and gender) revealed no vulnerable populations with equal risk among all population groups. Groups were affected at approximately the same rate regarding treatment appropriateness and need for medication change. The study shows that COPD assessment with all components were valuable at all ages, regardless of gender or race. This analysis was confirmed using a chi-square test of independence, which indicated the variables were independent of one another.

The correlation coefficient between the CAT and mMRC was high, indicating a large effect size. This indicated that as CAT scores increased, the mMRC score also increased. The correlation coefficient between CAT and exacerbation history was 0.32, showing a moderate correlation and effect size. Therefore, as CAT scores increased, the number of exacerbations in a patient's history tended to increase.

These results indicated the CAT assessment has a higher correlation with exacerbation history, and may be superior to the mMRC to assess symptoms. The literature does not specify which tool is better. However, this study showed the CAT likely provided a more comprehensive overview of symptoms that correlate with COPD exacerbations and suggests the need for more studies to determine if CAT should always be used instead of the mMRC.

Limitations

Despite the success of the COPD template, the intervention has limitations. Only one provider from a rural privately owned practice participated in the QI project, thereby reducing its generalizability to large hospital-affiliated practices in rural and urban areas. Also, provider adherence to the template may diminish over time.

Covariates that may reduce pharmacological treatment alignment with GOLD guidelines were not examined such as inaccessibility to inhalers due to financial hardship or patient noncompliance. Another limitation was that 42% of patients did not have documented spirometry values. The study did not examine what alterations of patients' pharmacological treatments should be made, nor did it consider the effectiveness of treatment changes over time using a follow-up symptom assessment instrument.

Conclusions

This QI project provided valuable data that has implications for practice improvement and future research. GOLD guidelines indicate implementation of evidence-based assessments will assist providers to ensure appropriate pharmacological interventions for this patient population. The simple design of the COPD template is a sustainable intervention to maintain. The template is an objective method for providers to document and track the patient's disease status and exacerbation risk. The template will also show objective data about disease state and progression over time, as an increase of CAT or exacerbations indicate that the pharmacological treatment requires adjustment.

Implications for Practice

Two major findings of this quality improvement project are that the COPD template has a simple design that is time efficient and helps ensure therapeutic regimens are evidence-based. The project results indicate the importance of symptom assessment and exacerbation history. Following the scores of either the CAT or the mMRC, along with exacerbation history would be an objective way to evaluate the status of a patient with COPD. The principal investigator and key provider found the CAT tool correlated more closely with exacerbation history than the mMRC tool. The project findings suggested the CAT better aligns with clinical symptoms, as well as risk for disease progression and/or exacerbation. An increase of two units in the CAT over several months can indicate a reduction in overall health status. Future studies, however, are needed to determine if use of CAT alone can be justified.

Spirometry has reliable sensitivity, but is not reliable for disease management due to its weak specificity. The study found that spirometry did not predict whether a patient's pharmacological regimen was aligned with GOLD guidelines. Further, spirometry values alone did not aid clinicians in determining whether a patient's current treatment met GOLD

recommendations or if medication changes were indicated. Spirometry could not predict the impact of COPD on either a patient's pulmonary symptoms or overall health.

Implications for Treatment

The PCP can provide disease assessment and screening that closely align with specialty care by streamlining the GOLD method for treatment and management. The CAT instrument can be used without the mMRC and still allow providers to follow GOLD recommendations using a simplified assessment. This has clear implications for providing services in rural locations. Screening can lead to better management and create effective treatment plans as well. Treatment in the primary care setting can be greatly enhanced if care is guided by evidence-based practices.

References

Donohue, J. F. (2018). Preventing acute exacerbations through novel insights in the treatment strategies for COPD. *Journal of Managed Care Medicine, 21*(1), 69–73.

Fakharian, A., Talischi, F., & Tafti, S.F. (2015). Evaluation of validity and reliability of CAT questionnaire among COPD patients attending Masih Daneshvari Hospital. *European Respiratory Society, 46*(suppl 59). doi:10.1183/13993003.congress-2015.

Gayle, A., Dickinson, S., Morris, K., Poole, C., Mathioudakis, A.G., & Vestbo, J. (2018). What is the impact of GOLD 2017 recommendations in primary care? A descriptive study of patient classifications, treatment burden and costs. *International Journal of COPD, 13*, 3485–3492. doi:10.2147/COPD.S173664

Global Initiative for Chronic Obstructive Lung Disease (GOLD) (2020). *Global Strategy for the Diagnosis, Management, and Prevention for Chronic Obstructive Pulmonary Disease.* https://goldcopd.org/wp-content/uploads/2019/11/GOLD-2020-REPORT-ver1.0wms.pdf

Hangaard, S., Helle, T., Nielsen, C., & Hejlesen, O. K. (2017). Causes of misdiagnosis of chronic obstructive pulmonary disease: A systematic scoping review. *Respiratory Medicine, 129*, 63–84. doi:10.1016/j.rmed.2017.05.015

Han, M. K., Hanania, N. A., & Martinez, F. J., (2018). Confronting the challenge of COPD. What is new in the approaches to diagnosis, treatment, and patient outcomes. *Chest, 4*(154), 984–985. doi:10.1016/j.chest.2018.08.1024.

Ho, T., Cusack, R. P., Chaudhary, N., Satia, I., & Kurmi, O. P. (2019). Under- and over-diagnosis of COPD: A global perspective. *Breathe (Sheffield, England), 15*(1), 24–35. doi:10.1183/20734735.0346-2018

Iheanacho, I., Zhang, S., King, D., Rizzo, M., & Ismaila, A. S. (2020). Economic burden of Chronic Obstructive Pulmonary Disease (COPD): A systematic literature review. *International Journal of Chronic and Obstructive Pulmonary Diseases*.*15*, 439–460. doi:10.2147/COPD.S234942

Koblizek, V., Novotna, B., Zbozinkova, Z., & Hejduk, K. (2016). Diagnosing COPD: Advances in training and practice—a systemic review. *Advances in Medical Education and Practice, 7*, 219–231. doi:10.2147/AMEP.S76976

Lomas, J. (1993). Retailing research: Increasing the role of evidence in clinical services for childbirth. *The Milbank Quarterly*, *71*, 439–475.

Lamprecht, B., Soriano, J. B., Studnicka, M., Kaiser, B., Vanfleteren, L. E., Gnatiuc, L, Burney. P., Miravitlles, M., García-Rio, F., Akbari, K., Ancochea, J., Menezes, A. M., Perez-Padilla, R., Montes de Oca, M., Torres-Duque, C. A., Caballero, A., González-García, M., Buist, S., BOLD Collaborative Research Group, the EPI-SCAN Team, the PLATINO Team, the PREPOCOL Study Group (2015). Determinants of underdiagnosis COPD in national and international surveys. *Chest*, *148*(4), 971–985. doi:10.1378/chest.14-2535

Llordes, M., Jaen, A., Almagro, P., Heredia, J. L., Morera, J., Soriano, J. B., Miravitlles, M. (2015). Prevalence, risk factors, and diagnostic accuracy of copd among smokers in primary care. *COPD*, *12*(4), 404–412. doi:10.3109/15412555.2014.974736

Meek, P. M., Banzett, R., Parshall, M. B., Gracely, R. H., Schwartzstein, R. M., & Lansing, R. (2012). Reliability and validity of multidimensional dyspnea profile. *Chest*, *141*(6), 1546–1553. doi:10.1378/chest.11-1087

O'Dell, A., Diegel-Vacek, L., Burt, L., & Corbridge, S. (2018). Managing stable COPD: An evidence based approach. *American Journal of Nursing, 9*(118), 36–47. doi:10.1097/01.NAJ.0000544950.73334.58

Rubio, M. C., Lopez-Campos, J. L., Soler-Cataluna, J. J., Navarrete, B. A., Soriano, J. B., Gonzalez-Moro, J. M., Ferrer, M. E., & Hermosa, J. L. (2017). Variability in adherence to clinical practice guidelines and recommendations in COPD outpatients: a multi-level, cross-sectional analysis of the EPOCONSUL study. *Respiratory Research, 18*(200), 1–14. doi:10.1186/s12931-017-0685-8

Sorge, R. & DeBlieux, P. (2020). Acute exacerbations of chronic obstructive pulmonary disease: A primer for emergency physicians. *The Journal of Emergency Medicine, 59*(5), 643-659. https://doi.org/10.1016/j.jemermed.2020.07.001

Van, D. W., Tan, W., Li, P., Guo, B., Li, S., Benedetti, A., & Bourbeau, J. (2015). Clinical relevance of fixed ration vs lower limit of normal of FEV1/FVC in COPD: Patient-reported outcomes from the CanCOLD cohort. *Family Medicine, 13*(1):41–8. doi:10.1370/afm.1714

Walters, J. A., Walters, E. H., Nelson, M., Robinson, A., Scott, J., Turner, P., Wood-Baker, R. (2011). Factors associated with misdiagnosis of copd in primary care. *Primary Care Respiratory, 20*(4), 396–402. doi:10.4104/pcrj.2011.00039.

White, K. M., Dudley-Brown, S., & Terhaar, M. F. (2016). *Translation of evidence into nursing and health care.* (2nd ed.). New York: Springer.

Appendix A

COPD Template

Initials _____ Date_____

Spirometry Value **FEV_1/FVC** ****< 0.7 confirms presence of persistent airflow limitation**	**Circle for quick reference:** $FEV_1 \geq 80\%$ Stage 1: Mild FEV_1/FVC=_____ FEV_1: 50-79% Stage 2: Moderate FEV_1 =_____ FEV_1: 30-49% Stage 3: Severe FEV_1: <30% Stage 4: Very Severe
mMRC Score	0-1 or ≥2
CAT Score	<10 or ≥10
Exacerbations	0-1 (NO hospitalization required) ≥ 1 (Required hospitalization)
GOLD Category <u>TODAY</u> (A-D)	A B C D
Current Treatment (what pt is currently on)	ICS, LABA, ICS/LABA, LAMA
Changes Needed Today?	Yes No Add Med D/C'd Med No Changes
Medication Changes Today (meds added or d/c'd today)	LABA, ICS/LABA, LAMA

Appendix B

The mMRC

Figure 6. The Modified Medical Research Council Dyspnea Scale

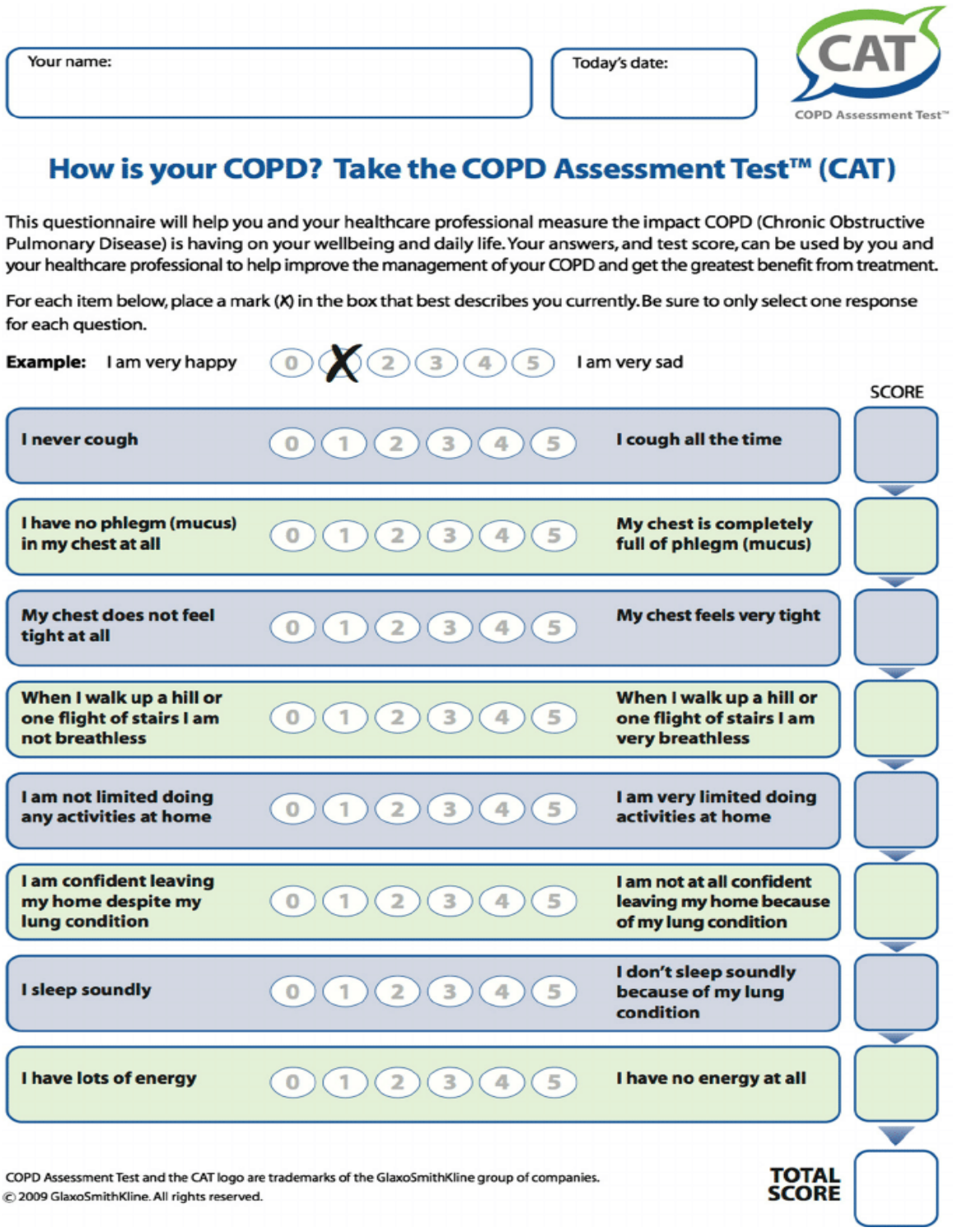
mMRC Breathlessness Scale

Grade	Description of Breathlessness
0	I only get breathless with strenuous exercise
1	I get short of breath when hurrying on level ground or walking up a slight hill
2	On level ground, I walk slower than people of the same age because of breathlessness, or have to stop for breath when walking at my own pace
3	I stop for breath after walking about 100 yards or after a few minutes on level ground
4	I am too breathless to leave the house or I am breathless when dressing

Chris Stenton. The MRC breathlessness scale. Occup Med (Lond)(2008)58(3): 226-227 doi:10.1093/occmed/kqm162, Table 1.
By permission of Oxford University Press on behalf of the Society of Occupational Medicine.
A mMRC score of 1 or more suggests significant symptoms.

mMRC=modified Medical Research Council

Appendix C
The CAT



Your name:

Today's date:

CAT
COPD Assessment Test™

How is your COPD? Take the COPD Assessment Test™ (CAT)

This questionnaire will help you and your healthcare professional measure the impact COPD (Chronic Obstructive Pulmonary Disease) is having on your wellbeing and daily life. Your answers, and test score, can be used by you and your healthcare professional to help improve the management of your COPD and get the greatest benefit from treatment.

For each item below, place a mark (X) in the box that best describes you currently. Be sure to only select one response for each question.

Example: I am very happy 0 X 2 3 4 5 I am very sad

			SCORE
I never cough	0 1 2 3 4 5	I cough all the time	
I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5	My chest is completely full of phlegm (mucus)	
My chest does not feel tight at all	0 1 2 3 4 5	My chest feels very tight	
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	When I walk up a hill or one flight of stairs I am very breathless	
I am not limited doing any activities at home	0 1 2 3 4 5	I am very limited doing activities at home	
I am confident leaving my home despite my lung condition	0 1 2 3 4 5	I am not at all confident leaving my home because of my lung condition	
I sleep soundly	0 1 2 3 4 5	I don't sleep soundly because of my lung condition	
I have lots of energy	0 1 2 3 4 5	I have no energy at all	
		TOTAL SCORE	