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Baseline of COPD Management in a Norton Healthcare Primary Care Clinic

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The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Assistant Dean for MSN and DNP Studies, on behalf of the program; we verify that this is the final, approved version of the student's DNP Project including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Angela Goldring, Student

Dr. Elizabeth Tovar, Advisor

Final DNP Project Report

Baseline of COPD Management in a Norton Healthcare Primary Care Clinic

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Fall 2016

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Dedication

This Practice Improvement Project is dedicated to my future patients with COPD. My commitment to this study positions me as an expert on the evidence-based guideline recommendations, which will enable me to deliver the best possible care to those patients in need of excellent COPD management. My hope is that this study will lead to future studies, as well as practice change, and improved outcomes of the COPD patients of Norton Healthcare and perhaps beyond.

Acknowledgements

I would like to thank my advisor, Dr. Elizabeth Tovar, of the University of Kentucky (UK). Her brilliant guidance and support gave me the confidence and the sense of security I needed to complete this project. Additionally, I would like to express gratitude for the time, expertise, and knowledge shared by Dr. Michelle Pendleton and Dr. Shirl Johnson of Norton Healthcare. They were of great assistance in adding value to the content of my project. I would also like to acknowledge Dr. Amanda Wiggins of UK, who was one of my statistics professors, as well as an advisor to the statistical portions of this project.

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a leading cause of death in the United States (U.S), with rates in Kentucky among the highest in the nation. Quality care in the primary care setting is key to optimizing the health outcomes of those with COPD.

Purpose: The objective of this study was to establish a baseline of COPD patient care in a primary care clinic. The specific aims of this study were to: 1) describe the demographic and health-related characteristics of patients with COPD who have a primary care provider (PCP) at one Norton Healthcare primary care clinic; 2) explore relationships among key variables; and, 3) evaluate provider adherence to COPD evidence-based practice (EBP) guidelines.

Methods: The study was conducted as a retrospective chart review, including a sample of patients (*N*=215) from the clinic between January 1, 2015 and December 31, 2015.

Results: Tobacco smokers have more exacerbations than former and never smokers; those with a heart failure (HF) comorbidity were more likely to have had a COPD exacerbation, and were more likely to be hospitalized with a COPD exacerbation; and, those with a diabetes mellitus (DM) comorbidity were also more likely to be hospitalized with a COPD exacerbation. The studied clinic did not meet national benchmarks for bronchodilator therapy, timely PCP follow-up after hospital discharge, or readmission rates.

Conclusion: The results of this study indicate a need for a practice improvement intervention involving program implementation to reduce hospitalizations. Specific aims of the program include: 1) spirometry evaluation in the clinic for objective diagnosis and staging of COPD; 2) optimizing the electronic medical record (EMR) with the addition of COPD templates; and, 3) creating a process for timely follow-up after hospital discharge, particularly for patients with HF or DM.

Baseline of COPD Management in a Norton Healthcare Primary Care Clinic

Background

Chronic Obstructive Pulmonary Disease (COPD) is a leading cause of death in the United States. Death rates for stroke and heart disease have significantly declined over the last 10-20 years, while death rates for COPD have steadily increased (Kochanek, Murphy, Xu, & Tejada-Vera, 2016). United States healthcare costs attributed to COPD in 2010 were $32.1 billion, and are projected to be $49 billion by year 2020 (Centers for Disease Control and Prevention [CDC], 2014). The National 2010 healthcare costs associated with COPD were paid mostly by state federal and state funds (51% by Medicare, 25% by Medicaid), with only 18% by private insurance (CDC, 2014).

Kentucky is among the states with the highest rates of COPD in the nation, with a near 15% rate in those over age 55 (National Institutes of Health, National Heart, Lung, and Blood Institute [NHLBI], 2012). The rate of readmission within 30 days for COPD is between 16.3% - 28% nationally, with Louisville, Kentucky among those with the highest rates from July 2012 – June 2013 (Centers for Medicare and Medicaid Services [CMS], 2014).

The Triple Aim Initiative of the Institute for Healthcare Improvement ([IHI], 2016) includes: 1) the improvement of patient care experience; 2) the improvement of population health outcomes; and, 3) the reduction of healthcare costs. Targeting improvements in the medical management of COPD can specifically address all three components of the Triple Aim. A CMS prevention quality indicator (PQI) points to COPD as a disease (along with asthma) that can be controlled in an outpatient setting, with the claim that high-quality outpatient care reduces preventable hospital admissions (CMS, 2016). Hospital admission and readmission rates above national average would suggest a need for improvement in the outpatient management of COPD.

Practice Guideline Overview

The leading evidence-based COPD clinical practice guideline is the Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease (Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2015). Goals for treatment in the management of stable COPD are to reduce symptoms of COPD and reduce the risk of COPD exacerbation. The presence of certain disease comorbidities change the risk for COPD events and have a negative impact on disease prognosis and health outcomes, and are therefore given consideration in the guidelines (GOLD, 2015).

To make a clinical diagnosis of COPD, the guideline clearly states that spirometry is required, with a resulting post-bronchodilator forced expiratory volume/forced vital capacity ratio (FEV_1/FVC) less than 70% (<0.70). Treatment recommendations are based on severity of COPD and impact on patient health status, including risk for exacerbations, hospitalization, or death. The GOLD combined assessment of COPD categorizes people A through D, according to subjective and objective assessment results, with groups C and D being high risk for exacerbation and poor health outcomes. Subjective assessment is measured by scores on an evidence-based survey, objective assessment is based on spirometry findings, and the final category regards exacerbations per year (≤ 1 or ≥ 2), which is the only measure of assessment applicable to this study.

Pharmacologic treatment recommendations are based on the group in which the patient is categorized. Table 1 lists the first line long-term pharmacologic recommendations, which are based on severity of disease or rather, whether patient fits into patient group A, B, C, or D. The types of medications listed in the table include: short-acting anticholinergic (SAA), short-acting $beta_2$-agonist (SABA), long-acting anticholinergic (LAA), long-acting $beta_2$-agonist (LABA),

and inhaled corticosteroid (ICS). In the event of an exacerbation, the goal is to minimize exacerbation impact and prevent subsequent exacerbations. Treatment preference for exacerbation includes SABAs with or without SAAs, with systemic corticosteroids and antibiotics often being indicated, depending on symptom severity (GOLD, 2015). There is substantial evidence to support primary care management of COPD per GOLD (2015) recommendations, however, there is little research specific to patient outcomes related to implementation of GOLD recommendations in the primary care setting.

Purpose

The purpose of this study was to establish a baseline of COPD patient care in a primary care clinic to inform quality improvement initiatives to reduce preventable hospitalizations for COPD. The specific aims were to:

1. Describe demographic and health-related characteristics of all specified patients of the Norton primary care clinic with COPD during January 1, 2015 through December 31, 2015.
2. Explore relationships among key variables (eg. comorbidities and COPD exacerbations).
3. Evaluate provider adherence to GOLD (2015) guideline recommendations.

Methods

Setting and Sample

The application to perform this retrospective chart review was approved by the Institutional Review Board (IRB) of the University of Kentucky and the Norton Healthcare Office of Research Administration (NHORA). The setting for this study was a primary care clinic of Norton Healthcare, located in Louisville, Kentucky. Subjects of the study included the entire population of patients (*N*=215) who met study inclusion criteria between January 1, 2015 and December 31, 2015.

Inclusion criteria consisted of the following: age 40 or older; had an outpatient visit (addressing COPD) to the clinic between January 1, 2015 and December 31, 2015; and, had a PCP at the clinic. Diagnostic codes included were: International Classification of Disease Ninth Edition (ICD-9), 490, 491, 492, 494, 496; ICD Tenth Edition (ICD-10) J44.0, J44.1, J44.9; and, Medicare Severity Diagnostic Related Groups (MS-DRGs) 190, 191, 192, 202, or 203. Exclusion criteria included: under 40 years of age; without an outpatient visit addressing COPD diagnosis or symptom management between January 1, 2015 and December 31, 2015; became patient of the clinic after January 1, 2015; employee of the Fincastle clinic; and/or, personal acquaintance or associate of the principal investigator (PI).

Data Collection

Norton Health Information Management (HIM) personnel provided a report based on study inclusion criteria. An electronic crosswalk table data collection tool was assembled to simplify the data collection process. The variables for data collection are within the results section and tables within the Appendix of this manuscript. All data was collected through Epic (Epic Hyperspace, Released 2015), the electronic medical record (EMR) platform used by

Norton Healthcare. The data was entered into the data collection tool, with all data analyzed through the IBM SPSS program (SPSS Version 22, Released 2013).

Statistical Analysis

Descriptive statistical analysis was used to summarize the data within IBM SPSS (SPSS Version 22, Released 2013). Non-parametric statistical analyses were used to evaluate relationships and establish correlations between variables. Bivariate analyses were used to evaluate relationships between two variables. Chi-square test for independence was used to discover relationships between two nominal or categorical variables. The Mann-Whitney U tested for group differences between nominal and ordinal variables, including mean rank and median comparisons. Spearman's Rank Order Correlation (Spearman's rho) tested for correlation between two ordinal variables. Statistical significance was determined by a *p* value less than or equal to 0.05 ($p=\leq 0.05$). If significant, the effect size was defined as small ($r=0.10$ to 0.29), medium ($r=0.30$ to 0.49), or large ($r=0.50$ to 1.0) based on the widely accepted Cohen (1988) guidelines outlined in the SPSS text (Pallant, 2013).

Results

The study sample included 215 patients aged 41 to 94 years, with a median age of 65. Tables 2, 3, 4, and 5 demonstrate the detailed results from the study. In summary, most patients were white (66%) or black (34%), and the gender studied was mostly female (67%) versus male (33%). Most of the patients in this sample were current smokers (52%) or former smokers (43%). The four categories for insurance type were Medicare (65%), Medicaid (24%), commercial or private (10%), and other or no insurance (1%). Figure 1 illustrates that the payer distribution for this study is consistent with the 2010 national data reported by the CDC (2014). Table 6 demonstrates the findings that insurance type was not correlated with COPD

hospitalizations or readmissions. Commercial or private insurance was not presented in this table due to an inadequate sample size for testing.

Exacerbations

There were 45 (21%) people in the study (N=215) who had at least one exacerbation, and 20 (9%) with two or more over the 12-month study period. Additional exacerbation data is displayed in Table 2. Spearman's rho identified a statistically significant (p=0.037) relationship when testing for correlation between smoking status and number of COPD exacerbations. There is a positive correlation of small effect size (r=0.142), indicating that current smokers have more exacerbations than the former and never smokers. The only comorbidity that correlated with COPD exacerbation was HF, which will be discussed further in the comorbidities subsection.

Primary Care Provider and Emergency Department Visits

Data regarding visits to the clinic PCP, Norton emergency department (ED), and Norton hospitals is displayed in table 2. Most people (56%) had four or more PCP visits over the 12-month period. Very few people had ED visits for COPD (<5%), however, the study was limited to Norton ED visits only, and there are several other ED options within proximity to Norton ED locations. About 27% of patients had ED visits for reasons other than COPD, however, the specific reasons were not part of the study. No statistically significant relationships could be found between number of PCP visits, ED visits or hospitalizations. Table 7 displays the variables, p value, and the testing method compelling this conclusion.

Pharmacotherapy

Data was collected by type of medication and whether it was used for long-term disease management, versus only used in times of exacerbation. The data collected on long-term pharmacotherapy is reported in frequency and rate in table 2. Those with two or more (≥ 2)

exacerbations per year are considered high-risk per GOLD (2015) measures, which places 20 (9%) patients from the study group (*N*=215) into patient Group C or D (see table 1 for grouping). The recommended long-term medication options for Group C and D patients include: LAA only, or ICS plus (+) LABA, or ICS + LABA + LAA. Figure 2 displays the medication combinations used for the high-risk patients (*n*=20), and identifies an 85% compliance rate with recommended long-term pharmacotherapy based on disease severity category.

Physician Quality Reporting System (PQRS) Performance Measure #52 is regarding bronchodilator therapy for all patients with COPD (CMS, 2016). The 2014 benchmark for bronchodilator therapy was reported at 92%. This performance measure for bronchodilator therapy aligns with GOLD recommendations. This study found an 83% rate of long-term bronchodilator therapy among the sample.

Standards of care for exacerbation treatment includes adding or increasing SABA and SAA inhaled medications, and adding systemic antibiotic and/or systemic corticosteroid in some cases, when appropriate. This study included antibiotic and corticosteroid administration as variables for collection regarding exacerbation. Medication use across the entire sample (*N*=215) is displayed in Table 2, and medications for exacerbation are in Table 8. There were 45 people (*n*=45) who had at least one exacerbation among the population (see data in table 2). Due to data extraction difficulty, the addition of or increase in SABA and SAA medications as well as indications for use of steroid and antibiotic medications were not study variables. Therefore, the table 8 shows whether the patient with an exacerbation had SABA and/or SAA as long-term medications, and whether systemic antibiotic and/or corticosteroid were additional exacerbation treatments. All but two people (4%) in the group (*n*=45) were treated with one of the four recommended medication combinations, thus, a 96% compliance rate with recommendations for

exacerbation treatment was found. Most patients were treated with inhaled medication (SABA and/or SAA) and both systemic antibiotic and systemic steroid therapy (56%).

Comorbid Conditions

There were nine comorbid conditions tracked, with a median number of two comorbidities per patient (*N*=215). The comorbidities tracked in the study include: anxiety and/or depression; atrial fibrillation (Afib); cognitive impairment; diabetes mellitus (DM); gastroesophageal reflux disease (GERD); heart failure (HF); hypertension (HTN); lung cancer; and, osteoporosis. Comorbidity frequencies and rates are displayed in table 2. The occurrence rate of the top five occurring comorbidities is illustrated in figure 3, while figure 4 illustrates the number of comorbidities present in each study subject.

Number of COPD exacerbations and presence of HF comorbidity were found to be related. A Mann-Whiney U test revealed (U=2206.500, z=-3.412, p=0.001, r=-0.233) a statistically significant difference of small effect size, in the number of exacerbations in those who had HF (n=33). Therefore, those with HF (mean rank=132.14) were slightly more likely to have had a COPD exacerbation than those studied (N=215) who did not have HF (mean rank=103.62).

A Mann-Whitney U test revealed (U=1144, z=-3.142, p=0.002, r=-0.214) a statistically significant difference of small effect size, in the number of comorbidities in those who had a hospitalization for COPD (n=20, median=3 comorbidities) and those who did not have a hospitalization for COPD (n=195, median=2 comorbidities). These findings indicate that the more comorbidities a person has, the more likely they are to be hospitalized with a COPD exacerbation.

When examining each comorbidity in a Chi-square test for independence, HF and DM were the comorbidities found to relate to hospitalization for COPD exacerbation. Those with DM (n=68) were found to have a statistically significant (p=0.002) relationship of small to medium effect size (r=0.230). Those with HF (n=20) were found to have a statistically significant (p=0.000) relationship of medium effect size (r=0.308). Therefore, those with HF or DM were more likely to have a hospitalization for COPD exacerbation than those without HF or DM. No other comorbidities showed statistically significant relationships with hospitalizations, however, some did not meet minimal sample size requirement for n.

Evidence points to association between anxiety and/or depression, and poor COPD prognosis; with both anxiety and depression associating with younger age, female gender, smoking, and lower FEV_1 (GOLD, 2015). This study was not able to correlate the comorbidity of anxiety and/or depression with female gender (p=0.271), smoking status (p=0.223), hospitalizations for COPD (p=0.058), or other hospitalizations (p=0.394). Presence of anxiety and/or depression was found to correlate with younger age (p=0.00), with the median age range of 51-60 in patients with this comorbidity (n=97).

Summary of Hospital Admissions

Rather than evaluating hospitalizations only in terms of patients hospitalized (n=20), each hospitalization (n=39) was also evaluated separately. As displayed in table 2, hospitalizations were divided into two groups: hospitalization with COPD exacerbation; and, hospitalization for anything other than COPD exacerbation. Both types of hospitalizations were subdivided into four groups per number of hospitalizations: zero; one; two; three; and, four (the maximum occurring number). For COPD exacerbation, there was a total of 39 hospital visits distributed among 20 patients in the study group. Table 3 reports frequencies and rates of the six variables

unique to hospitalizations with COPD exacerbation diagnoses (*n*=39): length of stay (LOS), discharge disposition, follow-up PCP appointment in place at time of discharge (PCP appointment at discharge), time from discharge to follow-up appointment (time to appointment), time from discharge to follow-up visit (time to actual PCP visit), and readmitted within 30 days of discharge for COPD (COPD readmission).

The median LOS was four days, with 87% of the group (*n*=39) having an LOS of seven days or less. Discharge to home was the median and mode (69%) discharge disposition. Most patients (67%) had an appointment with their PCP in place at time of discharge. However, there is no indication in Epic when this appointment was made, thus, the appointment could have been made without regard to hospitalization at the last PCP visit. This might explain why in 22 cases (54%), the appointment was scheduled greater than 14 days following hospital discharge. In 44% of cases, patients had an actual PCP visit within 14 days; while 56% either had a visit greater than 14 days from discharge, were readmitted to the hospital (28%) for COPD, or were readmitted for something else (3%). Readmission for COPD exacerbation occurred 11 times (28%) among seven patients. Among the patients hospitalized for COPD (*n*=20), seven (35%) were readmitted at least one time for COPD. Readmission for reasons other than COPD occurred one time (3%). It is unclear whether an intervention occurred to schedule PCP appointments prior to hospital discharge. The variation in time from scheduled appointment and actual visit might be explained by a care management or nurse navigator intervention (e.g. a post-discharge phone call) to move the appointment time closer to the discharge date.

Among the hospitalizations (*n*=39), there were 11 readmissions (*n*=11) for COPD distributed among seven total patients. Table 4 displays the basic demographic variables and results for only the patients who had a COPD readmission (*n*=7). Additionally, the data specific

to hospitalization for those patients is best viewed in a table comparing the initial hospitalization with the subsequent readmissions, as in table 5. With such a small sample size of people who were readmitted (*n*=7), it is difficult to determine relationships, therefore, the data is reported in frequencies. Findings of interest include: in hospitalized patients (*n*=20) the median number of exacerbations in hospitalized patients was two, whereas in readmitted patients (*n*=7) the median was three; and, the median number of comorbidities in hospitalized patients was three, whereas in readmitted patients the median was four. Another interesting finding was that there was little difference between time to follow up visit between the two groups of hospitalizations. The median time from discharge to PCP follow-up in all COPD hospitalizations (*n*=39) was >14 days, and for the readmissions (*n*=11), it was 11-14 days. Readmitted patients having a higher number of comorbidities indicates they could be more ill and at higher risk for exacerbation than those who were not readmitted. The minimal difference in time to follow-up indicates there might have been an intervention, but there is room to improve in the higher risk patients.

Comparison of Data

One study concludes that highest risk patients should follow-up within seven days from hospital discharge (Jackson et al., 2015); however, other study recommendations vary according to risk and diagnosis. Timeliness is not specifically defined as a national best practice recommendation, therefore, this study focused on 14 days or less for comparison with reported data. Hospital compare (CMS, 2016) reports 2012 – 2015 readmission rates for both Norton Healthcare and the nation of 20%. The hospitalizations in this study group (*n*=39) had a readmission rate of 28%, indicating a performance worse than national and Norton averages.

Follow-up rates within 14 days of hospital discharge are compared in figure 5. Comparisons are of the hospitalizations of this study group (*n*=39), with reported national and

Norton Healthcare averages for HF (The Dartmouth Institute for Health Policy and Clinical Practice [DAHC], 2016). No data could be found on COPD specifically for this measure, thus, HF was used for comparison. Figure 5 shows that COPD patients of the study have lower rates of PCP follow-up within 14 days of discharge than Norton Healthcare and the nation (for HF hospital discharges), indicating performance below the national standard.

All identifiable significant relationships among variables were summarized in this results section. There were 39 hospitalizations distributed among 20 patients, and there were 11 readmissions for COPD, distributed among seven patients. When testing for relationships between COPD hospitalization variables and others, specific patients with a COPD hospitalization were compared (n=20), thus making for a smaller sample for comparison. Variables were often manipulated and recoded from ordinal variables into bivariate nominal variables to enable various testing methods. The variables of interest in which there were no identifiable relationships are reported in Table 9, along with p-values and testing methods. Listed variables in table 9 are as follows: smoker (yes or no), smoking status (current, former, or never), any hospitalization (ordinal range), any hospitalization status (yes or no), COPD hospitalization (ordinal range), COPD hospitalization status (yes or no), readmission (yes or no), number of comorbidities (ordinal range) number of PCP visits (ordinal range), ED for COPD (ordinal range), ED for other than COPD (ordinal range), number of comorbidities (ordinal range), PCP appointment at discharge (yes/no), follow-up visit within 14 days of discharge (yes or no).

Discussion

An exhaustive literature review of published studies has determined that this is the first time an attempt has been made to establish a baseline of primary care management of COPD in the U.S. per the updated GOLD (2015) guideline recommendations. This study was a retrospective chart review conducted through the Epic EMR that included patients with COPD (*N*=215) who had a visit within the 12 months of 2015 to the Norton Healthcare primary care clinic studied. This study aimed to describe the characteristics of those studied, explore relationships among key variables, and evaluate provider adherence to GOLD (2015) guideline recommendations.

The first aim of this study was met by providing a description of the sample demographics and health characteristics of the COPD patients in the Louisville, Kentucky primary care clinic (*N*=215). The sample was majority white (65%), female (67%), current smokers (52%), with a median age of 65. The payer distribution was divided among Medicare, Medicaid, and commercial payers at a rate consistent with national rates. Resulting frequencies and rates of data regarding demographic variables, exacerbations, outpatient and inpatient visits, COPD pharmacotherapy, and comorbid conditions is displayed in table 2.

The significant relationships found were related to risk for exacerbation and hospitalization. Statistically significant relationships regarding exacerbations included: current smokers have more exacerbations than former and never smokers; those with HF tend to have more COPD exacerbations than those without HF; those hospitalized with COPD exacerbation tend to have more comorbidities than those who were not hospitalized; and, those with HF or DM comorbidities are more likely to be hospitalized with COPD exacerbation. These findings are not surprising, as it is widely accepted as fact that tobacco smoking is a risk factor for COPD

and continued smoking in presence of COPD leads to more complicated and rapid disease progression (GOLD, 2015). Studies have also established a connection between HF and COPD exacerbations and hospitalizations, and indicate that it can be difficult to separate cause of exacerbation with concomitance of HF and COPD due to both being diseases of exacerbation and remission (Iversen et al., 2008).

With the connection between cardiovascular disease and lung disease, and DM and cardiovascular disease (Mannino, Thorn, Swenson, & Holguin, 2008;) (GOLD, 2015), it is also not surprising that a DM comorbidity is associated with higher risk of hospitalization for COPD exacerbation. This study finding a relationship between a higher number of comorbidities and a higher incidence of COPD hospitalization correlates with the previously established evidence (GOLD, 2015).

Another aim of this study was to determine the degree to which the clinic adhered to GOLD 2015 guidelines. Due to study design, the data collected, and the 2015 structure of the Epic EMR, a complete assessment of guideline adherence could not be performed. Key GOLD (2015) recommendations include: diagnostic spirometry evaluation; pharmacologic treatment based on severity of disease (determined by spirometry results and symptoms); recommended treatment of COPD exacerbations include adding/increasing inhaled SABA and/or SAA, and adding systemic antibiotic and/or corticosteroid when appropriate; and, treating comorbidities per the practice guidelines for those comorbidities. Without data collected on evaluation procedures on all tracked comorbidities, it cannot be determined whether comorbidities were treated in accordance with guideline recommendations.

Diagnostic spirometry data was a variable for collection until it was determined that spirometry was not done or was not reliably reported in the EMR. The capability for spirometry

use as an objective diagnostic tool was not present on site, and there was no standard location for spirometry documentation in the EMR. The patient burden required an off-site visit at a separately scheduled time. Burden on clinic providers/staff included ordering and submitting referrals, obtaining records, and provider review/follow-up. These factors are highly likely to have influenced spirometry evaluation for this population and can easily explain a lack of spirometry for diagnosis. It is also likely that diagnosis of COPD was based on patient-reported historical diagnosis and clinical presentation, rather than the diagnostic and staging criteria defined by the GOLD 2015 guidelines.

The lack of variables to assess exacerbation further inhibited the ability to evaluate whether recommendations for exacerbation pharmacotherapy were followed. However, GOLD (2015) and CMS (2016) recommend long-term bronchodilator therapy at stages of disease, with 2014 national benchmark of 92% compliance. The study finding an 83% rate of compliance with this recommendation indicates room for improvement. Another method used to determine medication compliance was the pharmacologic treatment used in patients who had a COPD exacerbation (n=45). The evaluation indicated that most patients (96%) were treated with GOLD recommended therapies. The patients with two or more exacerbations (n=20) fit into the GOLD high-risk grouping C or D; the evaluation of these therapies indicated an 85% compliance rate with recommended long-term pharmacotherapy among these patients. Therefore, through the information that is available, it can be stated that the clinic requires improvement in bronchodilator therapy to meet the national benchmark. Without benchmark comparisons for the others, it appears acceptable, the compliance rates of 96% and 85% for exacerbation and high-risk patient treatments respectively.

Limitations

The study had a small sample size overall, in which the entire sample included 215 patients, with 39 total hospitalizations, and 11 readmissions. The small size limited the ability to test for relationships among variables because the sample sizes were often too small for reliable testing and/or had a low power of test results. The study design did not account for the overlap in clinical presentation and treatment recommendations for COPD, asthma, and bronchitis, so limiting data evaluation to only COPD exacerbation suggests disease process, specifically exacerbations, were underreported in this study. The collection of data over one year, versus two or more years of data limited the ability to grasp the big picture of disease progression and disease management. Tracking exacerbation medications for this study included only the addition of systemic corticosteroids and systemic antibiotics. Additional tracking of SABA and SAA use for exacerbations was not done due to overlap with most patients being on long-term SABA and/or SAA, and the inability to redesign methods for data collection. This limited the ability to determine compliance with exacerbation treatment.

Possibly the largest limitation and factor inhibiting the ability to determine guideline adherence, was the inability to stage the severity of COPD in the population. Without spirometry data, it was impossible to measure guideline adherence due to guideline recommendations being largely based on spirometry values. The study data only being from Norton facilities has an unknown impact on the ability to fully appreciate the complete picture of the COPD disease process and disease management. There are several non-Norton options for emergency and hospital care in the Louisville area, and patients often require emergent care for COPD exacerbations, and thus travel to the nearest medical facility. Finally, tracking only PCP visits

post-discharge versus including specialist visits such as pulmonology visits, might have led to underreporting of timely hospital follow-up.

Practice Improvement Recommendations

The NHLBI (2012) reported rate of hospitalization is 15% for Kentucky residents over age 55, and the admission rate for COPD of those in this study aged 55 and over was also 15%. Considering the CMS (2016) PQI regarding hospital admissions for COPD and asthma, the 15% admission rate and 28% readmission rate of those in this study (*N*=215), targeting a reduction in hospitalizations is an appropriate goal for this clinic. A pilot program to better manage COPD in the outpatient setting per GOLD guidelines with the goal of reduction in hospitalizations (and readmissions) is the recommendation based on study findings and evidence-based practice recommendations. Program aims include: 1) objective diagnosis and staging of COPD on all patients; 2) optimize the EMR with COPD templates; and, 3) create a process for timely follow-up after hospitalization.

Additional study procedure recommendations include: account for specialist visits as data variables, particularly pulmonology; include asthma exacerbation and acute bronchitis in variables for collection; include all GOLD comorbidities and treatments as variables; collect data on smoking cessation counseling and cessation treatments; and, include data regarding timely follow-up intervention for those hospitalized with COPD exacerbations. Comparing the findings of this study to those of future years could have broad implications for COPD management in primary care.

Timely Follow-up. Past study findings link timely outpatient follow-up after hospital discharge with reduction in readmission rates (Jackson et al., 2015;) (Misky, Wald, & Coleman, 2010). Pittsburgh Regional Health Initiative (2011) recommends identifying patients at highest risk for readmission and implementing a high-impact intervention that will improve transition back to the community and prevent an avoidable hospital readmission. Jackson et al. (2015) found that outpatient follow-up within 14 days of hospital discharge was associated with a 1.5% to 19.1% reduction in readmissions, with the wide range due to varying risk groups. When comparing the study population to Norton Healthcare and national averages, the study population revealed a comparatively high readmission rate of 28% and a low rate of PCP follow-up within 14 days of 44%. Considering previous evidence suggesting the importance of timely follow-up, as well as the relationship findings in this study between comorbidities and COPD hospitalization, there is evidence that the clinic would benefit from a focus on timely PCP follow-up after hospital discharge.

The goal includes improving the rate of follow-up within 14 days from 44% to at or above 60%. The proposed intervention to achieve this goal includes the use of the outpatient nurse navigator (already in place at the clinic) to ensure that a follow-up appointment is in place prior to hospital discharge. Additionally, this nurse navigator will make a follow-up telephone call within two days of hospital discharge to confirm the appointment and assist the patient with any health questions or barriers to follow-up. Due to the study group having a higher-than-average COPD readmission rate, targeting timely follow-up could serve as a high-impact intervention to reduce readmission rates. Specifically targeting those with HF and DM comorbidities could also be impactful due to the relationship between those diagnoses and hospital admission rates found in this study.

Staging COPD Severity. Both GOLD (2015) and CMS (2016) agree that it is a diagnostic necessity for patients with COPD to have at least baseline spirometry evaluation. Spirometry is a low-cost, billable test that takes minimal time to perform, with results that can be immediately interpreted by the PCP. The proposed intervention includes performing spirometry in the clinic. This will require training medical assistants at test administration, obtaining the required equipment, and dedicating a location in the clinic for performing spirometry. The benefits to on-site spirometry evaluation include: a reduction in patient burden due to decreased outpatient visits and cost; the results can be interpreted by the PCP immediately following testing, therefore objectively guiding treatment per guidelines; and, the clinic will benefit from an increased revenue.

Medical grade spirometry equipment can be purchased at a cost below $2,000, and Medicare reimbursement for various spirometry tests ranges $36-$57 (Jones Medical Instrument Company [Jones], 2015; QRS Diagnostics [QRS], 2012). If equipment is purchased for $2,000, with four tests performed weekly, at an average reimbursement of $44 per test, the net revenue after one year is $7,152. In this scenario, the return on investment is achieved in about 11 weeks. Best practice recommendations, the results of this study, and spirometry revenues lead to a strong recommendation that this primary care clinic have spirometry evaluation capability, trained spirometry administrators, and the goal of baseline spirometry evaluation in all patients with COPD. Spirometry and Epic optimization to prompt providers to obtain spirometry evaluation is a recommendation based on the existing evidence and findings in this study.

Optimization of the Electronic Medical Record. Optimization of the EMR is an ongoing process at Norton Healthcare, and has not occurred system-wide to specifically target COPD management in primary care. Results from this study indicate need for improvement in GOLD (2015) guideline adherence, and the use of EMR templates for chronic disease management has been shown to align patient care with EBP guidelines (Gronkiewicz, Borkgren-Okonek, Diamond, & Hickam, 2009). The recommended intervention is to implement an evidence-based template in the EMR for COPD management in primary care.

Recent Epic optimization has occurred to improve DM management per guideline recommendations. This includes a template of best practice recommendations and a standard location in which to document DM care. It is recommended that the COPD template includes disease symptoms, spirometry values (and corresponding date), COPD staging, pharmacologic treatment regimen, GOLD comorbidities, and dates of recent exacerbations and treatments. The template should also include provider prompts to guide care per recommendations. The use of COPD templates has the potential to improve patient health outcomes, as well as improved reported measures such as bronchodilator therapy and spirometry. An additional benefit of optimizing the EMR to include these components, is that it will simplify future studies measuring guideline adherence, and change in patient outcomes such as hospitalizations and exacerbations.

Conclusion

The data and analysis regarding hospitalizations and comorbidities have provided valuable results with implications for practice improvement and future research. Results from this study indicate that the implementation of evidence-based practice change initiatives will improve the health outcomes of patients with COPD. Implementing the suggested program interventions incorporates every aspect of the Triple Aim (IHI, 2016). The process for timely follow-up puts patients at the center of care includes their best interest as well as cost-reduction in the efforts to promote health and reduce hospital readmissions. The spirometry intervention will reduce the patient burden of an off-site visit, it will objectively guide treatment to improve health outcomes, and will help achieve reduced costs by improving health and reducing both outpatient and hospital visits. Optimization of the EMR with COPD templates will enable patients to better report their symptoms, providers to better treat their disease, and improved outpatient disease management will be cost-effective in that it will reduce hospitalizations.

Professional next steps as a Doctor of Nursing Practice will be to share these study findings with stakeholders and obtain buy-in for the pilot program. It will be necessary to explore potential barriers and modify the program to optimize potential outcomes, as well as develop an implementation and evaluation method for the proposed program. Adapting the 2015 study per previously mentioned criteria will enable 2016 data collection for additional baseline data prior to program implementation. Following at least one year of program implementation, a pre-post retrospective study could provide broad implications to inform quality improvement initiatives for the management of COPD in the primary care setting.

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Table 1

GOLD (2015) Pharmacotherapy Management Recommendations for Stable COPD

Patient Group	First Line Therapy
A	SAA PRN or SABA PRN
B	LAA or LABA
C	ICS + LABA or LAA
D	ICS + LABA and/or LAA

Note. Adapted from GOLD (2015) recommendations.

Table 2

Variables, Measures, and Results for Basic Demographic Data (N=215)

Variable	Frequency	Rate[a]
Age		
40-50	19	9
51-60	60	28
61-70	62	29
71-80	45	21
81 and over	29	14
Race/ethnicity		
Caucasian/White	141	66
African American/Black	72	34
Other or Unknown	2	1
Gender		
Female	145	67
Male	70	33
Other	0	0
Insurance Provider		
Medicare	139	65
Medicaid	52	24
Commercial/Private	22	10
Other or none	2	1
Smoking Status		
Current (ever smoked in 2015)	111	52
Former (quit prior to 2015)	93	43
Never Smoker	11	5
Number of exacerbations		
Zero	170	79
One	25	12
Two	11	5
Three	3	1
Four or more	6	3

Number of PCP visits		
One	18	8
Two	41	19
Three	35	16
Four or more	121	56
ED for COPD		
Zero	205	95
One	7	3
Two	3	1
ED for Other		
Zero	157	73
One	38	18
Two or more	47	9
Long-Term Pharmacotherapy		
SABA	179	83
LABA	133	62
SAA	36	17
LAA	70	33
ICS	134	62
None	17	8
Exacerbation Pharmacotherapy		
Both	25	12
Steroid Only	6	3
Antibiotic Only	5	2
Neither	9	4
N/A (no exacerbation)	170	79
Comorbid conditions		
HTN	160	74
Anxiety and/or Depression	97	45
GERD	71	33
Diabetes	68	32
HF	33	15
Afib	22	10
Osteoporosis	15	7
Cognitive Impairment	11	5
Lung Cancer	5	2

Number of hospitalizations – Non-COPD exacerbation diagnosis (all other hospitalizations)		
Zero	166	77
One	30	14
Two	10	5
Three	3	1
Four or more	6	3
Number of hospitalizations - COPD exacerbation		
Zero	195	91
One	9	4
Two	4	2
Three	6	3
Four or more	1	1

Note. [a]Rate as percent (%) rounded to nearest whole number.

Table 3

Variables, Measures, and Results for COPD Hospitalizations (n=39)

Variable	Frequency[a]	Rate[b]
Length of stay		
Equal to 1 day	3	8
2-3 days	7	18
4 days	12	31
5-7 days	12	31
8-10 days	1	3
11-14 days	2	5
More than 14 days	2	5
Discharge disposition		
Home	27	69
Home with home health	4	10
Subacute rehabilitation	1	3
Skilled nursing facility	1	3
Pulmonary rehabilitation (outpatient)	5	13
Death prior to discharge	1	3
PCP appointment at discharge		
Yes	26	67
No	12	31
N/A	1	3
Time to appointment		
4 days or less	3	8
5-7 days	1	3
8-10 days	0	0
11-14 days	0	0
More than 14 days	22	54
N/A	13	36

Time to actual PCP visit		
4 days or less	7	18
5-7 days	5	13
8-10 days	2	5
11-14 days	3	8
More than 14 days	10	26
N/A	12	31
COPD Readmission		
Yes	11	28
No	27	69
N/A (readmission for non-COPD reason)	1	3

Note. [a]*n* = 39 in each variable category. [b]Rate (%) rounded to nearest whole number and totals per category are approximately 100%

Table 4

Variables, Measures and Results for Patients with COPD Readmissions (n=7)

Variable	Frequency
Age	
40-50	1
51-60	2
61-70	2
71-80	2
81 and over	0
Race/ethnicity	
Caucasian/White	2
African American/Black	5
Other or Unknown	0
Gender	
Female	5
Male	2
Other	0
Insurance Provider	
Medicare	6
Medicaid	1
Commercial/Private	0
Other or none	0
Smoking Status	
Current (ever smoked in 2015)	5
Former (quit prior to 2015)	2
Never Smoker	0
Number of exacerbations	
Zero	0
One	1
Two	1
Three	2
Four or more	3

Number of PCP visits	
One	0
Two	0
Three	0
Four or more	7
ED for COPD	
Zero	5
One	0
Two	2
ED for Other	
Zero	3
One	2
Two or more	2
Long-Term Pharmacotherapy	
SABA	7
LABA	6
SAA	4
LAA	4
ICS	5
None	0
Exacerbation Pharmacotherapy	
None	0
SABA and/or SAA only	0
SABA and/or SAA and Antibiotic	0
SABA and/or SAA and Steroid	1
SABA and/or SAA and Steroid and Antibiotic	6

Comorbid conditions	
HTN	7
Anxiety and/or Depression	1
GERD	3
Diabetes	4
HF	3
Afib	1
Osteoporosis	1
Cognitive Impairment	1
Lung Cancer	1
Number of hospitalizations – Non-COPD exacerbation diagnosis (all other hospitalizations)	
Zero	4
One	2
Two	0
Three	0
Four or more	1
Number of hospitalizations – COPD exacerbation	
Zero	0
One	0
Two	2
Three	4
Four or more	1

Table 5

Comparison of Variables, Measures and Results for Patients with COPD Readmissions (n=7)

Variable	Admission[a]	Readmission[b]	Readmission[c]	Readmission[c]
Length of stay				
Equal to 1 day	0	0	1	0
2-3 days	1	1	0	0
4 days	0	3	2	0
5-7 days	4	1	2	0
8-10 days	1	0	0	0
11-14 days	0	2	0	0
More than 14 days	1	0	0	1
Discharge disposition				
Home	3	4	2	1
Home with home health	2	1	1	0
Subacute rehabilitation	1	0	0	0
Skilled nursing facility	0	0	1	0
Pulmonary rehabilitation (outpatient)	0	2	1	0
N/A (death)	1	0	0	0
PCP appointment at discharge				
Yes	4	5	3	0
No	3	2	2	1
Time to appointment				
4 days or less	1	0	1	0
5-7 days	0	0	0	0
8-10 days	0	0	0	0
11-14 days	0	0	0	0
More than 14 days	3	5	2	0
N/A (no appointment, death, or readmission)	3	2	2	1

Time to actual PCP visit				
4 days or less	0	2	2	0
5-7 days	2	1	0	1
8-10 days	1	0	0	0
11-14 days	0	0	1	0
More than 14 days	0	1	2	0
N/A (no appointment, death, or readmission)	4	3	0	0
COPD Readmission				
Yes	6	4	1	0
No	1	3	4	1
Readmission prior to follow-up visit				
Yes	4	2	0	0
No	3	5	5	1

Note. [a]Column total for each section = 7. [b]Column total for each section = 7. [c]Column total for each section = 5. [d]Column total for each section = 1

Table 6

Relationships Among Insurer and COPD Hospitalization (N=215)

Variables	*p*-Value	Test
Medicare and COPD hospitalization	$p=0.301$	Mann-Whitney U
Medicare and COPD readmission	$p=0.787$	Chi-square
Medicaid and COPD hospitalization	$p=0.651$	Mann-Whitney U
Medicaid and COPD readmission	$p=1.0$[a]	Chi-square

Note. [a]Minimum cell count for testing not met.

Table 7

Relationships Among Number of PCP Visits and ED or Hospital Visits (N=215)

Variables	*p*-Value	Test
PCP and ED COPD	$p=0.477$	Spearman's rho
PCP and ED for reason other than COPD	$p=0.203$	Spearman's rho
PCP and ED for any reason	$p=0.492$	Mann-Whitney U
PCP and Hospitalizations for COPD	$p=0.131$	Spearman's rho
PCP and Hospitalization for any reason	$p=0.155$	Mann-Whitney U

Table 8

Medications Used in Patients with COPD Exacerbation (n=45)

Medication Type	Frequency	Rate (%)
None	2	4
SABA and/or SAA only	7	16
SABA and/or SAA and Antibiotic	5	11
SABA and/or SAA and Steroid	6	13
SABA and/or SAA and Steroid and Antibiotic	25	56
Total	45	100

Table 9

Variables of Interest Without Established Significant Relationships (N=215)

Variables	*p*-Value	Test
Smoker and COPD hospitalization	*p*=0.197	Mann Whitney U
Smoker and readmission	*p*=1.0[a]	Chi-square
Smoking status and COPD hospitalization	*p*=0.154	Spearman's rho
Smoking status and any hospitalization	*p*=0.857	Spearman's rho
Number PCP and any hospitalization status	*p*=0.155	Mann Whitney U
Number PCP and COPD hospitalization	*p*=0.131	Spearman's rho
Number PCP and ED for COPD	*p*=0.477	Spearman's rho
Number PCP and ED for other	*p*=0.203	Spearman's rho
Number of comorbidities and readmission	*p*=0.4	Mann Whitney U
PCP appointment at discharge and readmission	*p*=0.396	Chi-square
Follow-up visit and readmission	*p*=0.74	Chi-square

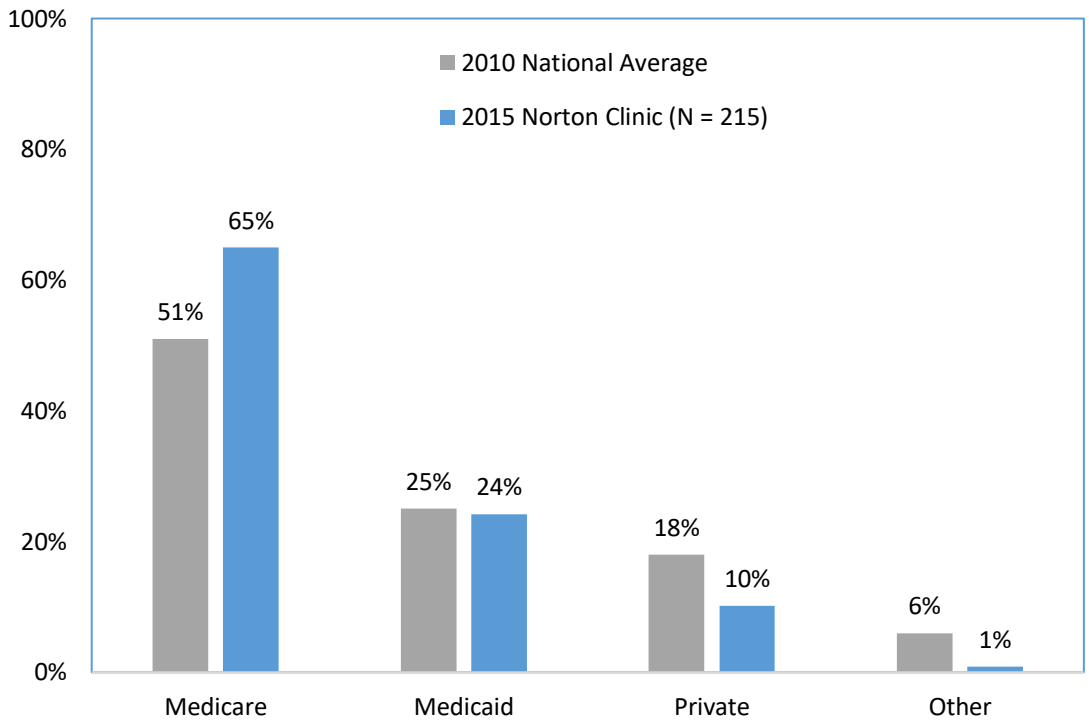

Figure 1. Comparison of COPD Healthcare Cost Payers

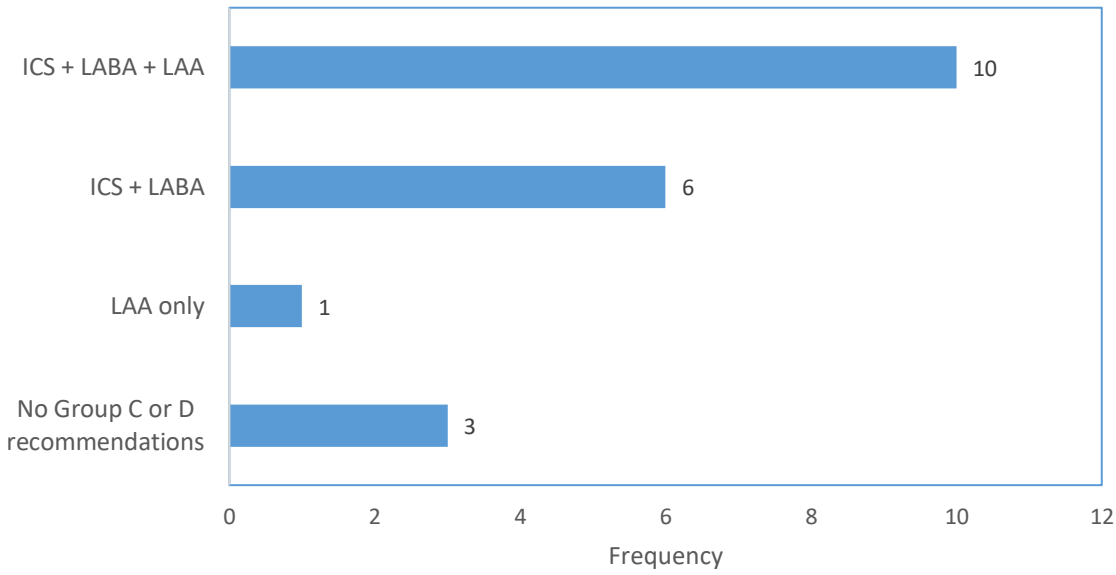

Figure 2. Pharmacotherapy Combinations for High-Risk Patients (*n*=20)

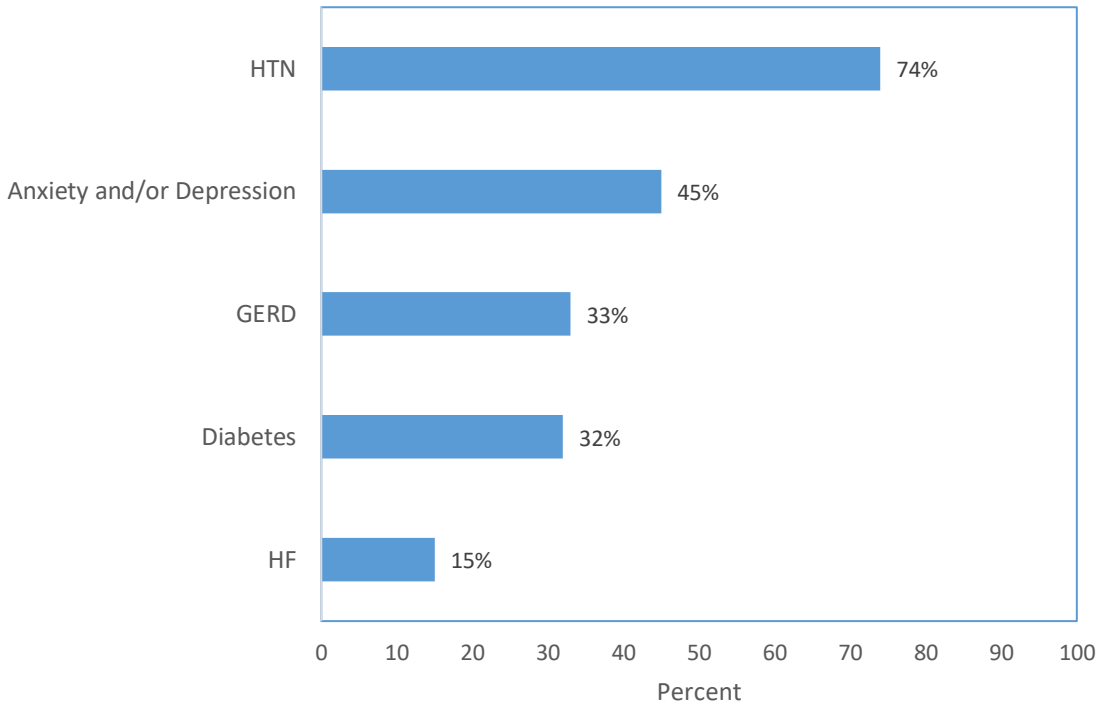

Figure 3. Occurrence Rate (%) of Top 5 Comorbidities (*N*=215)

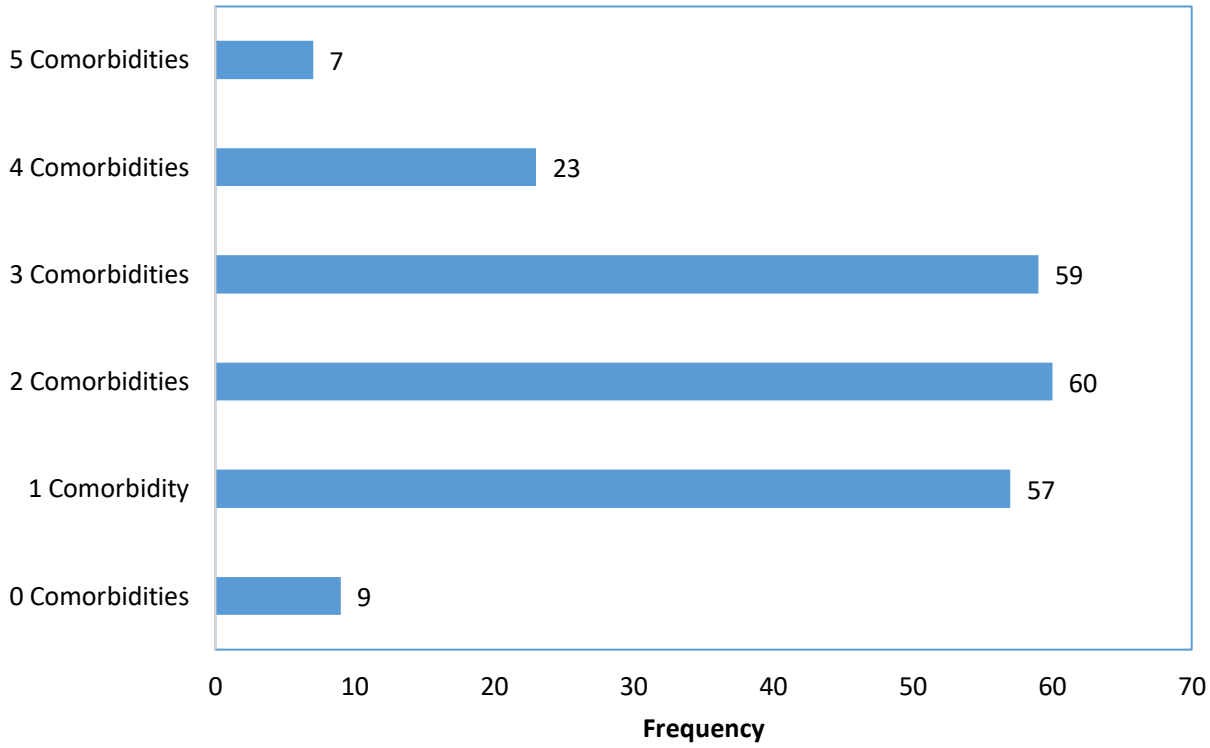

Figure 4. Occurrence Frequency of Comorbidities (*N*=215)

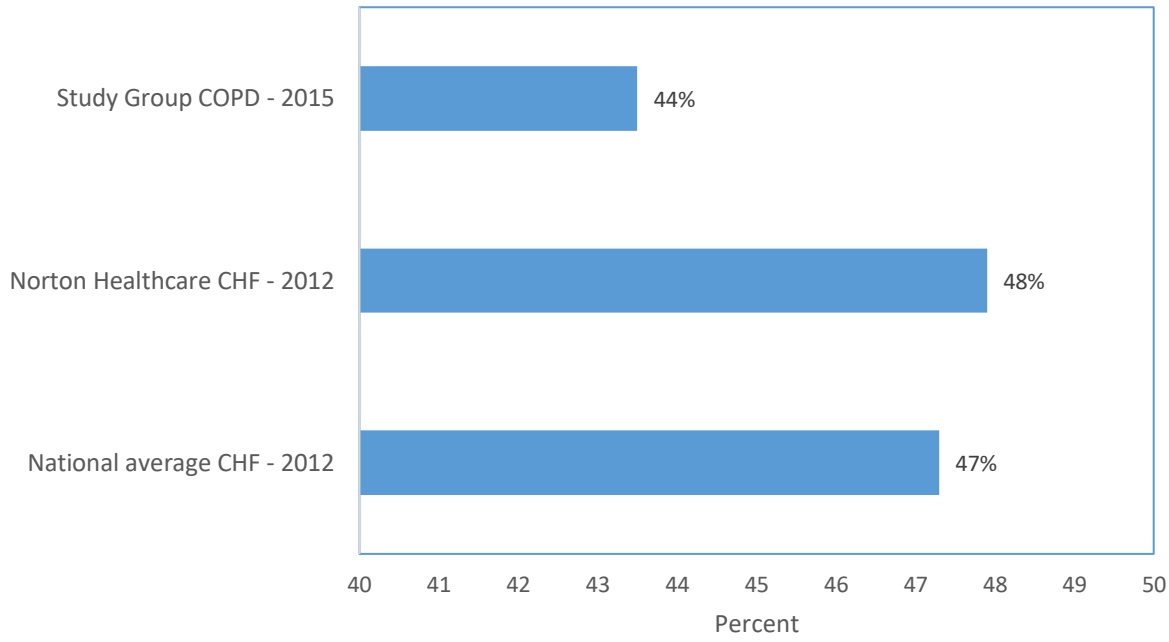

Figure 5. Patients with a PCP Visit within 14 Days of Discharge