***Does an interdisciplinary approach utilizing a nurse navigator reduce the 30-day hospital readmission rate for COPD patients?***

**Background**: As of October 2014, COPD has been included as part of Medicare's Hospital Readmissions Reduction Program (HRRP), which penalizes hospitals for 30-day excess all-cause readmissions. There is limited data available on both readmission risk factors and reasons for hospital readmission to guide hospitals in formulating programs to reduce COPD readmissions. At Unity Point-Methodist Hospital, an interdisciplinary approach using a nurse navigator post hospital discharge was implemented to reduce 30-day COPD hospital readmissions.

**Objective:** To determine if an interdisciplinary approach post-acute care including a nurse navigator reduces 30-day hospital readmissions among COPD patients.

**Methods:** Retrospective analysis of traditional Medicare claims data (DRG) of COPD patients at Unity Point-Methodist Hospital between April 2014 and April 2016, comparing 30-day readmission rates prior to and after the implementation of an interdisciplinary approach including a nurse navigator.

**Results:** Over the study period there were a total of 200 respiratory related hospital re-admissions. Before the implementation of a nurse navigator, the 30-day re-admission rate was 14.5% which was reduced to 7.7% after the introduction of a nurse navigator. Based on the small sample size of our study, statistical significance was not achieved (P=0.124). Re-admitted patients were no more likely to have a change in median length of stay (P=0.276). Although the rate of COPD re-admission increased, the overall rate of re-admissions for respiratory related illness reduced resulting in a savings of $123,672.00.

**Conclusions:** The post-acute care multidisciplinary approach with the introduction of a nurse navigator seems to reduce the re-admission rate for respiratory related illnesses. Although statistical significance was not achieved in this outcome, there was a noted benefit to the patient as evidenced by a reduction in re-admission rates, as well as to the hospital by avoiding a 3% reduced reimbursement penalty.

## Introduction

In 2009, the centers for Medicare and Medicaid services (CMS) began publicly reporting hospital readmission rates and in 2010 the US Patient Protection and Affordable Care Act for healthcare reform was developed emphasizing the need for reducing hospital readmissions to improve quality of care and reduce costs for CMS beneficiaries. In 2012, CMS instituted a payment penalty for those hospitals with higher than expected readmission rates with an emphasis on improving post hospital transitional care, and reducing hospital readmissions. The hospital readmissions reduction program (HRRP) was developed to monitor and penalize hospitals for all cause 30-day hospital readmissions, and in October of 2014, extended its scope to include COPD readmissions. The HRRP targets inpatient discharges in the Medicare fee-for-service population including congestive heart failure, acute myocardial infarction, pneumonia and COPD. Prior to the enactment of HRRP for CHF readmissions, extensive literature was available to guide hospitals for the appropriate protocols to help reduce readmission rates. Unfortunately, there are no specific randomized studies for US hospital interventions to evaluate the effect on 30-day readmission rates for COPD patients. The HRRP subject hospitals to a 3% reduction in Medicare reimbursements if they fail to stay below their expected readmission rates for the diagnoses. Currently in the United States, the readmission rate for acute exacerbation of COPD is 22%, although geographic variation is noted particularly between healthcare systems in the private, public or inner-city areas (11).

This fiscal penalty raises awareness for hospital readmissions and potential benefits, but also significant concerns when attempting to transform the care of COPD patients into a value based care model. Hospitals are now devoting greater resources during inpatient care and have begun to collaborate with

post-acute care providers including skilled nursing facilities and home health agencies to help facilitate a smooth transition of care, these activities not previously done under the traditional payment model. On the negative side, disproportionately high penalties have been assessed on hospitals with fewer resources who take care of a larger share of underserved patients.

Hospital readmission for COPD patients are common and costly. It is believed that approximately 10 to 55% of readmissions after an index admission for acute exacerbation of COPD may be preventable. Factors contributing to this early readmission rate includes premature discharge from the hospital, poor discharge medication reconciliation and compliance, as well as lack of family education on disease management and lack of communication with outpatient physicians who are responsible for assuming the patient's care and providing continuity of care.

COPD is estimated to affect one in 10 million people globally and is the third leading cause of death in the United States. It is estimated that 1 in 5 patients require re-hospitalization within 30 days of discharge following an admission of acute exacerbation of COPD. The ten leading reasons for re-hospitalization after the index COPD admission include COPD as the most common cause followed by respiratory failure, pneumonia, CHF, asthma, septicemia, cardiac dysrhythmias, fluid and electrolyte disorders, intestinal infection, and nonspecific chest pain (10). This same study demonstrated a readmission rate of 20.2%. Also noted by this author is that patients with an index COPD admission tended to be white women with a median age of 74 years, and compared with the general Medicare population, those at index admission tend to be dually eligible (both Medicare and Medicaid recipients). In those patients with comorbidities, the prevalence of patients on readmission with CHF was 7% greater than in the non-readmitted group. Logistic regression demonstrated that the rate of readmission for COPD was 1.22 times greater in dually enrolled patients (10). Per another study by Shah et al, factors associated with increased risk of early readmission after index acute exacerbation of COPD include black race, congestive heart failure, frailty, other systemic medical conditions, psychiatric conditions, discharge to post-acute care, dual eligibility for Medicare and Medicaid, elevated serum arterial blood carbon dioxide level, low BMI, longer length of stay, and male sex (11). For COPD patients readmitted within 30 days, coexisting CHF is the third leading cause for this early readmission.

Another potential area for concern is quantifying the actual definition for an acute exacerbation of COPD. It should be noted whether the definition is per the provider or based on billing methods before attempting to compare studies for possible interventions. "To date, no literature has been published demonstrating a mechanism to find all AECOPD patients by using centers for Medicare and Medicaid services (CMS) definition during the index admission. In addition, CMS has not updated the rules that define AECOPD using the recently introduced ICD-10-CM codes that hospitals have been using for billing purposes since October 1, 2015. An inability to identify the target population for the HRRP penalty generates significant barriers in implementing an effective COPD risk reduction program" (11). Despite this, there are several interventions that can improve early readmissions after an acute COPD exacerbation. These include patient’s self-management, inhaler device training, and early outpatient follow-up within 30 days after discharge. Emerging interventions include pulmonary rehabilitation, tele-healthcare, filling of prescriptions prior to hospital discharge with pharmacist supervised medication reconciliation, appropriate medications and perhaps at some point hospital care in the home setting for the proper patient (11). Another approach being used increasingly utilizes a patient centered approach using a multi-disciplinary team with coordination by a case manager or navigator to help facilitate a seamless transfer of information and coordination between the patient and all outpatient care providers.

Programs that improve clinical efficiency and reduce costs based on a recent Cochran review include patient self-management, including knowledge of disease, action plans, exercise, nutrition, smoking cessation, coping techniques and adherence to medications as well as inhaler device training, all of which can reduce hospital readmission. Early outpatient follow-up within 30 days after discharge as well as

pulmonary rehabilitation, tele-healthcare, filling of all respiratory medications prior to hospital discharge, pharmacist supervised medication reconciliation and appropriate medications have all been associated

with improving early readmissions for acute exacerbation of COPD. One approach to reducing readmissions and control costs is the use of comprehensive care management programs (CCMPs).

These programs offer a patient centered coordination team consisting of patient education delivered by a respiratory therapist, diagnosis and treatment of COPD by a physician, evaluation and coordination for home equipment by a case manager, and follow-up telephone calls by a nurse, with seamless transfer of information and coordination between the patient and all care providers (11). Bourbeau et al (11) evaluated patient COPD education programs which included telephone calls and direct patient access to nurses and respiratory therapists, and found an approximate 40% reduction in acute exacerbation of COPD hospitalizations and emergency department visits. Current evidence suggests that these programs may provide a useful structure for the long-term care of patients with difficult COPD. In another study by Dajczman et al (5), the use of an advanced practice nurse-COPD nurse navigator showed significant reduction in respiratory cause emergency department visits as well as respiratory 30-day hospital readmissions. Conversely, in a study by Balaban et al (3), the use of a patient navigator only showed a reduction of 4.4% in readmission rates in patients greater than 60 years of age, and an increase of 11.8% in readmission in those patients under 60 years of age. In this study the patient population consisted of low socio-economic status, highly diverse in race and language, history of psychiatric illness and substance abuse while almost exclusively on public assistance. In the older patient population, patients were more medically complex while younger patients had significantly more mental illness, substance abuse and higher rates of previous hospitalizations. This may be suggestive that Medicare beneficiaries are more likely to benefit from these types of interventions. In another study by Weinberger et al, a multicenter randomized control trial at nine Veterans Affairs Medical Centers evaluated the impact of increased access to primary care physicians post discharge from the hospital showing that 30-day readmission rates increased in the intervention group, however patients were more satisfied with their care (14). In a study by Fidahussein et al (6), patients who had follow-up visits with a pulmonologist or PCP post hospital discharge did not demonstrate significant reduction in rates of 30-day readmission, however did demonstrate a statistical improvement in mortality.

The purpose of this study is to determine whether a multidisciplinary approach with the introduction of a nurse navigator during the index hospital admission with coordination of post discharge care would reduce the 30-day hospital readmission rate at Unity-Methodist Hospital in Peoria, Illinois. Based on a literature search demonstrating wide variation in success with mixed results utilizing this method, I wanted to determine whether this approach would be applicable to our Medicare population.

***Materials and Methods:***

The program utilized at Unity Point Methodist Hospital includes the implementation of a nurse navigator at the time of the index admission. The credentials of the navigator consist of a BSN in nursing with experience in pulmonology. The navigator receives a list of patients admitted for shortness of breath, bronchitis, COPD, or other primary respiratory illness, and sees the patient while in the hospital. During the hospital stay, the patient's records are evaluated for previous bedside spirometry or pulmonary function testing, and if not performed the patient receives a bedside spirometry. A mandatory pulmonology consult is required and the nurse navigator in conjunction with the pulmonologist begin the process of patient education. Patients are rounded on every 1-2 days by the navigator to ensure they are progressing. Patients are educated on the use of incentive spirometry and acapella. The recommendations for appropriate home medications are then formulated based on appropriateness and cost. The nurse navigator works with the case manager to help ensure that medications are affordable and available. Prior to discharge, an appointment is made for follow up with the COPD clinic within 3-5 days. Patients are seen at the COPD clinic once and follow up with their PCP and pulmonology. If their pulmonologist is from another hospital system, the patient is scheduled with that physician for follow-up within 1 week of discharge in addition to the COPD clinic.

The nurse navigator will follow-up with the patient on the day after discharge, day 7, 14, 21, 30, 45, 60, 75 and 90, and in-between if necessary. The patient is counseled on self-management and on a COPD

action plan. When the patient arrives at the COPD clinic they are seen by a pulmonologist, the nurse navigator, respiratory therapy, a social worker, and behavioral health. The respiratory therapist assesses the patient for proper inhaler use and provides education. The patient is also evaluated for oxygen needs and to ensure patient has the proper home medications and is using them properly. The patient is also evaluated for CHF (ECHO) if pulmonary hypertension was detected on work-up. If the patient is a smoker, they are counselled on tobacco cessation and a onetime chest x-ray is obtained. In addition to patient education, a means assessment is performed to ensure the patient can obtain all necessary treatments. If there is a sufficient need the patient can enter a program with Walgreens for a price reduction on medication for one year. The patient is also referred for pulmonary rehabilitation, if they qualify. Pulmonary function testing must be available for the patient to qualify and will be done if not available. PFT's may also be repeated at the discretion of the pulmonologist. Both social work and behavioral therapy are considered an integral part of the non-pharmacologic therapy regimen, Patient are evaluated for anxiety and depression, and advanced care directives are also discussed. Palliative care consult is obtained. Home health assessments are also performed and options for telehealth are considered. The patient's entire medication list is reconciled by pharmacy to eliminate any conflicts. A follow-up appointment is made with pulmonology.

For the statistical analysis, I used data including DRG's for traditional (fee for service) Medicare patients provided by Unity Point-Methodist Hospital (Peoria, Illinois), which included encounter and length of stay information. The hospital was unwilling to provide patient demographic information due to concerns of possible CMS violations. This study was approved by the University of Illinois Institutional Review Board and subject to a data use agreement.

I conducted a retrospective analysis of hospitalizations at Unity point-Methodist Hospital for Medicare fee for service beneficiaries from April 2014 to April 2016 (the year prior to and after the implementation of a nurse navigator). Inclusion criteria included all patient 30-day readmission for COPD and related respiratory illnesses to include acute bronchitis, bronchiectasis, unspecified, mild, moderate, and severe persistent asthma. This included DRG's 190, 191, 192, 202, and 203. Patients that left AMA on subsequent admission, admitted to another hospital, or died were included in the data. The only exclusions were for patients that left AMA at the time of the index admission, end stage renal disease, and aspiration pneumonia

Variables included 30-day re-admission and average length of stay on each admission. Information on patient demographics was not included in this analysis.

Statistical analysis consisted of Chi-square test to compare re-admission rates before implementation of a nurse navigator and after. Length of stay was compared before and after the implantation of a nurse navigator using the Wilcoxon rank-sum test.

***Results:***

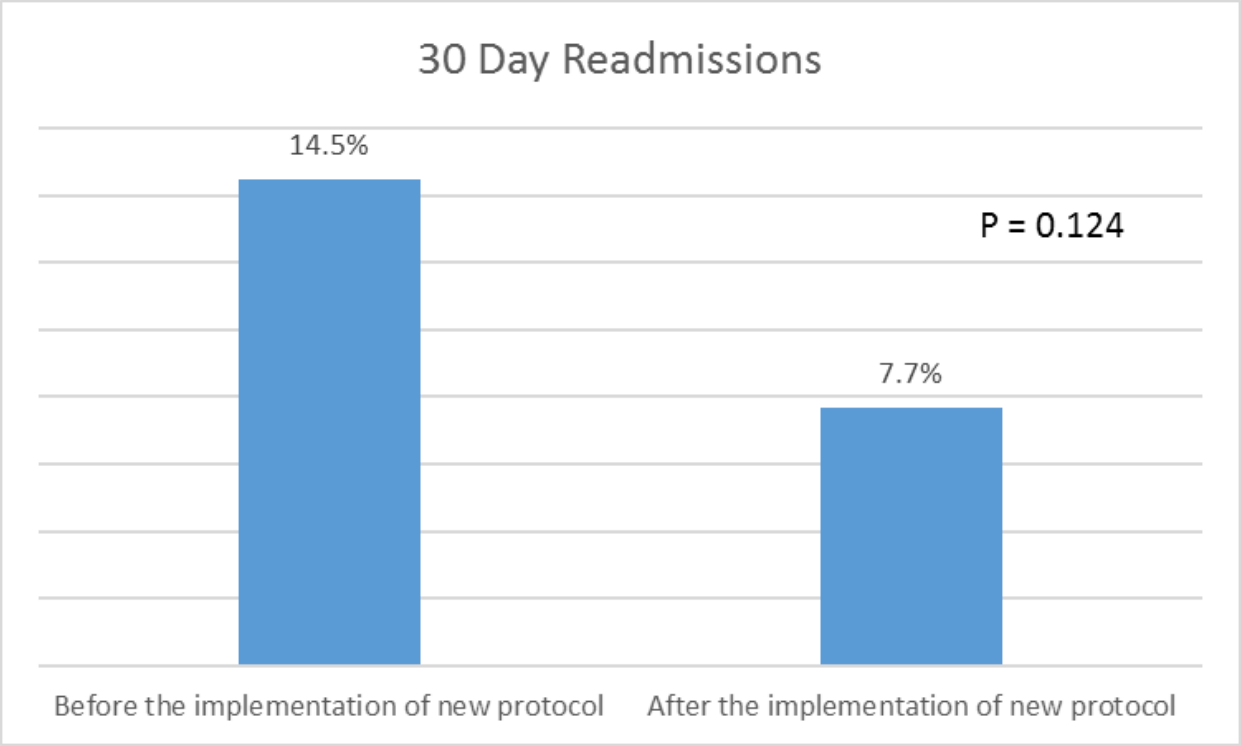
As depicted in table 1, comparisons were made to patients admitted for COPD and related respiratory illness at index admission to those patients re-admitted within 30-days of discharge 1 year prior and 1 year after the implementation of a nurse navigator along with the aforementioned protocols. Chi-square test was used to compare re-admission rates before the implementation of a nurse navigator and after. The re-admission rate before implementation of a nurse navigator was 14.5%, and the re-admission rate after implementation was 7.7%. At the level of significance of 0.05, we do not have evidence to conclude the two rates are statistically significant (P=0.124). The effect size Cramer's Phi Coefficient is 0.1087, indicating there is a small difference in readmission rates before and after. The inability to detect a difference is likely the result of our small sample size.

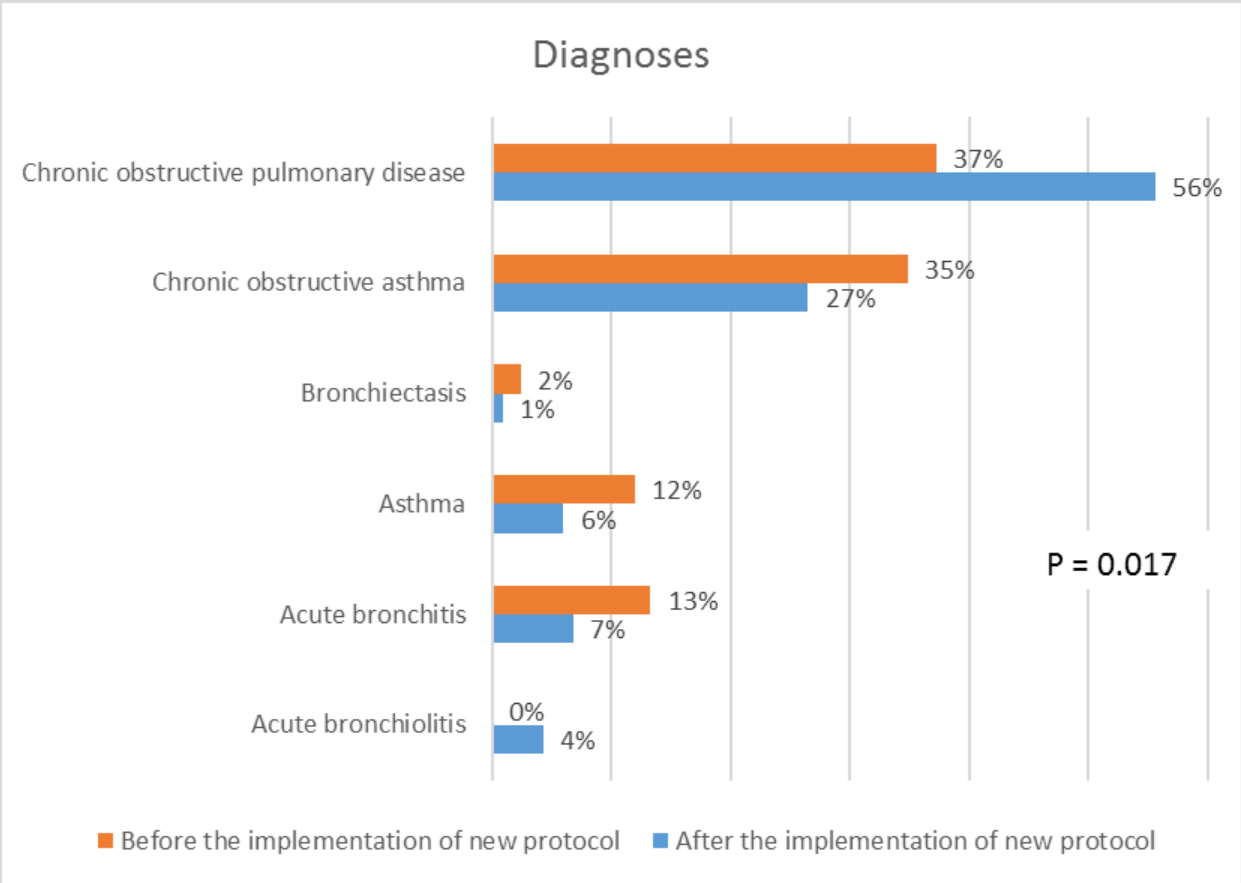
Length of stay was compared as well before and after the intervention using the Wilcoxon rank-sum test. At the level of significance of 0.05, we also do not have evidence to conclude that LOS before and after are statistically significant (P=0.276).

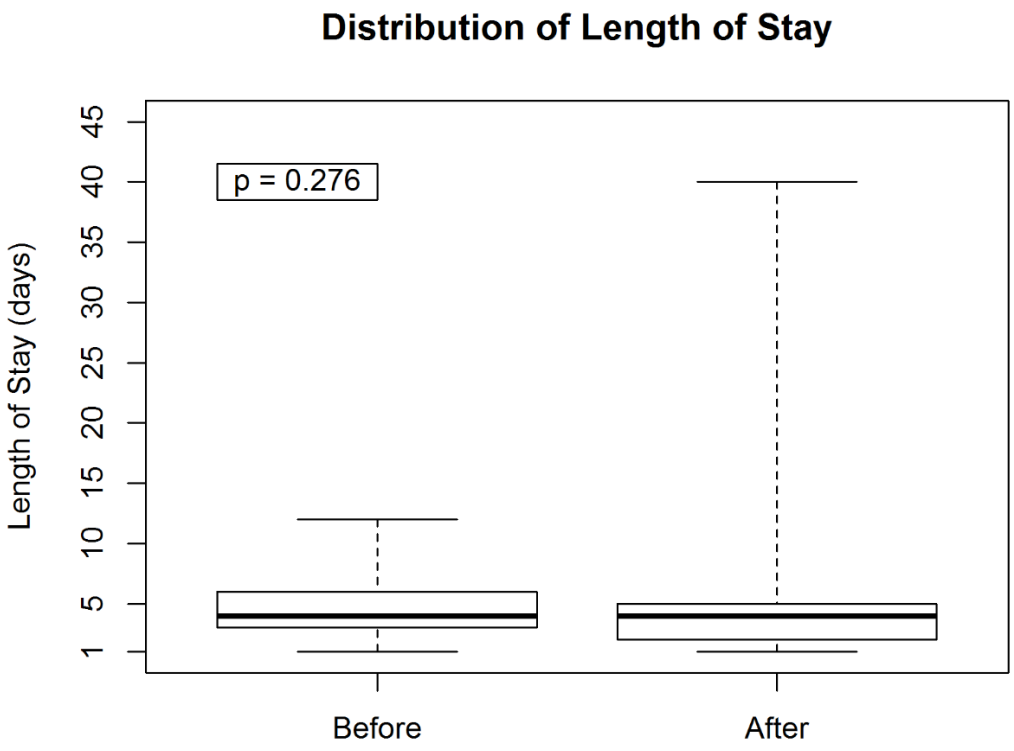
***Table 1***

| *Variables* | *Total N=200(%)* | *Group* *Before N=83(%)* | *After N=117(%)* | *P Value* |
|---|---|---|---|---|
| **Readmission** | | | | *0.124* [C] |
| No | 179 (89.5) | 71 (85.5) | 108 (92.3) | |
| Yes | 21 (10.5) | 12 (14.5) | 9 (7.7) | |
| Missing | 0 | 0 | 0 | |
| **LOS** | | | | *0.276* [W] |
| N | 200 | 83 | 117 | |
| Median (min - max) | 4.0 (1.0 - 40.0) | 4.0 (1.0 - 12.0) | 4.0 (1.0 - 40.0) | |
| Mean ± SD | 4.4 ± 3.8 | 4.4 ± 2.6 | 4.4 ± 4.5 | |
| Missing | 0 | 0 | 0 | |

[T]t-test; [C]Chi-square test; [W]Wilcoxon rank-sum test


30 Day Readmissions
14.5%
P = 0.124
7.7%
Before the implementation of new protocol
After the implementation of new protocol


Diagnoses
Chronic obstructive pulmonary disease
37%
56%
Chronic obstructive asthma
35%
27%
Bronchiectasis
2%
1%
Asthma
12%
6%
P = 0.017
Acute bronchitis
13%
7%
Acute bronchiolitis
0%
4%
Before the implementation of new protocol
After the implementation of new protocol




***Discussion:***

There appears to be a lack of consensus on the definition of acute exacerbation of COPD. Clinically, AECOPD may be defined by worsening changes in dyspnea, cough or sputum quality where the ICD-9 classification system may define AECOPD using different criteria, creating disparity between biller and provider definitions. The ICD-9 codes for COPD used and the proposed algorithm has yet to be tested or validated in comparison to those which identify pneumonia and AMI. There is currently no literature to define a universal mechanism to identify patients in acute exacerbation of COPD using the current CMS definition for an index admission. CMS has not updated this information as it pertains to the new ICD 10 codes that hospitals have been using for billing purposes since October 1, 2015. Another challenge is that unlike cardiac disease and CHF, COPD does not have a definitive biomarker. This can be problematic since COPD symptoms may overlap with many other diseases making it difficult to appropriately classify patients with primary COPD.

The definition for COPD readmission also various, sometimes defined as readmission for acute exacerbation of COPD versus readmission due to any cause. This makes evaluation of readmissions more difficult creating potential problems for comparison.

The study by Shah, et al (10) is the first study to date to use a large Medicare data set to evaluate beneficiaries who were admitted for COPD and readmitted under the HRRP COPD methodology. In this study, only one half of readmissions were due to respiratory causes. Approximately 22.6% of Medicare patients admitted for acute exacerbation of COPD are readmitted within 30 days, and those patients with coexisting CHF constitute the third leading cause for early readmission. Other significant comorbidities include frailty and psychiatric conditions. Other risk factors include hospitalization in the past year and

dual eligibility for Medicare and Medicaid. The role of dual enrollment has been examined as a risk factor for COPD readmission and it has been found that patients admitted for an index COPD diagnosis are

more likely to be on both Medicare and Medicaid when compared to other beneficiaries, which raises concern for safety net hospitals who predominantly care for these patients. This patient population tends be poor, sicker, and less educated presenting unique challenges which is usually beyond the control of any hospital. Other challenges include limited social support and financial hardship, making it difficult in many cases for proper adherence with post discharge treatment plans. Because the current readmission equation does not adjust for social economic factors, hospitals serving the most vulnerable populations may be unfairly penalized. Thus, this new penalty system may create incentives for hospitals to alter their coding to represent other conditions to avoid penalties. Additional uncertainty relates to the perceived benefits of reducing hospital readmissions. This is based on observations regarding lower mortality in CHF patients who have a higher 30-day readmission rate for CHF exacerbation. It is unclear whether a higher readmission rate for COPD is protective. It has been estimated that 25% of patients with COPD do not recover their lung function by day 35 after an acute exacerbation, and may therefore benefit from re-hospitalization during this 30-day time interval (11). Discharge destination is also a key factor in patients who are readmitted to the hospital for COPD. Readmitted patients who are discharged to post-acute care (particularly skilled nursing facilities) were less likely to be readmitted than those who did not go to post-acute care facilities. Studies have found that a larger percentage of readmissions come from home rather than from patients at a skilled nursing facility. These findings could be explained by the higher quality of care received at a skilled facility, particularly with respect to the physical and cognitive patient related barriers that are better addressed in this controlled setting. This suggests that there may be other potential explanations for readmissions in this patient population.

Another concern regarding the HRRP rule is that hospitals may lower readmissions by electing to treat patients in an observation unit versus as a readmission. Observation status include inpatient episodes that typically lasts less than 48 hours but are categorized by Medicare as outpatient care and are therefore exempt from the HRRP. In this instance, hospitals may elect to deliver high acuity care in this setting while avoiding potential penalties for this encounter. Increased use of observation and ED visits circumvent the original intent of the HRRP and may result in the same or higher health costs to society and out-of-pocket costs to patients. Another area of significant concern is whether the HRRP is an appropriate approach for safety net hospitals who provide care for low income or uninsured populations and may be unfairly penalized. Safety net hospitals typically have limited resources to implement new initiatives and often cannot afford professional staff. Patients who are eligible for coverage under both Medicare and Medicaid are typically the most vulnerable population who have a prevalence nearly twice the national average for the acute exacerbation of COPD, and is identified as an independent risk factor for readmission.

In this study, our new multidisciplinary approach with the implementation of a nurse navigator did appear to have a positive impact in reducing 30-day hospital re-admissions. Although the data did not achieve statistical significance, the real benefit to both the hospital and patient was preserved resulting in the better continuity of care for the patient post discharge, and the avoidance of penalties to the hospital. In the context of our community, caring for Medicare patients of all socioeconomic classes, this system of care appears to improve compliance and continuity of care post discharge resulting in a reduction of hospital re-admissions.

This study has several limitations. The data provided by the hospital was limited to only re-admission rates and length of stay, and only included Medicare data. The period for evaluation of this new approach was only limited to one year pre-and post-implementation. Also, the use of claims data limits the extent of clinical information available to assess potential comorbidities affecting readmission rates in COPD patients. The claims data used for our study may not reflect patients seen at other facilities It is also difficult to generalize these results based on data related to patients in our hospital setting, when compared to other hospitals who may care for higher risk patients and have either no nurse navigator or a

navigator without clinical expertise, due to limited resources. Also, this study does not reflect the entire COPD Medicare population and does not account for planned re-hospitalizations. In addition, based on studies examining non-Medicare patients, the same benefits have not shown to exist. Other possible limitations in our study include the inability to judge the quality of care during the index hospitalization, although care at our institution is generally standardized.

***Conclusion:***

Readmissions for acute exacerbation of COPD remain a challenging medical problem for both the patient, provider, and healthcare system. The intent of this national policy is to create a value base care for patients with COPD with the intent to bring greater coordination and communication between hospitals and patient care providers. It appears that further refinements are needed to better identify patients that will most likely improve from coordination of care and to ensure that the penalty formula is equitable, particularly to safety net hospitals.

Medicare patients who are admitted to the hospital for acute exacerbation of COPD are generally readmitted in most cases for reasons other than COPD. Appropriate use of post-acute care is a potential target to reduce COPD readmissions. Readmitted patients tend to be of lower social economic status and are generally on both Medicare and Medicaid which may disproportionately affect safety net hospitals. COPD is unique when compared to other chronic medical conditions, predisposing to misclassification making the need for further research for evidence policy more important.

In assessing the results of our study, there is the scientific interpretation and the practical implications. While statistical significance was not achieved in this study, the reported reduction in 30-day re-admission rate of 7.7% was well below the national average and well below the regional 10% best performance group which is 30.2%. The financial benefit to the hospital was a savings of $123,672.00, and the benefit to the patient was stricter oversight in the post hospital transition care period with fewer 30 day re-admissions. While this approach seems to be beneficial in the Medicare population at our institution, there is no way to determine its effectiveness in the younger (non-Medicare) population, who is likely to have a higher incidence of mental illness and substance abuse. Further investigation will be necessary to evaluate whether this pattern is sustainable and continued data tracking will be needed.

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