Research Article

Assessment of COPD Overdiagnosis as an Important Factor in COPD Readmission

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Abstract

Introduction: The Hospital Readmission Reduction Program (HRRP) was established in 2012 to improve health care by linking payment to the quality of hospital care. Readmission is considered a hospital care quality measure. Under the program, hospitals are penalized for Chronic Obstructive Pulmonary Disease (COPD) readmission, which incentivizes improved care to avoid financial penalties. The effect of COPD overdiagnosis on COPD readmission has not been studied.

Objective: The study aims to assess the effect of COPD overdiagnosis in outpatient and inpatient settings on hospital COPD readmissions.

Methods: We conducted a retrospective study and examined outpatient and inpatient settings for COPD overdiagnosis. In the outpatient setting, we collected all COPD referrals to our clinic and reviewed charts to determine if those patients had COPD or an alternate diagnosis after our workup. We also studied 3-year inpatient data from January 2015 to March 2018 on hospital readmissions and extracted COPD readmissions. For patients seen by a pulmonary provider in our clinic, we studied patients' pulmonary function test/ spirometry results and charts and determined if they had a true COPD diagnosis or an overdiagnosis. We also assessed the effect of COPD overdiagnosis on inflation of COPD readmission numbers.

Results: Of patients referred to our clinic, 46% did not have COPD on our workup. Among inpatients, our results revealed that preventing COPD overdiagnosis could have reduced admissions attributable to COPD by 22.6%.

Conclusion: Correct diagnosis using the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria is an inexpensive way for hospitals to avoid readmission penalties.

Keywords: Hospital readmission; COPD readmission; COPD overdiagnosis

Abbreviations

HRRP: Hospital Readmission Reduction Program; COPD: Chronic Obstructive Pulmonary Disease; PFT: Pulmonary Function Test; AECOPD: Acute Exacerbation of Chronic Obstructive Pulmonary Disease

Introduction

The Hospital Readmission Reduction Program (HRRP) was established under the Affordable Care Act and provides financial incentives to hospitals to lower hospital readmissions [1]. HRRP defines readmission as a patient who has an unplanned readmission to the same or a different acute care hospital within 30 days of discharge [2]. Approximately 20% of Medicare patients are readmitted within 30 days of their hospital discharge [3]. For inpatient Medicare beneficiaries, hospitals receive reimbursements through the Inpatient Prospective Payment System [4]. Under HRRP, the Center for Medicare and Medicaid services was required to reduce payments to hospitals under the Inpatient Prospective Payment System program for Medicare patients for excess readmissions under certain conditions starting October 1st, 2012 [1]. Originally, the excess readmissions were

determined by calculating the excess readmission ratio by comparing a hospital's readmissions to those of all hospitals in the US with ≥25 discharges for the penalized condition [5]. The program expanded to include Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) to the list of penalized diagnoses from fiscal year 2015 (starting October 1st, 2014), with a current maximum penalty of 3% [2].

The program aims to improve health care by linking payment to hospital care quality [1]. From 2010 to 2015, readmission rates for 3 HRRP-targeted diagnoses (acute myocardial infarction, pneumonia, and heart failure) have decreased in Medicare, Medicaid, and privately insured patient populations [5]. Conversely, the penalties adversely affected the finances of safety-net hospitals caring for uninsured and low-income patients [6]. To reduce financial penalties, hospitals have invested in strategies to reduce readmissions; several programs, such as the Care Transitions Intervention [7], Project Re-Engineered Discharge [8], and Interventions to Reduce Acute Care Transfers [9], and certain measures, such as having a skilled nursing facility within the hospital [10], have reduced readmissions.

Approximately 10%-55% of readmissions for AECOPD are

preventable [11]. Several disease-specific interventions, such as pulmonary rehabilitation [12], treatment of AECOPD at home [13], inhaler device training prior to discharge [14], tele health care [15], and early outpatient follow-up [16], have been shown to improve early readmission for AECOPD.

However, none of the prior studies has investigated correcting or addressing the practice of overdiagnosis of COPD as an intervention. No prior study has investigated the effect of overdiagnosed COPD on the financial penalties paid by hospitals because of COPD readmissions.

According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines, COPD is diagnosed by a Pulmonary Function Test (PFT) or spirometry showing a post bronchodilator Forced Expiratory Volume in 1sec (FEV1)/Forced Vital Capacity (FVC) ratio <0.7 in patients with appropriate symptoms and a history of exposure to noxious stimuli [17]. COPD overdiagnosis is common because many health care providers are not aware of its diagnostic criteria. Based on our practice, we believe that a COPD diagnosis can become a part of a patient's medical history under several circumstances. Dyspnea in patients with a significant smoking history is often treated as COPD by primary care providers without performing spirometry. Additionally, dyspnea is commonly diagnosed as emphysema in emergency departments or urgent care if there is any degree of hyperinflation on chest X-ray images. Once a diagnosis of COPD is recorded in a patient's medical history, it is carried over on subsequent medical visits.

The study aims to estimate COPD overdiagnosis in outpatient and inpatient settings at our North Central Montana Hospital serving 13 counties with a population of 164,000 [18]. For the outpatient setting, we examined new patients referred to our pulmonary clinic with a prior COPD diagnosis. For the inpatient setting, we analyzed our readmission database from fiscal year 2015 onward to see if COPD overdiagnosis overestimated the COPD readmission numbers.

Methods

We studied two different aspects of COPD overdiagnosis. In lieu of an Institutional Review Board, our hospital-based risk management department approved this study and waived patient consent because of the retrospective design.

The outpatient arm of the study involved a retrospective chart review of new patients referred to us with a COPD diagnosis. We included all new patients with a referral COPD diagnosis, chronic bronchitis, COPD exacerbation, or emphysema. Three providers in the pulmonary clinic see new patient referrals. The new patient referrals originate from primary care clinics, emergency departments, urgent care, and hospital discharges from various hospitals in North Central Montana.

All of the new referrals are distributed among the three providers, and the patient's name, referral diagnosis, and date of referral are handwritten in a book maintained by the nursing staff.

We collected the number of all new referrals made in 6 months from August 2017 to February 2018. Patients who were seen until June 2018 were included in the study; no additional data were collected from any patient seen after June 2018. The referral diagnosis

was extracted by the nursing staff from the faxed progress note or clinic note from the referring physician or referral order. Limited data collection, specifically the referral diagnosis, was noted from all referrals to the clinic during the study period. For the patients who were referred to the author with a COPD diagnosis, we collected more extensive data by performing a chart review of the clinic visit and gathering demographic information, age, sex, origin of referrals, hospital *vs.* clinic, PFT or spirometry results, smoking history, and alternate diagnosis if they did not have a COPD diagnosis from our evaluation during the pulmonary visit(s).

In the second part of our study, we evaluated the data of patients who were readmitted to an acute care hospital ≤30 days of discharge from our hospital in a 3-year period. The data were obtained from a readmission matrix maintained electronically by a hospital readmission reduction program on an Excel (Microsoft Corp., Redmond, WA) sheet per the Affordable Care Act requirements. At study conception, the data were complete and up to date from January 2015 to March 2018. The database included all-cause readmission ≤30 days of discharge after an index admission for any cause and the six penalized diagnoses (COPD, acute myocardial infarction, postcoronary bypass grafting, pneumonia, and elective total hip arthroplasty or total knee arthroplasty) as a part of the hospital readmission reduction program. All patients >18 years old and all insurance types were included. Specifically for COPD, the COPD diagnosis used to maintain the database included patients who were admitted with a primary diagnosis of COPD or primary diagnosis of respiratory failure with a secondary diagnosis of AECOPD. Any-cause admission to any hospital ≤30 days of hospital discharge from the studied hospital with above criteria were included in this database as a COPD readmission [19].

If any patients were readmitted with an admitting diagnosis of COPD, we searched for a complete PFT or spirometric examination in the inpatient or outpatient electronic medical record system. If a patient had spirometry/PFT results in any setting, further chart review of the clinical notes specifically from a pulmonary clinic provider was done in the outpatient electronic medical record system to ascertain if they met the diagnostic criteria for COPD. For the study we required an FEV1/FVC ratio of <0.7 and current or past smoking history to make a diagnosis of COPD.
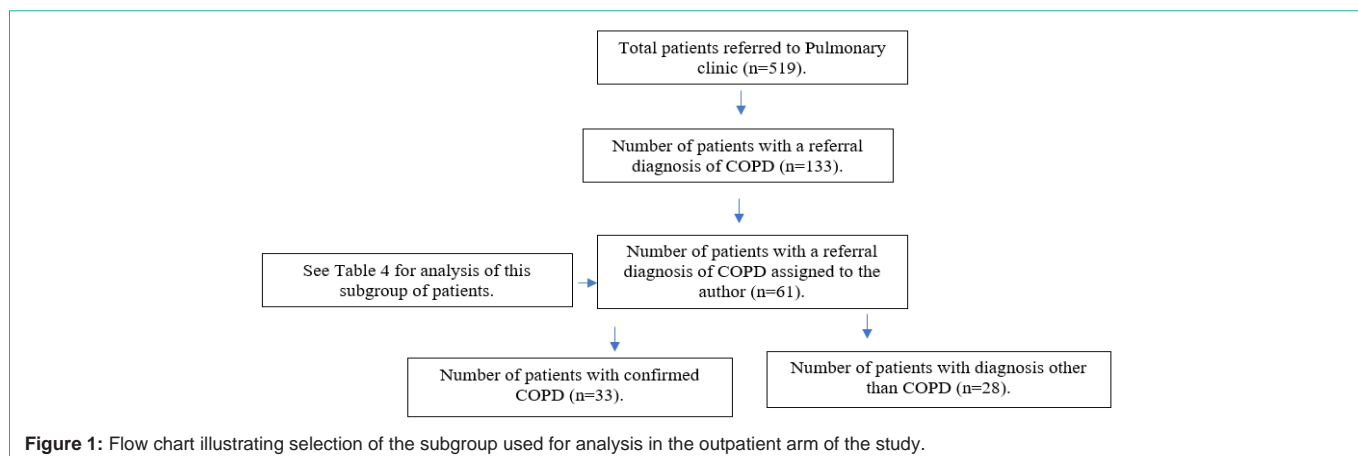
Statistical analysis was performed by IBM SPPS statistics for Windows (IBM Copr., Armonk, N.Y., USA) package.

Results

From August 2017 to February 2018, 519 new referrals were received by our clinic (Figure 1). Of the 519 referrals, 269 were seen by the author and 250 by the other two providers. There were 39 different referral diagnoses of which the top 15 are listed in Table 1. COPD, dyspnea on exertion, and asthma were the top three referral diagnoses. One hundred and eighteen new COPD referrals (COPD and AECOPD) and fifteen new emphysema referrals were received. Combined, there were 133 new COPD referrals of which 74 were assigned to the author and 59 to other providers.

Out of the 74 assigned, the author eventually saw 61.

Of these 61 patients, twenty-eight patients were found not to have COPD (Table 2). Of these 28 patients, 9 had never smoked a cigarette,

Figure 1: Flow chart illustrating selection of the subgroup used for analysis in the outpatient arm of the study.

Table 1: Outpatient referrals by diagnosis.

Referral diagnosis	Author (SO)	Others	Total	Percent
COPD	64	54	118	22.7
Emphysema	10	5	15	2.89
Dyspnea	39	32	71	13.68
Asthma	22	43	65	12.52
Lung nodule	21	7	28	5.39
Cough	16	27	43	8.28
Not documented	8	14	22	4.23
Lung cancer	11	2	13	2.5
Lung Mass	8	2	10	1.92
Hypoxemic respiratory failure	5	8	13	2.5
Abnormal chest CT scan	5	7	12	2.31
Pre-op	7	3	10	1.92
Pneumonia	5	4	9	1.73
Amyotropic lateral sclerosis/myotonic dystrophy	6	2	8	1.54
Pulmonary fibrosis	4	3	7	1.34

but 1 had smoked marijuana. The other 33 patients had accurate COPD diagnoses (Table 3). Hence, 46% of the patients referred with a COPD diagnosis did not have COPD on our workup.

The patients with a final diagnosis of COPD were older, more likely to be smokers, and had more pack-years of smoking history than those with an alternate diagnosis. There was no difference in sex between the two groups (Table 4).

The 30-day readmission matrix showed that, during the 3-year period from January 2015 to March 2018, there were a total of 4583 admissions (Figure 2) and 444 30-day all-cause readmissions for the 6 penalized diagnoses (Table 5).

There were total 615 COPD admissions, including 88 readmission cases involving 75 patients (Table 6). Of these readmission cases, only 38 cases had either COPD as the primary diagnosis or respiratory failure as primary with AECOPD as a secondary diagnosis during readmission. Thus, 50 readmission cases were due to causes other than COPD (Figure 2).

The mean age was 70 years for males and 67 years for females. Forty-four patients had undergone PFT or spirometry and were seen in the network affiliated with the hospital by a board-certified pulmonologist or an experienced physician assistant. Thirty-one patients were not referred to a pulmonary clinic in the network and PFT/spirometry were not available for those patients. Out of these 44 patients, 34 patients had confirmed COPD based on their spirometry and smoking history obtained on chart review. Ten patients did not have COPD. The FEV1/FVC ratio, FEV1, and COPD stage are presented in Table 7.

There were no differences in the age and sex distribution between the groups, but the FEV1/FVC ratio, absolute FEV1 in milliliters, and predicted FEV1 as a percentage were significantly lower in the patients with COPD than in those without.

There were 53 readmissions for these 44 patients. There were 41 readmissions for the 34 patients confirmed with COPD; 2 patients had 3 readmissions, and 3 had 2 readmissions. Ten patients who did not have COPD accounted for 12 readmissions because 1 patient

Table 2: Other diagnoses after work up.

S.N0	Referral Diagnosis	Age (years)	Fev1/FVC ratio[α]	Gender	Smoking history (pack-years)	Final diagnosis or impression/comments
1	COPD	63	75	M	25	Unknown
2	COPD Exacerbation	68	83	F	38	Asthma
3	COPD	54	79	F	41	Unknown
4	COPD	42	72	M	Never smoker	Lingular PNA
5	COPD	63	74	M	48	Lingular PNA
6	Emphysema	74	79	M	Never smoker	Chronic indolent infection causing cough, scarring
7	COPD	76	76	M	20	Unknown
8	COPD	60	74	F	47	Dyspnea at rest, not with exertion
9	COPD	54	86	F	Marijuana	Mild asthma, positive bronchodilator response
10	COPD	59	81	M	40	Deconditioning, weight 253 pounds
11	Emphysema	77	67,73	F	Never smoker	Asthma, reversible obstruction, positive bronchodilator response for FEV1
12	COPD	43	71	M	26	Asthma
13	COPD	67	65,72	M	Never smoker	Asthma, reversible obstruction
14	Emphysema	64	78	F	45	Normal coronaries, mild symptoms suggestive for asthma
15	COPD	63	81	F	45	Asthma based on history
16	COPD	82	73	F	19	Paralyzed and elevated right hemidiaphragm
17	COPD	76	70	M	12	Equivocal for COPD
18	COPD	58	75	M	45	Usual interstitial pneumonitis
19	COPD	59	81	M	40	Asthma
20	COPD	62	81	M	5	Denied dyspnea during clinic visit
21	COPD	61	61,64	M	Never smoker	Asthma since 1997
22	COPD	67	79	F	Never smoker	Cough variant asthma, 24% and 450 cc increase in FEv1.
23	COPD	68	76	F	9	Acute bronchitis, resolved by the time of visit
24	COPD	56	59,73	M	Never smoker	Mild intermittent asthma
25	COPD-asthma	59	72	M	Never smoker	Mild intermittent asthma
26	COPD	68	64,66	F	35	Dyspnea on hiking, climbing mountains
27	COPD	63	50,56	F	Never smoker	Sarcoid, asthma
28	COPD	66	72	M	27	Non ischemic cardiomyopathy

[α]Only post bronchodilator Fev1/FVC ratio is provided for all the patients. If pre-bronchodilator ratio was <70 then both pre- and post-ratios are provided.
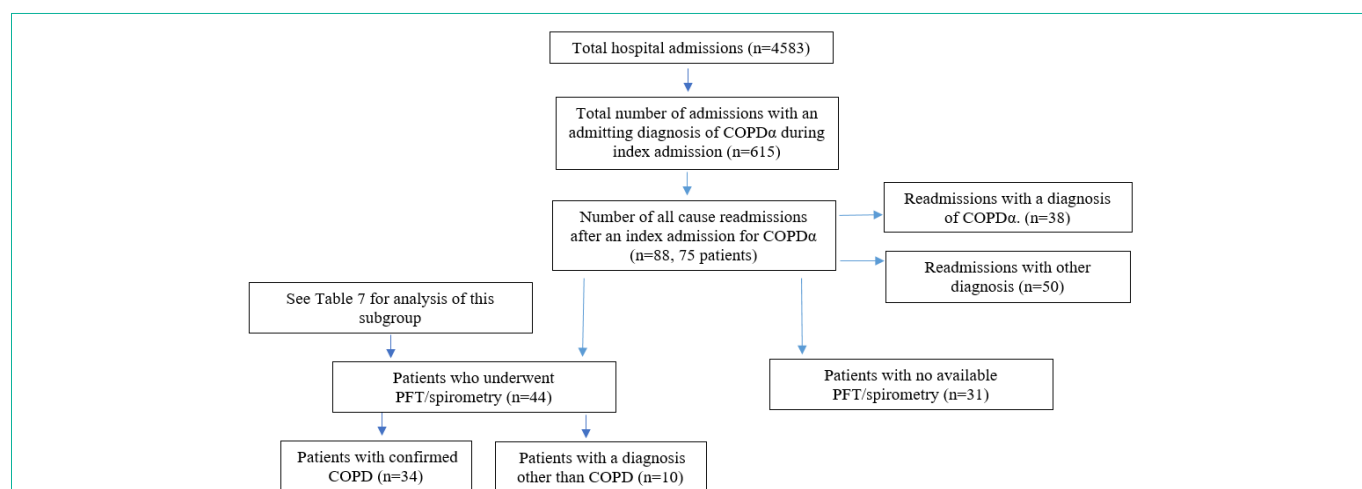
Figure 2: Flow chart illustrating selection of subgroup selection for analysis in the inpatient arm of the study.
[α]Primary diagnosis of COPD or primary diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of chronic obstructive pulmonary disease.

Table 3: COPD referrals, which were confirmed as COPD after work up.

S.NO.	Referral Diagnosis	Gender	Age	Fev1/FVC ratio	Fev1	Smoking pack-years	Final Diagnosis
1	COPD	F	61	41	3	32	COPD
2	COPD	M	62	61	3	38	COPD
3	COPD	F	73	26	4	128	COPD
4	COPD	M	78	34	3	41	COPD
5	COPD	F	65	38	4	41	COPD
6	COPD	M	52	64	2	19	COPD
7	COPD	M	72	66	2	40	COPD
8	COPD	M	72	53	3	96	COPD
9	COPD	F	59	64	3	50	COPD
10	COPD	M	79	67	1	58	COPD
11	COPD	F	61	35	4	40	COPD
12	COPD	M	61	57	2	135	COPD
13	COPD	M	72	60	2	58	COPD
14	COPD	F	57	60	2	36	COPD with asthma
15	COPD	F	80	63	2	30	COPD
16	COPD, asbestosis	M	80	63	3	30	COPD
17	COPD, pre-op clearance	M	79	28	4	75	COPD
18	COPD	F	62	38	2	18	COPD
19	COPD	M	57	66	2	76	COPD
20	COPD	M	71	38	4	159	COPD
21	COPD	M	62	61	2	27	COPD with asthma
22	COPD	M	80	53	2	91	COPD
23	Emphysema	F	69	67	2	50	COPD
24	COPD	M	65	46	3	50	COPD
25	COPD	F	67	67	2	42	COPD
26	COPD	M	69	64	2	128	COPD
27	COPD	M	68	58	2	65	COPD
28	COPD, pre-op clearance	M	61	46	2	44	COPD
29	COPD	M	67	59	2	51	COPD
30	COPD	M	63	24	4	46	COPD
31	COPD	F	75	36	3	38	COPD
23	COPD	M	69	42	3	48	COPD
33	COPD	M	76	65	3	44	COPD with asthma

Table 4: Patient characteristics by confirmed COPD versus other diagnoses.

	Confirmed COPD (n=33)	Other diagnosis (n=28)	test$^\alpha$	P-value
Gender				
Male n (%)	22 (66.7)	16 (57.1)	χ^2	0.444
Female	11	12		
Age M (SD)	68.0 (7.7)	63.3 (9.2)$^\beta$		0.033
Smoking history n (%)	33 (100)	19 (70.3)$^\beta$	p	<0.001
Smoking pack-years M-(SD)	58.3 (35.0)	30.9 (13.8)	U	0.001
Fev1/FVC ratio M (SD)	51.8 (13.8)	74.7 (6.2)	t	<0.001

$^\alpha$Test χ^2 = Chi-Square; t = independent t-test; p = Fisher's exact test; U = Mann-Whitney U-test
$^\beta$One patient who only smoked marijuana was excluded from the smoking comparisons

Table 5: Penalized readmissions by diagnosis (inpatient).

S.NO	Diagnosis	Total	Readmits	Percentage readmits
1	PNA[α]	1157	134	11.5
2	TKA/THA[β]	1135	29	2.55
3	Heart failure	716	118	16.4
4	COPD	615	88	14.3
	COPD Medicare[*]	365	53	14.5
5	CABG[†]	236	25	10.5
6	AMI[‡]	724	50	6.9
Total		4583	444	9.68

[α]PNA, Pneumonia.
[β]TKA, total knee arthroplasty, THA, total hip arthroplasty.
[*]Medicare data are a subgroup of S.NO 4 COPD.
[†]CABG, coronary artery bypass grafting.
[‡]AMI, acute myocardial infarction.

Table 6: Readmission episodes by gender and recurrence.[α]

	No. of patients[α]	Total episodes
Males (n=31)		
1 re-admission	28	28
2 re-admissions	1	2
3 re-admissions	2	6
Females (n=44)		
1 re-admission	38	38
2 re-admissions	4	8
3 re-admissions	2	6
Total	75	88

[α]Recurrence: Repeat readmission episode for the same patient.

Table 7: Characteristics of inpatients with confirmed COPD versus other diagnosis.

	Other diagnosis (n = 10)	Confirmed COPD (n = 34)	test[α]	*p value*
Gender				
Male n (%)	4 (38.2)	13 (40.0)	p	1
Female n (%)	6	21		
Age in years M (SD)	68.6(20.7)	70.9(10.5)	t	0.637
Fev1/FVC ratio-M (SD)	75.2(6.9)	45.1 (11.6)	t	<0.001
Fev1 absolute(mls)-M (SD)	1818.0(695.3)	948.5(376.1)	U	0.001
FEV1 percent predicted	69.8(20.7)	40.4(15.3)	t	<0.001
COPD stage				
I		1		
2		8		
3		18		
4		7		
Other Diagnosis	Restrictive, 2			
	Asthma, 2			
	ILD, 1			
	Cough, 1			
	Diastolic dysfunction, 1			
	Tracheal-stenosis, 1			
	Cystic fibrosis, 1			
	Trapped lung, 1			

[α]*p* = Fisher's exact test; t = independent *t*-test; *U* = Mann–Whitney U test.

was readmitted thrice. Hence, there were 12 readmissions out of 53 over 3 years, which was attributed to COPD overdiagnosis. Correct diagnosis could have led to a 22.6% decrease in admissions attributable to COPD. Of these 10 patients, 7 had Medicare as their primary insurance, 2 had Medicaid, and 1 had Blue Cross of Montana.

Discussion

In the US, there are 1.5 million emergency department visits and 725,000 hospital admissions for COPD each year, with a health care cost of about $60 billion [20,21]. Among Medicare patients, 17.6% are readmitted ≤30 days of discharge, which increases to approximately 20% for COPD patients. The HRRP reduces payments to hospitals with excess COPD readmissions, with a current reduction cap of 3%. The program goal is to improve health care by linking payment to hospital care quality [1]. Program critics argue that the program does not account for differences in the socioeconomic status between hospitals, penalties are too large, and hospitals cannot improve patients' compliance [22]. The hospitals that must pay HRRP penalties serve vulnerable populations with many low-income patients [23]. To address these concerns and achieve more equitable distribution of penalties, the Center for Medicare and Medicaid services changed the methodology for payment reduction [2,24]. Starting in 2019, the hospital performance is assessed relative to that of other hospitals with similar proportions of patients eligible for Medicare and full-benefit Medicaid [2]. Currently, excess readmissions are measured by the excess readmission ratio [5].

Despite the penalties for COPD readmission, hospitals may be incurring those penalties for patients admitted with other cardiorespiratory diseases because of COPD overdiagnosis. As found in our study, COPD overdiagnosis is prevalent in both new referrals and readmissions. This self-caused penalty is caused by physicians not using validated COPD criteria in initial assessments. In our experience, many non-pulmonary physicians "diagnose" COPD according to the patient's history of cough, breathlessness, and smoking without using spirometric data. This approach is in striking contrast with the diagnosis of congestive heart failure, commonly by echocardiography [25]. Approximately half of primary care physicians are unaware of the COPD GOLD guidelines and use clinical criteria to diagnose COPD because they think that spirometry is unnecessary [26,27].

The reason for the underuse of spirometry to diagnose the etiology of dyspnea may be a lack of proper training [27]. Many physicians do not know the indications of spirometry or how to order one [28]. We believe that underuse could also be because misdiagnosis is not directly life threatening. For immediate life-threatening conditions, such as pulmonary embolism or myocardial infarction, the issue is over-testing [29,30] and not necessarily overdiagnosis by clinicians without proper testing.

Most clinicians believe that patients are too weak to undergo a hospital PFT; there may be a difference in the numbers obtained during an exacerbation and in the outpatient setting. However, several recent

studies found that a hospital spirometry prior to discharge was not different from one during clinical stability and inpatient spirometry provided good accuracy to predict outpatient airflow obstruction, although it overestimated severity [31,32]. Even if inpatient-setting spirometry may overdiagnose COPD in a small number of patients [31], the benefit in eliminating many erroneous COPD diagnoses will help allocate hospital resources for investigating the true diagnosis.

Another reason for overdiagnosis could be that COPD is more common than many other pulmonary conditions, such as interstitial lung diseases [33]. Providing a prescription for an inhaler to treat "COPD" is much quicker [34] than investigating comorbidities, such as obesity or cardiac issues, or testing for interstitial lung diseases in a busy practice. Hence, COPD is used very liberally as a catchall for all respiratory ailments.

The impact of COPD overdiagnosis is not limited to incurring avoidable penalties for readmissions. Overtreatment of COPD has adverse health consequences in terms of drug-related adverse effects and potential financial costs [35]. Additionally, treatment of the true diagnosis is delayed. Lack of proper treatment between admissions may itself contribute to readmission. In the current insurance milieu, documenting spirometry data in COPD exacerbations should be a part of history taking for patients admitted for COPD exacerbation. If no PFT data is available, spirometry should perhaps be a part of inpatient COPD management.

All other efforts to improve COPD management during the index hospitalization and post-discharge periods may not reduce "COPD readmission". As observed in our study, in 50 of 88 COPD readmission episodes the admitting diagnosis during the readmission episode, was not COPD (Figure 2) and included conditions unrelated to respiratory diseases, like cellulitis and urinary tract infection. However, since the admitting diagnosis during the index admission was COPD, those readmission episodes were still subject to financial penalties. Hence, better control of COPD alone during the index admission or post hospital discharge may prove futile in preventing a readmission. A more effective strategy would be to avoid COPD overdiagnosis at the index admission or in the outpatient setting. In our study, COPD overdiagnosis resulted in 29% excess readmissions for COPD. The national COPD readmission rate is 19.5%. The latest COPD readmission rate for the hospital 14.5%, is no different than the HRRP's "expected readmission rate" as the mean national readmission rate [36], and it has stayed below the expected rate since the penalty inception despite overdiagnosis.

Eliminating the readmission load due to COPD overdiagnosis may not be difficult. Many hospitals have established a COPD readmission team led by a pulmonologist. A COPD navigator who is a either a nurse, nurse practitioner, respiratory therapist, or technician from the PFT lab can be assigned to screen all inpatient charts of patients admitted with a diagnosis. If the patient has had a prior PFT or spirometry with a post-bronchodilator FEV1/FVC ratio ≥70, the attending physician should be made aware, which may cost fewer resources than the number some hospitals assign for pulmonary consultations with every COPD patient. However, this measure will not eliminate all patients without COPD because some of the PFT/spirometry done at other hospitals or out-of-network clinics may not be available.

Absence of COPD essentially rules out a COPD exacerbation diagnosis. However, a correct COPD diagnosis alone does not necessarily mean that a dyspneic, hypoxemic, or hypercarbic patient is in COPD exacerbation because other comorbidities such as congestive heart failure and untreated obstructive sleep apnea are frequently present [37], and some may cause a hospital admission in a COPD patient without causing COPD exacerbation [38]. Our study had several strengths. We evaluated two different settings of COPD overdiagnosis, outpatient referrals to the pulmonary clinic and inpatient readmissions, and found that COPD was overdiagnosed in both settings. We found that one single intervention, correcting the diagnosis, could result in a 22.6% reduction in readmissions attributable to COPD.

The study limitations were its retrospective nature that relied on chart review, which limited the sample size because PFT/spirometry was not available on all the charts in the study's inpatient arm. Only in 53 readmissions (44 patients) out of 88 could we determine if patients had a true COPD diagnosis or were overdiagnosed.

However, only a retrospective study design is more suited to uncover the gravity of "COPD overdiagnosis" and its true effect on inflation of readmission numbers.

The study was conducted at a community hospital in North Central Montana. The age-adjusted prevalence rate of COPD in Montana of 5.4% is similar to the national average of 5.9% [39]. Despite the similar rates, demographics for COPD patients are not representative of a typical US population because the survey that provided this prevalence rate did not include data for minorities because of the low numbers of African American and Hispanic responders [38]. Additionally, the most current report from the Center for Medicare and Medicaid services shows that none of the Montana Hospitals was penalized for COPD readmission [36], whereas 83% of US hospitals received some penalties for the six penalized diagnoses [40], the readmission rate across all-cause readmission is among the six lowest of states [41]. In terms of avoiding penalties, Montana has fared better than all but one or two states in the past 5 years [42,43]. These factors raise the question of whether the findings are applicable to other states.

Conclusion

In the HRRP era in which the COPD readmission penalties are at their maximal rate, hospitals need to strongly consider implementing the GOLD guidelines and inpatient spirometries to ensure a correct diagnosis of the underlying etiology of dyspnea and minimize self-caused penalties.

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Author Contributions

SO takes full responsibility for the manuscript content, data integrity, and data analysis accuracy.

SP contributed substantially to the study design, data entry, and writing of the manuscript.

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