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Pulmonary Rehabilitation Use in Older Adults with Chronic Obstructive Pulmonary Disease, 2003-2012

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Structured Abstract

Purpose—To assess the trends in pulmonary rehabilitation (PR) use and factors associated with its use in older adults with chronic obstructive pulmonary disease (COPD) from 2003-2012.

Methods—We examined Medicare beneficiaries with COPD who received PR from January 1, 2003 to December 31, 2012. COPD subjects were identified by: 1) 2 outpatient visits >30 days apart within one year with an encounter diagnosis of COPD; or 2) an acute care hospitalization with COPD as the primary diagnosis or an acute respiratory failure primary diagnosis with a secondary discharge diagnosis of COPD. PR was the study outcome identified by healthcare common procedure coding system (HCPCS) codes G0237, G0238, G0239, G0424 (after year 2010) or current procedural terminology CPT codes (97001, 97003, 97110, 97116, 97124, 97139, 97150, 97530, 97535, 97537) in a calendar year.

Results—Subjects with COPD who received PR increased from 2.6% in 2003 to 3.7% in 2012 (p-value 0.001). In a multivariable analysis, factors associated with receipt of PR were younger age, non-Hispanic white race, high socioeconomic status, multiple comorbidities (OR 1.20; 95% CI: 1.13-1.27) and evaluation by a pulmonary physician (OR 2.23; 95% CI: 2.13-2.33). Increase in PR use was attributed to prior users rather than new users of PR.

Conclusions—The use of PR in unique patients with COPD remains low.

Keywords

chronic obstructive pulmonary disease; pulmonary rehabilitation

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Introduction

Pulmonary rehabilitation (PR) is a non-pharmacologic treatment program targeting the systemic manifestations of chronic obstructive pulmonary disease (COPD). It offers a comprehensive, integrative approach with goals to relieve symptoms, halt systemic manifestations related to the disease and impact behavior change through education for self-management beyond the duration of the program.

Benefits of PR include reduced symptoms of dyspnea^{1,2}, increased exercise capacity^{2,3}, improved health related quality of life (QOL)^{3,4}, optimized self-management, increased participation in daily life² and reduced health care resource utilization³. Regardless of severity of obstruction, any symptomatic patients with COPD have shown similar improvement in outcomes.

Although first defined in 1974, PR continues to evolve and numerous professional societies have drafted official statements for the use of PR in COPD⁵⁻⁷. Moreover, PR was endorsed as standard therapy for COPD by the Global Initiative for Obstructive Lung Disease (GOLD)⁸; the National Emphysema Treatment Trial (NETT) incorporated PR in 2003 as a requirement for patients referred for lung volume reduction surgery (LVRS)⁹. However, its widespread use outside of NETT remains poorly understood.

There are no national studies describing the current use of PR among patients with COPD in the United States. Using a 5% national sample of fee-for-service Medicare beneficiaries, we examined national trends and factors associated with the use of PR in older adults with COPD between 2003 and 2012. We hypothesize an increase in PR in patients with COPD after 2010, the year Centers for Medicare and Medicaid Services (CMS) approved PR services.

Methods

Data Source

This is a retrospective study of PR use in subjects with COPD using a 5% Medicare beneficiary population, 2003–2012. Over 98% of adults in the United States age ≥ 65 years are enrolled in Medicare, which comprises >45 million beneficiaries. The CMS selects a random sample of 5% Medicare beneficiaries based on the eighth and ninth digits (05, 20, 45, 70, 95) of their health insurance claim number and this standard data available for research purposes has been shown to be representative of the whole cohort¹⁰.

This study was approved by the University of Texas Medical Branch Institutional Review Board and informed consent was not obtained due to the nature of the study. All records were de-identified prior to analysis. Data from multiple files were used for this study: 1) Denominator File (Medicare enrollment information and demographic data); 2) Medicare Provider Analysis and Review file (claims for hospital inpatient and skilled nursing facility stays); 3) Outpatient Standard Analytic File (hospital outpatient services); and 4) 100% Physician/Supplier File (physicians and other medical services)¹⁰.

Study Cohort

A patient met the diagnosis of COPD who had any of the following: 1) at least two outpatient or consultation visits (Evaluation and Management [E&M] codes 99201-99205, 99211-99215) with an encounter diagnosis of COPD at least 30 days apart within a year; or 2) one acute care hospitalization with a primary discharge diagnosis of COPD based on the following International Classification of Diseases, 9th revision (ICD-9) codes: 491.x (chronic bronchitis), 492.x (emphysema) or 496 (chronic airway obstruction); or 3) an acute care hospitalization for respiratory failure (ICD-9 codes 518.81, 518.82, 518.84) as the primary discharge diagnosis and COPD listed as the secondary diagnosis. The index date was defined as the earliest COPD encounter during the calendar year.

A separate denominator file of beneficiaries with COPD was created for each calendar year (2003-2012). Each file was composed of participants in the year of interest who: 1) had a diagnosis of COPD; 2) were age ≥ 66 years; 3) had complete Medicare enrollment (Part A, Part B) in the year prior to and the year of interest or until death; 4) were not enrolled in a health maintenance organization (HMO); 5) were not a resident of a nursing facility in the year before and the year of interest or until death; and 6) and being a resident in one of nine United States geographic regions.

Variables

Medicare enrollment files were used to categorize subjects by age (66–74, 75–84, ≥ 85 years), gender (male, female) and race/ethnicity (White, Black and Other). Medicaid eligibility (state buy-in) in the enrollment file was used as a proxy for low socioeconomic status. A comorbidity score (0, 1, 2, ≥ 3) was generated using the Elixhauser comorbidity score (excluding COPD) from inpatient and outpatient billing data^{11,12}. Geographic region was divided into 9 CMS regions.

Outpatient physician visits to a primary care physician (PCP) or to a pulmonary specialist during the 365 days prior to the index date, defined as the first visit with COPD, were calculated. PCPs include physicians in any of the following specialties: family medicine, general practice, internal medicine and geriatrics. Beneficiaries who had a PCP visit and a pulmonary physician visit were considered as being co-managed by a PCP and a pulmonary specialist; those who had a visit to a non-PCP or a non-pulmonary physician were considered as having “other” physician.

Outcome Measure

Our outcome of interest was unique days of PR performed in each calendar year of interest for subjects with COPD. PR was identified through the healthcare common procedure coding system (HCPCS) codes G0237, G0238, G0239, G0424 (after year 2010) or the CPT codes 97001, 97003, 97110, 97116, 97124, 97139, 97150, 97530, 97535, 97537 with primary ICD-9 diagnosis codes 491.x, 492.x, or 496.x.

Statistical Analysis

Patient characteristics were summarized from 2003-2012 using counts and percentages of categorical variables. A generalized estimate equation with binomial distribution model

analysis was used to assess the trend in PR utilization adjusted for patient characteristics (age, gender, race, region and comorbidity) and health care measures (type of provider) and accounted for the cluster effect of patient. A patient with COPD can be eligible for PR in each year. We randomly selected one hospital per patient per year to examine the receipt of PR use after hospitalization for COPD. All analyses were performed using SAS version 9.2 (SAS Inc., Cary, NC). All reported p-values were two-sided with $p < 0.05$ considered statistically significant.

Results

Baseline characteristics of the study cohort in select years are presented in Table 1. The number of COPD beneficiaries remained stable overall during the study period from 33,526 to 33,446 subjects; however, the number of beneficiaries with COPD utilizing PR increased from 870 subjects in 2003 to 1239 subjects in 2012. Overall, the percentage of COPD subjects utilizing PR remains low: only 3.70% in 2012.

The largest percentage increases in PR use from 2003 to 2012 were in individuals older than 75 years, males, those of black race and those with more co-morbidities and higher socioeconomic status. However, these increases were of small magnitude. Geographically, PR use in COPD subjects increased across all regions from 2003 to 2012, except in the West South Central region, where it decreased from 2.72% to 2.66%. Increase in PR use varied from 0.27% in the East South Central regions to 2.42% in the Mountain region.

The majority of subjects with COPD were managed by a PCP alone or co-managed with a pulmonary physician (84.8% in 2012). The largest percentage of subjects who used PR were managed by a pulmonary physician alone or co-managed with a PCP (89.2% in 2012). Subjects co-managed by a PCP and a pulmonary physician showed the largest percentage increase in use of PR over time.

Table 2 shows the number of days with PR claims per subject who received PR by calendar year over the study period. Among patients who received PR, the majority of subjects participated in >8 PR days throughout the study period. The percent of subjects participating in 1-4 and >8 PR days increased slightly over the study period ($<1\%$). Subjects receiving 5-8 PR days decreased from 14.37% to 12.83% during the study period.

Table 3 presents the multivariable analysis of factors associated with PR use in subjects with COPD. Younger subjects (66-74 years), males, those of higher socioeconomic class and those with more comorbidities had higher odds of participating in PR. After adjusting for other relevant factors, compared to 2003, subjects in 2012 had 35% higher odds (odds ratio [OR] 1.35, 95% Confidence Interval [CI] 1.24-1.48) of participating in PR. Beneficiaries co-managed by both a PCP and a pulmonary physician had a significantly increased odds of PR participation (OR 2.23; 95% CI: 2.13-2.33) over those seen by a PCP only.

Finally we examined the percentage of subjects who participated in PR within 30 days after a hospitalization for COPD. Only 0.59% in 2003 and 0.62% in 2012 had a claim for PR after hospitalization for COPD suggesting most PR use is after 30 days of hospitalization and/or referred from an out-patient setting.

Discussion

We report use of PR in the Medicare population with COPD over time. From 2003 to 2012, subjects enrolled in PR modestly increased. Among those who participated (3.7%) in PR, most completed at least 8 sessions of the program. However, despite becoming an allowable benefit under Medicare since 2010, PR use remains low.

Our result of the low use of PR is consistent with prior international surveys of 1-2% use of PR in patients with COPD. The modest increase in PR noted in the study is likely multifactorial. The American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) estimates that there are over 1000 PR programs in the United States, a number which continues to grow¹³. However, an international study evaluating accessibility to PR programs estimated that 1.2% of the COPD population could receive PR if all available facilities operated at capacity¹⁴. The majority of PR programs are outpatient and affiliated with hospitals, but use of home and community based programs extend PR benefits beyond these, mainly in urban settings¹⁴. This is the likely explanation of regional variation of use of PR in our population.

Any symptomatic patient with lung disease qualifies for PR; however, specific circumstances should prompt PR referral. Recent data indicate an increase in oxygen therapy since 2001 as over 40% of COPD subjects had at least one durable medical equipment claim for oxygen by 2010¹⁵. Prescription of oxygen should serve as a reminder to consider PR. Patients with a history of COPD exacerbation have increased odds of future exacerbations, which is also the most common reason for PR non-adherence^{16,17}. Referral to PR following a recent COPD exacerbation is safe and reduces hospital admission, emergency room (ED) visits and unscheduled physician visits¹⁸. Only 0.62% of patients in 2012 had a claim of PR after hospitalization for COPD in our cohort. This may represent an opportunity to improve disease management by early referral to a PR program. In contrast, prescription sales of COPD inhalers increased from 6% to up to 30% over the last decade; however, the use of PR remains low¹⁹. PR referral should be considered when adding long acting bronchodilators and for patients hospitalized for acute exacerbation of COPD.

Several factors need to be addressed in order to increase PR participation. Less than 25% of COPD patients are evaluated by a pulmonary physician, who comprise the majority of PR referrals^{14,20}. Primary care physicians diagnose and manage the majority of patients with COPD. However, a recent survey showed that, although 32% had PR available, only 3% of PCPs thought PR was beneficial for patients and were less likely to refer patients to PR²⁰⁻²². Other cited reasons for low PCP referral were lack of PR awareness, unclear referral process and questioning the need to do more to promote exercise behavior change²³. Patient factors associated with low PR participation include belief that their disease was too mild or too severe to benefit from PR, fear that PR would be detrimental to their health or inability to attend related to lack of transportation or social support^{16,24,25}. Promoting PR will require a multifactorial approach to include physician and patient education, improved program access and structures to encourage enrollment and adherence.

PR clearly has improved patient centered outcomes but it also has a role in the changing environment of healthcare reimbursement. Starting FY2015, CMS added COPD to the list of conditions subject to penalties for readmissions under the Hospital Readmission Reduction Program²⁶. Additionally, the first phase of implementation of the Bundled Payments for Care Improvement initiative began in 2013. Compared to the traditional fee-for-service reimbursement model, this model links a single payment to the multiple services beneficiaries receive during an initial and subsequent related episodes of care²⁷. The majority of the economic burden in caring for COPD is due to hospitalization for acute exacerbations^{28,29}. As PR is shown to reduce the COPD-related ED visits, hospitalizations and unscheduled physician visits, PR provides an overall cost-effective management strategy for a health care system^{3,8,28,30,31}. As we shift from volume- to value-based reimbursement, it is prudent for every health system to offer hospital- or community-based PR services to its patients with COPD. Products are under development to offer low cost PR applications for patients who are technology savvy and/or located in a healthcare system without PR in the vicinity.

Strengths of the study include large sample size and a nationally representative cohort of subjects. There are several limitations in our study. Our data does not identify the number of suitable patients with COPD who might benefit from PR. However, COPD management guidelines suggest that any COPD patient with respiratory symptoms, reduced exercise tolerance or restriction in activities because of the disease should be consider for PR referral^{5-8,30}. Administrative data also does not indicate the number of referrals, only the number of participating subjects. International survey data show that only 3-16% of suitable candidates with COPD are referred for PR and up to half of these referred patients never attend a single session of PR^{16,25}. Therefore, we cannot discern if the modest increase in PR may be due to a greater number of referred candidates or an inherent rise in PR sessions due to re-enrollment of past participants. Additionally, claims data can only indicate the number of sessions submitted for payment and does not give any information on the quality of PR programs. PR programs not certified by the AACVPR may not have a standardized practice or competencies. The use of PR prior to 2010 was based on HCPCS codes and may have been recommended for other reasons than COPD, such as congestive heart failure. However, even factoring in its use for non-COPD conditions, PR referral remains low. Moreover, after the introduction of the specific code G0424, we saw no substantial growth in the use of PR in patients with COPD. Due to the cross section nature of the study, a PR participant may be included in multiple years. The number of unique patients with COPD who initially participated in PR during our study period was 2.6% in 2003 and 2.88% in 2012 suggesting modest growth seems likely from repeat use than new referrals.

In conclusion, PR use in Medicare subjects with COPD, despite a modest increase, remains suboptimal.

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Alphabetical list of abbreviations

COPD	chronic obstructive pulmonary disease
PR	Pulmonary rehabilitation Introduction

Baseline Characteristics of Patient with COPD who did and did not receive Pulmonary Rehabilitation during 2003, 2008 and 2012 ^a

Table 1

	COPD patients: 2003				COPD patients: 2008				COPD patients: 2012			
	Total	PR	No-PR		Total	PR	No-PR		Total	PR	No-PR	
Overall	33526	870 (2.6)	32656 (97.4)		31142	1064 (3.2)	30078 (96.6)		33446	1239 (3.0)	32207 (96.0)	
Age, y												
66-74	16134	504 (3.1)	15630 (96.9)		14608	568 (3.9)	14040 (96.1)		14009	577 (4.1)	13432 (95.9)	
75-84	14464	336 (2.3)	14128 (97.7)		13183	439 (3.3)	12744 (96.7)		14498	547 (3.8)	13951 (96.2)	
85	2928	30 (1.0)	2898 (99.0)		3351	57 (1.7)	3294 (98.3)		4939	115 (2.3)	4824 (97.7)	
Sex												
Male	16652	394 (2.4)	16258 (97.6)		15311	541 (3.5)	14770 (96.5)		14953	586 (3.9)	14367 (96.1)	
Female	16874	476 (2.8)	16398 (97.2)		15831	523 (3.3)	15308 (96.7)		18493	653 (3.5)	17840 (96.5)	
Race												
White	30490	832 (2.7)	29658 (97.3)		28458	998 (3.5)	27460 (96.5)		30310	1151 (3.8)	29159 (96.2)	
Black	1842	26 (1.4)	1816 (98.6)		1544	47 (3.0)	1497 (97.0)		1858	66 (3.6)	1792 (96.4)	
Others	1194	12 (1.0)	1182 (99.0)		1140	19 (1.7)	1121 (98.3)		1278	22 (1.7)	1256 (98.3)	
Low socioeconomic status ^b												
No	27916	778 (2.8)	27138 (97.2)		26082	968 (3.7)	25114 (96.3)		27506	1119 (4.1)	26387 (95.9)	
Yes	5610	92 (1.6)	5518 (98.4)		5060	96 (1.9)	4964 (98.1)		5940	120 (2.0)	5820 (97.0)	
Elixhauser Comorbidity Score ^c												
0	8780	222 (2.5)	8558 (97.5)		5912	186 (3.2)	5726 (96.8)		5175	153 (3.0)	5022 (97.0)	
1	9131	234 (2.6)	8897 (97.4)		7566	225 (3.0)	7341 (97.0)		7310	254 (3.5)	7056 (96.5)	
2	6562	162 (2.5)	6400 (97.5)		6648	240 (3.6)	6408 (96.4)		7015	259 (3.7)	6756 (96.3)	
3	9053	252 (2.8)	8801 (97.2)		11016	413 (3.8)	10603 (96.2)		13946	573 (4.1)	13373 (95.9)	
CMS Region												
East North Central	5913	236 (4.0)	5677 (96.0)		5176	245 (4.7)	4931 (95.3)		5495	257 (4.7)	5238 (95.3)	
East South Central	2801	62 (2.2)	2739 (97.8)		2634	71 (2.7)	2563 (97.3)		2907	72 (2.5)	2835 (97.5)	
Middle Atlantic	4917	101 (2.1)	4816 (97.9)		4337	125 (2.9)	4212 (97.1)		4453	144 (3.2)	4309 (96.8)	
Mountain	1629	38 (2.3)	1591 (97.7)		1633	35 (2.1)	1598 (97.9)		1749	83 (4.8)	1666 (95.2)	

	COPD patients: 2003				COPD patients: 2008				COPD patients: 2012			
	Total	PR	No-PR		Total	PR	No-PR		Total	PR	No-PR	
New England	1661	50 (3.)	1611 (97.0)		1552	69 (4.4)	1483 (95.6)		1740	81 (4.7)	1659 (95.3)	
Pacific	2978	79 (2.7)	2899 (97.3)		2962	74 (2.5)	2888 (97.5)		3184	109 (3.4)	3075 (96.6)	
South Atlantic	7907	141 (1.8)	7766 (98.2)		7455	233 (3.1)	7222 (96.9)		8263	289 (3.5)	7974 (96.5)	
West North Central	2156	66 (3.1)	2090 (96.9)		2012	100 (5.0)	1912 (95.0)		1969	106 (5.4)	1863 (94.6)	
West South Central	3564	97 (2.7)	3467 (97.3)		3381	112 (3.3)	3269 (96.7)		3686	98 (2.7)	3588 (97.3)	
Provider												
PCP only	18600	321 (1.7)	18279 (98.3)		15371	366 (2.4)	15005 (97.6)		15040	372 (2.5)	14668 (97.5)	
PUL only	2989	94 (3.1)	2895 (96.9)		2618	97 (3.7)	2521 (96.3)		2682	98 (3.7)	2584 (96.3)	
PCP + PUL	9731	424 (4.4)	9307 (95.6)		10966	567 (5.2)	10399 (94.8)		13329	733 (5.5)	12596 (94.5)	
Others	2206	31 (1.4)	2175 (98.6)		2187	34 (1.5)	2153 (98.5)		2395	36 (1.5)	2359 (98.5)	

Abbreviations: CMS, Centers for Medicare and Medicaid Services; COPD, chronic obstructive pulmonary disease; PCP, primary care physician; PR, pulmonary rehabilitation; PUL, pulmonary physician.

^aData reported as number (%).

^bSocioeconomic status was based on whether the patient was eligible for state buy-in coverage provided by the Medicaid program for at least one month during the index year.

^cElixhauser comorbidity score components: chronic pulmonary disease, congestive heart failure, valvular disease, pulmonary circulation disorders, peripheral vascular disorders, hypertension, paralysis, other neurological disorders, diabetes-uncomplicated, diabetes-complicated, hypothyroidism, renal failure, liver disease, peptic ulcer disease excluding bleeding, AIDS (acquired immune deficiency syndrome), lymphoma, metastatic cancer, solid tumor without metastasis, rheumatoid arthritis/collagen vascular diseases, coagulopathy, obesity, weight loss, fluid and electrolyte disorders, blood loss anemia, deficiency anemia, alcohol abuse, drug abuse, psychoses, and depression.¹¹

Table 2
Number of Days of PR Utilization by Unique Patients with COPD Who Received any PR by Calendar Year: 2003-2012

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Patients with PR, n	870	1055	1083	1082	1058	1064	1207	1247	1260	1239
Days, %										
1 – 4	20.1	20.7	21.9	21.3	20.5	20.7	23.9	23.2	21.6	21.0
5 – 8	14.4	12.0	12.3	11.2	12.2	11.2	12.1	9.1	10.4	12.8
>8	65.5	67.3	65.8	67.5	67.3	68.1	64.0	67.7	68.0	66.2

Abbreviations: COPD, chronic obstructive pulmonary disease; PR, pulmonary rehabilitation.

Table 3
Multivariable analysis of factors associated with odds of receiving pulmonary rehabilitation (PR) in patients with COPD from 2003 to 2012

Variable	Model 1 Odds of PR (95% CI)	Model 2 Odds of PR (95% CI)
Diagnosed Year		
2003	Ref	Ref
2004	1.20 (1.10 – 1.31)	1.18 (1.08 – 1.29)
2005	1.23 (1.12 – 1.34)	1.20 (1.10 – 1.31)
2006	1.30 (1.19 – 1.42)	1.25 (1.14 – 1.37)
2007	1.32 (1.20 – 1.44)	1.25 (1.14 – 1.37)
2008	1.33 (1.22 – 1.46)	1.26 (1.15 – 1.38)
2009	1.39 (1.27 – 1.52)	1.33 (1.22 – 1.46)
2010	1.41 (1.29 – 1.53)	1.34 (1.23 – 1.46)
2011	1.42 (1.30 – 1.55)	1.34 (1.23 – 1.46)
2012	1.44 (1.32 – 1.57)	1.35 (1.24 – 1.48)
Age Group (years)		
66 - 74		Ref
75 - 84		0.83 (0.79 – 0.86)
85		0.50 (0.46 – 0.54)
Gender		
Female		Ref
Male		1.02 (0.97 – 1.06)
Race		
White		Ref
Black		0.82 (0.72 – 0.92)
Others		0.73 (0.61 – 0.86)
Low socioeconomic status		
No		Ref
Yes		0.59 (0.55 – 0.64)
Elixhauser Comorbidity		
0		Ref
1		1.02 (0.96 – 1.09)
2		1.10 (1.04 – 1.18)
3		1.20 (1.13 – 1.27)
Region		
New England		Ref
East North Central		1.03 (0.94 – 1.13)
East South Central		0.56 (0.50 – 0.64)

Variable	Model 1 Odds of PR (95% CI)	Model 2 Odds of PR (95% CI)
Middle Atlantic		0.60 (0.53 – 0.66)
Mountain		0.74 (0.65 – 0.84)
Pacific		0.77 (0.69 – 0.86)
South Atlantic		0.70 (0.64 – 0.77)
West North Central		1.08 (0.97 – 1.21)
West South Central		0.64 (0.57 – 0.72)
Provider		
PCP only		Ref
PUL only		1.51 (1.39 – 1.63)
PCP + PUL		2.23 (2.13 – 2.33)
Others		0.70 (0.62 – 0.78)

1. **PR** was identified through the healthcare common procedure coding system (HCPCS) codes (G0237, G0238, G0239) or the evaluation and management (E&M) codes (97001, 97003, 97110, 97116, 97124, 97139, 97150, 97530, 97535, 97537) with primary ICD-9 codes (491.x, 492.x, or 496.x);
2. A **Chronic Obstructive Pulmonary Disease (COPD)** diagnosis is defined as having International Classification of Diseases, ninth revision (ICD-9) codes 491.x [chronic bronchitis], 492.x [emphysema], or 496 [chronic airway obstruction];
3. **Socioeconomic status:** based on whether the patient was eligible for state buy-in coverage provided by the Medicaid program for at least one month during the index year;
4. **Elixhauser comorbidity** components: chronic pulmonary disease, congestive heart failure, valvular disease, pulmonary circulation disorders, peripheral vascular disorders, hypertension, paralysis, other neurological disorders, diabetes-uncomplicated, diabetes-complicated, hypothyroidism, renal failure, liver disease, peptic ulcer disease excluding bleeding, AIDS (acquired immune deficiency syndrome), lymphoma, metastatic cancer, solid tumor without metastasis, rheumatoid arthritis/collagen vascular diseases, coagulopathy, obesity, weight loss, fluid and electrolyte disorders, blood loss anemia, deficiency anemia, alcohol abuse, drug abuse, psychoses, and depression¹¹;
5. **Region:** Geographic region was divided into 9 CMS regions;
6. **Provider:** PCPs include family medicine, general practice, internal medicine and geriatrics. PUL = pulmonary physician; others include non-PCP or a non-pulmonary physician visits.