The Impact of a Home Respiratory Therapist to Reduce 30-Day Readmission Rates for Exacerbation of COPD

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BACKGROUND: In 2015, the Centers for Medicare and Medicaid Services limited payments to hospitals with high readmission rates for patients admitted with COPD exacerbation. Decreasing readmissions in this patient population improves patient health and decreases health care utilization of resources. We hypothesized a COPD disease management program delivered by a respiratory therapist (RT) in the patient's home may reduce readmission rates for COPD exacerbation. METHODS: We performed a pre/post interventional study comparing hospital readmissions for subjects with COPD exacerbation that received standard of care in the home versus an RT-led home COPD disease management program. Subjects discharged home from Atlantic Health System with COPD exacerbation were enrolled in the pre-intervention group. Subsequently, an evidence-based home COPD disease management program was implemented by an RT from At Home Medical in the home. The home COPD Disease Management Program was implemented from April 2017–September 2019, and this served as the post-intervention group. The primary end point was readmission rates at 30 d. Secondary end points included 60-d and 90-d readmission rates. RESULTS: A total of 1,093 participants were included in the study, 658 in the pre-intervention cohort and 435 participants in the post-intervention group. Approximately 22.3% (n = 147) of subjects in the pre-intervention group was readmitted within 30 d of discharge compared to 12.2% (n = 53) in the post-intervention group (P < .001). A reduction in 60-d (33.9% vs 12.0%, P < .001) and 90-d all-cause readmissions (43.5% vs 13.1%, P < .001) was also seen. Participation in the COPD Disease Management Program was significantly associated with decreased 30-, 60-, and 90-d readmission rates adjusting for age, gender, race, ethnicity, and smoking status (odds ratio 0.48 [95% CI 0.33–0.70]; odds ratio 0.26 [95% CI 0.18–0.38]; odds ratio 0.20 [95% CI 0.14–0.27];P < .001, for all 3 readmission rates). CONCLUSIONS: The COPD Disease Management Program is significantly associated with decreased readmission adjusting for demographics and smoking status. *Key words: respiratory therapy; COPD; hospital readmission; home care agency; Centers for Medicare and Medicaid Services; patient education; patient centered care; home visit program; adherence; home care program.* [Respir Care 2022;67(6):631–637. © 2022 Daedalus Enterprises]

Introduction

The Hospital Readmission Reduction Program, a Medicare value-based program, reduced payment to hospitals with excess readmissions starting in fiscal year 2013 with heart failure, pneumonia, and acute myocardial infarction.[1] In 2015, the Centers for Medicare and Medicaid Services (CMS) limited payments to hospitals with high readmission rates for patients admitted with COPD exacerbation and knee/hip replacement.[2] COPD remains the third most common cause of readmission among Medicare beneficiaries, occurring in 60% of patients within 1 year of hospital discharge and in 30% within 3 months of discharge.[3] In the United States, exacerbations of COPD leading to hospitalization account for $13.2 billion of the nearly $50 billion annual direct costs for COPD.[4]

Hospitalizations and mortality associated with COPD are caused by intermittent declines in respiratory symptoms such as shortness of breath. Health care systems can identify and alleviate risk factors to prevent readmissions. In the United States, approximately 19% of COPD patients are readmitted within 30 d. CMS has examined readmissions

as a measure of the quality of care given by health care systems. Globally, preventing readmissions among patients with COPD has been identified as a high-priority management process.[5]

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Health care systems and providers are expected to collaboratively direct clinical efforts to decrease hospital readmission rates, which is difficult due to the lack of clear agreement and evidence-based guidelines on how best to project and prevent 30-d readmissions.[5] Care bundles are evidence-based clinical interventions that ensure high-quality care is provided consistently across the course of health care.[5] COPD care bundles can help standardize medications patients receive for COPD exacerbations including antibiotics and steroids, education on disease state and inhaler devices, discharge instructions, and follow-up home care and provider appointments. Utilizing a care bundle and providing consistent care may improve patient outcomes. One study found that 30-d readmissions were lower in the bundle group compared to the placebo group (10.0% vs 38.1%, $P = .04$), and emergency department (ED) visits were reduced.[6] Although care bundles can be beneficial at providing consistent care, patients transitioning to home safely is equally important to preventing readmissions. Health coaching and education by a health care professional after a hospitalization, in the patient's home, can identify barriers earlier and improve treatment adherence. A patient- and family-centered approach providing comprehensive pulmonary services in the home after discharge is key to preventing readmissions.[7] The home COPD Disease Management Program integrates the key components of the ideal transitions of care framework that include discharge planning, communication of information, timeliness of information, medication safety, educating patients on self-management, community support, advance care planning, coordination with team members, managing symptoms post discharge, and follow-up care.[8] Multiple pulmonary interventions from hospital to home are required to support the hospital discharge transition.

QUICK LOOK

Current knowledge

In 2015, the Centers for Medicare and Medicaid Services limited payments to hospitals with high readmission rates for patients admitted with COPD exacerbation. COPD remains the third most common cause of readmission among Medicare beneficiaries, occurring in 60% of subjects within one year of hospital discharge and in 30% within 3 months of discharge. Problems that arise at the time of transition increase the risk for readmission when patients leave the hospital and return home. Studies have identified that home visits focusing on COPD disease management can reduce readmission rates in this population.

What this paper contributes to our knowledge

A respiratory therapist (RT)-led home COPD disease management program focused on a patient- and family-centered approach provided comprehensive pulmonary services in the home after discharge. Utilizing an evidence-based RT-led home COPD Disease Management Program approach in the post discharge period was efficacious in preventing recurrent hospitalizations. This original strategy implemented by an RT in the discharge period reduced 30-d, 60-d, and 90-d readmission rates.

Patient outcomes improve when patients have uninterrupted care transitions from one setting to another. For COPD exacerbations, these include availability to conduct home visits, reviewing pulmonary medication in the home, education on the COPD action plan and self-management, hospital referral to the respiratory therapist (RT), discussions regarding end-of-life issues such as intubation and mechanical ventilation, coordinating care in the home,

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The study was performed at Atlantic Health System locations (At Home Medical, Morristown Medical Center, Newton Medical Center, Hackettstown Medical Center, Chilton Medical Center, and Overlook Medical Center).

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Table 1. Baseline Demographics

	Pre-Intervention $n = 658$	Post-Intervention $n = 435$	P
Age, mean (SD)	76.58 (7.62)	77.3 (7.16)	.10
Gender			.25
Male	272 (41.34)	195 (44.83)	
Female	386 (58.66)	240 (55.17)	
Race			.001
Asian	5 (0.79)	5 (1.17)	
Black	24 (3.75)	1 (0.23)	
White	611 (96.37)	422 (98.60)	
Ethnicity			
Hispanic	9 (1.37)	13 (2.99)	.31
Non-Hispanic	454 (69.00)	422 (97.01)	
Smoking Status			< .001
Never	79 (12.01)	28 (6.47)	
Current	114 (17.33)	42 (9.70)	
Former	417 (63.37)	363 (83.83)	

Data are presented as *n* (%) unless otherwise noted.

implementation of the COPD Assessment Test (CAT) at home to monitor for deterioration of respiratory symptoms, and confirming early pulmonary follow-up appointments.[8] We hypothesized education of timely identification of exacerbation symptoms and the delivery of short-acting medications can decrease the risk of hospital readmissions. Patient health coaching can improve treatment compliance as a key component of self-management approaches, which can be conducted during the home care visits. There are currently no studies demonstrating the effectiveness of home care visits post care bundle discharge to readmission rates. The objective of the study was to evaluate the effect of RT-lead home care visits on readmission rates following a COPD exacerbation.

Methods

A retrospective chart review was performed with a pre/post intervention design study comparing hospital readmissions for subjects with COPD exacerbation that received standard of care at home versus an RT-led COPD program. Subjects 65 y and older were included in the pre-intervention group if they had a diagnosis of COPD and were admitted to one of 5 hospitals in a New Jersey mid-size health care system from January 2016–March 2017. Subjects 65 y and older admitted from April 2017–September 2019 were included in the post-intervention group. Patients were excluded if they left against medical advice at the index discharge, died during the hospital admission, were transferred to another acute care hospital outside our health care system, received hospice care at discharge, refused home care, refused the COPD care bundle during hospitalization, or were unable to participate in the pulmonary education.

Subjects in the pre-intervention group received standard of care at the admission facility and were not provided scheduled follow-up home care at hospital discharge but may have received telehealth post discharge. Subjects in the post-intervention group received standard of care at the admission facility and were referred to home care at hospital discharge. Subjects were contacted via telephone within 2 business days of discharge, and an RT had 3 home visits over a 4-week period. Subjects may have qualified for an additional 1–2 home visits based on progress. Home care visits included COPD self-management education, COPD Action Plan, CAT, smoking cessation education, inhaler device training, proper medication reconciliation, importance of pulmonary rehabilitation, nutrition counseling, coping methods for anxiety and depression, and adherence to hospital discharge medications/instructions. The RT worked with subject's pulmonologist to overcome any barriers, and referrals to other providers were made based on need. Convenience sampling was used, and all subjects seen by the RT were included in the intervention group. The primary end point was the difference in composite risk of hospitalizations between the pre/post intervention groups in the 30 d following discharge. A secondary end point was the 60-d and 90-d rate of readmission.

Descriptive analyses were performed for baseline patient characteristics. P values were calculated using 2-sample t tests and chi-square or 2 proportions for categorical variables. 30-, 60-, and 90-d readmission rates were compared before and after intervention using 2-sample Poisson. Multivariable logistic regression was used to determine if the intervention was significantly associated with readmission, adjusting for demographics and baseline variable. Repeat analyses were performed on subsets of matched subjects based on significant demographic and baseline variables. $P < .05$ indicates statistical significance. All analyses were performed with Minitab version 17.1.0 (Minitab, State College, Pennsylvania). This study was approved by the Atlantic Health System Institutional Review Board.

Results

A total of 1,093 participants were included in the study, 658 in the pre-intervention cohort and 435 participants in the post-intervention group. There was a higher proportion of Black subjects and never or current smokers in the pre-intervention group The post-intervention group had a higher proportion of white subjects, with more former smokers. Other baseline demographics had no difference (Table 1). In the pre-intervention group, 22.3% ($n = 147$) of subjects was readmitted within 30 d of discharge compared 12.2% ($n = 53$) in the post-intervention group ($P <$

.001). There was also a reduction in 60-d (33.9% vs 12.0%, $P < .001$) and 90-d all-cause readmissions (43.5% vs 13.1%, $P < .001$) (Table 2). Receiving the intervention was significantly associated with decreased 30-, 60-, and 90-d readmission rates adjusting for age, gender, race, ethnicity, and smoking status (odds ratio [OR] 0.48 [95% CI 0.33–0.70]; OR 0.26 [95% CI 0.18–0.38]; OR 0.20 [95% CI 0.14–0.27], respectively; $P < .001$ for all rates) (Table 3).

Additional analyses using a subset of matched data included 852 subjects. Demographics and baseline variables were well balanced between the 2 groups (Table 4). Decreased post-intervention 30-, 60-, and 90-d readmission rates remained significantly less compared to the pre-intervention group ($P < .001$ for all rates) (Table 5). When adjusting for variables that were not matched in the data selection (adjusting for age, gender, and ethnicity only), receiving intervention was significantly associated with decreased readmission rates (OR 0.49 [95% CI 0.33–0.73]; OR 0.27 [95% CI 0.18–0.39]; OR 0.20 [95% CI 0.14–0.28]; $P < .001$ for all rates) (Table 6).

Table 2. Readmission Rates

	Pre-Intervention	Post-Intervention	*P*
30-d readmission	147 (22.3)	53 (12.2)	< .001
60-d readmission	223 (33.9)	52 (12.0)	< .001
90-d readmission	286 (43.8)	57 (13.1)	< .001

Data are presented as *n* (%).

Discussion

Although some COPD readmissions are unavoidable due to progression of disease or worsening of comorbidities, they may also result from an uncoordinated transition between the hospital to home.[9] In this study, we examined the role of home care on readmission rates with COPD subjects. Our research demonstrated a 10.1% absolute reduction in 30-d readmission when utilizing a COPD disease management program in the subject's home. There was also a significant reduction in 60-d and 90-d readmission, 21.9% and 30.7%,

Table 3. Intervention Regression Analyses

Independent Variable	30-d Readmission		60-d Readmission		90-d Readmission	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Intervention		< .001		< .001		< .001
No						
Yes	0.48 (0.33–0.71)		0.26 (0.18–0.38)		0.20 (0.14–0.27)	
Age	0.99 (0.97–1.02)	.67	1.00 (0.98–1.03)	.79	1.00 (0.98–1.02)	.98
Gender		.45		.21		.71
Male						
Female	0.87 (0.61–1.25)		0.81 (0.58–1.13)		1.06 (0.79–1.41)	
Race		.46		.89		.28
White						
Asian	2.41 (0.30–19.48)		1.61 (0.21–12.23)		0.24 (0.03–2.01)	
Black	1.61 (0.64–4.04)		1.08 (0.44–2.61)		0.86 (0.37–2.00)	
Ethnicity		.40		.36		Unavailable
Hispanic						
Non-Hispanic	2.87 (0.21–39.84)		2.95 (0.24–35.64)			
Smoking Status		.33		.50		.03
Never						
Current	0.75 (0.34–1.64)		0.75 (0.38–1.50)		0.74 (0.42–1.32)	
Former	1.11 (0.58–2.12)		0.99 (0.56–1.77)		1.28 (0.80–2.03)	

Data are presented as odds ratio (OR) and 95% CI.

Table 4. Demographics (Matched Data Subset)

	Pre-Intervention $n = 426$	Post-Intervention $n = 426$	*P*
Age, mean (SD)	76.74 (7.7)	77.28 (7.2)	.28
Gender			.53
Male	183 (43.0)	192 (45.1)	
Female	243 (57.0)	234 (54.9)	
Race			> .99
Asian	5 (1.7)	5 (1.7)	
Black	1 (0.2)	1 (0.2)	
White	420 (98.6)	420 (98.6)	
Ethnicity			.32
Hispanic	2 (0.7)	6 (1.4)	
Non-Hispanic	308 (99.4)	420 (98.6)	
Smoking Status			.96
Never	29 (6.8)	27 (6.3)	
Current	42 (9.9)	42 (9.9)	
Former	355 (83.3)	357 (83.8)	

Data are presented as *n* (%) unless otherwise noted.

Table 5. Readmission (Matched Data Subset)

	Pre-Intervention $n = 426$	Post-Intervention $n = 426$	*P*
30-d readmission	96 (22.5)	52 (12.2)	< .001
60-d readmission	145 (34.0)	51 (12.0)	< .001
90-d readmission	185 (43.4)	57 (13.4)	< .001

Data are presented as *n* (%).

respectively. The distribution of race and smoking status differed between before and after intervention groups, but the invention was found to be significantly associated with a decrease in 30-, 60-, and 90-d readmission rates in both analyses, using the full data set adjusting for all demographic and baseline variables and in the matched data subset adjusting for remaining nonmatched data variables. The home care program focused on providing comprehensive pulmonary services at home after discharge. Key components of the program included reviewing pulmonary medication safety, creating a COPD Action Plan, smoking cessation, referral to pulmonary rehabilitation, and appropriate follow-up. Similarly, Benzo and colleagues found interventions such as health coaching, COPD Action Plans, and brief exercise advice reduced readmission rates.[10]

In addition, the home care visits were done in a timely manner within 2 days of hospital discharge. RTs also provided frequent follow-up, with at least 3 visits within the first 30 d post discharge, along with communication to other disciplines and applicable referrals. Prior research has demonstrated that poor communication and lack of follow-up contribute to readmissions.[11]

The improvements in communication included effective pulmonary guidance in the home after discharge, confirmation of early out-patient follow-up within 7 days of discharge, increase patient and family engagement with the pulmonary discharge plans, and assessment of the affordability of inhaler therapies. The RT can help patients with home health goals such as improving symptom management and mitigating total health care expenditures by reducing acute care hospital readmissions.[12] The RT is key to the success of this initiative with a focus on the following

Table 6. Regression analysis (Matched Data Subset)

Independent Variable	30-d Readmission		60-d Readmission		90-d Readmission	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Intervention		< .001		< .001		< .001
No						
Yes	0.49 (0.33–0.73)		0.27 (0.18–0.39)		0.20 (0.14–0.28)	
Age	1.00 (0.97–1.02)	.78	1.01 (0.98–1.03)	.61	1.00 (0.98–1.02)	.88
Gender		.91		.59		.31
Male						
Female	0.98 (0.65–1.45)		0.90 (0.62–1.31)		1.18 (0.86–1.62)	
Ethnicity		.87		.63		Unavailable
Hispanic						
Non-Hispanic	1.19 (0.14–10.1)		1.67 (0.19–14.67)			

Data are presented as odds ratio (OR) and 95% CI.

educational objectives in the patient's home: (1) education on COPD after discharge, (2) completion of an individualized self-management COPD Action Plan, and (3) completion of the CAT.[13] It requires a complete understanding of respiratory therapy to facilitate a smooth transition between care in the hospital to that of managing a patient recovering from COPD exacerbation in the home.

Similarresearch by Silver et al[14] suggests that a comprehensive RT disease management program can be associated with reduced hospital readmissions and fewer hospital days from COPD exacerbations. The use of an RT-led home COPD disease management program and a COPD care bundle included criteria for appropriate patient selection and addressed all the needed home health care necessary to return the patient to a greater quality of life. This care allowed for RT management over a 4-week period in the home setting to decrease the potential for ED visits and hospitalizations.

Depression is an independent risk factor for both short- and long-term readmissions for COPD exacerbation and should be addressed with all patients.[15] The RT addressed smoking cessation and coping with anxiety and depression during home visits. Early pulmonary rehabilitation initiated following hospitalization for COPD has been associated with significantly improved patient mortality at 1 y; current evidence-based guidelines recommend that patients begin pulmonary rehabiitation within 3–4 weeks of hospitalization for COPD exacerbation.[16] Studies have demonstrated that a high prevalence of current or ex–heavy smoking was significantly associated with frequent hospital readmissions.[17] Utilizing RTs to provide education on these important issues related to COPD may have been a reason for the reduction in readmission rates, however, there were no statistical differences.

Suggestion

Our study has several limitations, including retrospective data collection and analysis. We also had difficulty contacting potential subjects post discharge and maintaining contact during the 4-week intervention. At times, we made multiple telephone calls to schedule follow-up appointments. In addition, race and smoking status varied between the pre-intervention and post-intervention groups. However, there were no significant differences in program outcomes. Further, although actual readmission rates from outside facilities were unknown, most area pulmonologists refer patients back to our health care system.

Our subjects were selected from a patient population that had high health care utilization for their COPD either in the ED or the hospital. Thus, these results may not be applicable to a population with milder COPD. Socioeconomic status is an important determinant of readmissions and was not captured in our study. Readmissions were lower in subjects who had RT visits at home. This quality improvement project demonstrated RT home visits could help reduce readmission rates and prevent penalties.

Conclusions

There was a significant reduction of 30-, 60-, and 90-d readmissions for subjects with COPD. It is imperative to involve RTs in a home COPD disease management program. The duration of interventions included 3 home visits over the course of 4 weeks, which focused primarily on patient education, COPD Action Plans, and the importance of follow-up. This home health strategy was cost effective for payers and not cost prohibitive for our health care system, which contributed significantly to the success in reducing COPD hospital readmissions. Intervention at home can be easily incorporated into hospital discharge plans while simultaneously not being overbearing for patients, families, or providers.

REFERENCES

1. Bashir B, Schneider D, Naglak MC, Churilla TM, Adelsberger M. Evaluation of prediction strategy and care coordination for COPD readmissions. Hosp Pract (1995) 2016;44(3):123-128.
2. McIlvennan CK, Eapen ZJ, Allen LA. Hospital readmissions reduction program. Circulation 2015;131(20):1796-1803.
3. Sharif R, Parekh TM, Pierson KS, Kuo YF, Sharma G. Predictors of early readmission among subjects 40 to 64 years of age hospitalized for chronic obstructive pulmonary disease. Annals ATS 2014;11(5):685-694.
4. Kong CW, Wilkinson TMA. Predicting and preventing hospital readmission for exacerbations of COPD. ERJ Open Res 2020;6(2):00325-2019.
5. Alqahtani JS, Njoku CM, Bereznicki B, Wimmer BC, Peterson GM, Kinsman L, et al. Risk factors for all-cause hospital readmission following exacerbation of COPD: a systematic review and meta-analysis. Eur Respir Rev 2020;29(156):190166.
6. Koehler BE, Richter KM, Youngblood L, Cohen BA, Prengler ID, Cheng D, et al. Reduction of 30-day post-discharge hospital readmission or emergency department (ED) visit rates in high-risk elderly medical subjects through delivery of a targeted care bundle. J Hosp Med 2009;4(4):211-218.
7. Press VG, Au DH, Bourbeau J, Dransfield MT, Gershon AS, Krishnan JA, et al. Reducing chronic obstructive pulmonary disease hospital readmissions. An official American Thoracic Society Workshop report. Ann Am Thorac Soc 2019;16(2):161-170.
8. Kripalani S, Theobald CN, Anctil B, Vasilevskis EE. Reducing hospital readmission rates: current strategies and future directions. Annu Rev Med 2014;65:471-485.
9. Li J, Young R, Williams MV. Optimizing transitions of care to reduce rehospitalizations. Cleve Clin J Med 2014;81(5):312-320.
10. Benzo R, Vickers K, Novotny PJ, Tucker S, Hoult J, Neuenfeldt P, et al. Health coaching and chronic obstructive pulmonary disease rehospitalization. A randomized study. Am J Respir Crit Care Med 2016;194(6):672-680.
11. Greenwald JL, Jack BW. Preventing the preventable: reducing rehospitalizations through coordinated, patient-centered discharge processes. Prof Case Manag 2009;14(3):135-140.quiz 141–132.

12. Clarke BT. Home care in respiratory therapy. Can J Respir Ther 2016;52(2):51-52.
13. Stridsman C, Svensson M, Johansson Strandkvist V, Hedman L, Backman H, Lindberg A. The COPD Assessment Test (CAT) can screen for fatigue among subjects with COPD. Ther Adv Respir Dis 2018;12:1753466618787380.
14. Silver PC, Kollef MH, Clinkscale D, Watts P, Kidder R, Eads B, et al. A respiratory therapist disease management program for subjects hospitalized with COPD. Respir Care 2017;62(1):1-9.
15. Iyer AS, Bhatt SP, Garner JJ, Wells JM, Trevor JL, Patel NM, et al. Depression is associated with readmission for acute exacerbation of chronic obstructive pulmonary disease. Ann Am Thorac Soc 2016;13(2):197-203.
16. Lindenauer PK. Early pulmonary rehabilitation reduces COPD mortality risk after exacerbation.
17. Cao Z, Ong KC, Eng P, Tan WC, Ng TP. Frequent hospital readmissions for acute exacerbation of COPD and their associated factors. Respirology 2006;11(2):188-195.