


# Impact of Pharmacist-Conducted Medication Reconciliation at Discharge on Readmissions of Elderly Patients With COPD

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Christine Eisenhower, PharmD, BCPS<sup>1</sup>

## Abstract

**Purpose:** Beginning in fiscal year 2015, the Centers for Medicare and Medicaid Services will measure all-cause readmissions for patients admitted for exacerbation of chronic obstructive pulmonary disease (COPD). Hospitals will incur a payment penalty for unplanned 30-day readmissions. Elderly patients frequently present a challenge because of polypharmacy, which contributes to a greater risk for medication-related readmissions. **Objective:** To determine whether pharmacist-conducted medication reconciliation at discharge decreased medication discrepancies and reduced 30-day readmissions for elderly patients with COPD. **Methods:** Patients aged 65 years and older admitted for a COPD exacerbation between January 31, 2012, and February 29, 2012, were included. The pharmacist reviewed the discharge form for discrepancies. Patients who were readmitted within 30 days of discharge were identified. The rate of 30-day readmission was compared with baseline data. Length of stay and cost for admission versus readmission were also assessed. **Results:** A total of 29 patients were admitted for a COPD exacerbation; 6 medication discrepancies were identified and reported to prescribers. Four patients were readmitted within 30 days of discharge. The 30-day readmission rate was lower than the baseline rate (16.0% vs 22.2%). When comparing admissions with readmissions, a slight reduction in average length of stay and slight increase in cost was observed. **Conclusions:** Pharmacist-conducted medication reconciliation at discharge decreased discrepancies for elderly patients admitted for exacerbation of COPD. The 30-day readmission rate could be decreased further by expanding pharmacist responsibilities during transitions of care. This includes patient counseling, tracking outpatient adherence, selecting affordable medications, and expanding the process to include other chronic disease states.

## Keywords

medication reconciliation, readmission, elderly

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## Introduction

The Centers for Medicare and Medicaid Services (CMS) defines a hospital readmission as an admission to the same hospital within 30 days of discharge.<sup>1</sup> Hospitals incur a payment penalty for unplanned 30-day all-cause readmissions of patients who are hospitalized for heart failure, acute myocardial infarction, and pneumonia.<sup>2</sup> Hospital readmission rates are available to consumers on the CMS Hospital Compare Web site.<sup>2</sup> In fiscal year (FY) 2015, readmissions for patients hospitalized for acute exacerbation of chronic obstructive pulmonary disease (COPD) will also be measured.<sup>1</sup> Based on administrative claims data for fee-for-service Medicare beneficiaries 65 years and older, patients admitted for acute exacerbation of COPD have an estimated national unplanned 30-day readmission rate of 21.6%.<sup>3</sup>

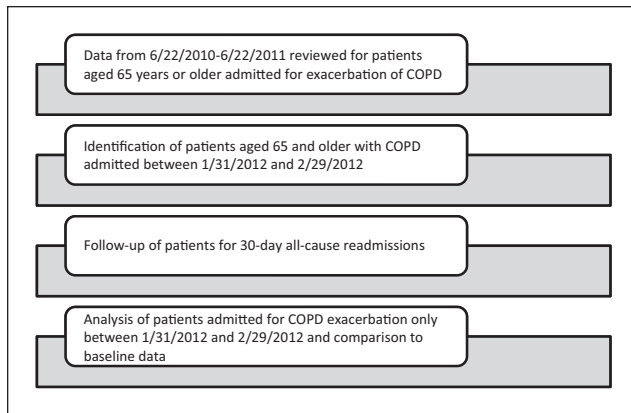
Medication discrepancies may contribute to hospital readmissions. In particular, elderly patients frequently present a challenge because of polypharmacy, which

contributes to a greater risk for medication discrepancies or unknown variations between medication lists. Coleman et al<sup>4</sup> performed home visits to evaluate community patients aged 65 years and older for medication discrepancies after discharge. The authors identified 14.1% of patients as having one or more medication discrepancies. Patients with medication discrepancies were more likely to be readmitted within 30 days than patients without discrepancies (14.3% vs 6.1%, respectively,  $P = .04$ ).<sup>4</sup> Additionally, a retrospective review of 200 patients by Stitt et al<sup>5</sup> revealed a positive linear relationship between the number of medications used by patients

<sup>1</sup>University of Rhode Island College of Pharmacy, Kingston, RI, USA

### Corresponding Author:

Christine Eisenhower, PharmD, BCPS, University of Rhode Island, College of Pharmacy, 7 Greenhouse Rd, Kingston, RI 02881, USA.  
Email: ceisenhower@mail.uri.edu



**Figure 1.** Study design and collection.

Abbreviation: COPD, chronic obstructive pulmonary disease.

aged 65 years or older and the number of discrepancies ( $r^2 = 0.249$ ;  $P < .001$ ).

The primary objective of this study was to determine whether pharmacist-conducted medication reconciliation at discharge decreased medication discrepancies, leading to a corresponding reduction in 30-day all-cause readmission rates for patients aged 65 years and older with COPD. Secondary objectives included change in hospital length of stay and cost for readmitted patients as well as justification for a full-time discharge medication reconciliation pharmacist.

## Methods (Figure 1)

### Study Design

The term *readmission* will be used throughout this report to refer to a 30-day all-cause readmission. The study was completed at an 800-bed community teaching hospital. It was approved as exempt from informed consent by the institutional review board of the hospital because the study interventions involved usual patient care by a pharmacist and minimal risk to patients. The patient identification and intervention period was 30 days. The follow-up period was 30 days from discharge for each patient. A study information sheet was available to all patients.

### Patient Selection

Patients were included in the study if they were aged 65 years or older with a history of COPD and were admitted to the hospital for any cause between January 31, 2012, and February 29, 2012. Patients were excluded if they left the hospital against medical advice because this does not count against CMS reimbursement for readmissions.<sup>2</sup> Patients were identified using the pharmacist order entry system. A search was established for patients aged 65 years and older with diagnostic terms that included *COPD* or *emphysema*

and ICD-9 codes for obstructive chronic bronchitis and acute/chronic respiratory failure. The pharmacist double-checked each patient's history and physical report to confirm whether a diagnosis of COPD existed. Data from June 22, 2010, to June 22, 2011, indicated that approximately 60 admissions for COPD occurred per month; therefore, this was the target number to be enrolled.

### Demographic and Baseline Data Collection

Information for each patient was scanned or dictated into the electronic medical record. The pharmacist reviewed history and physical, reason for admission, home medication lists, immunization records, demographics, and list of previous admissions.

Baseline data were reviewed from June 22, 2010, through June 22, 2011, for admission of patients aged 65 years and older with COPD. These data were used to estimate the average length of stay and cost for an admission for exacerbation of COPD. In addition, the information was used to calculate the rate of readmission from March 1, 2011, to March 31, 2011, for patients admitted for exacerbation of COPD. A pharmacist specifically designated to perform medication reconciliation was not present during the baseline data collection period.

### Medication Reconciliation

The paper medical record for each eligible patient was flagged with a document that briefly described the study and alerted the nursing staff to the patient's inclusion in the study. It also included contact information for the pharmacist. The nursing staff was verbally instructed to page the pharmacist if a patient from the study would be discharged, so that medication reconciliation could occur before the patient left the hospital. Once patients were identified, the medication reconciliation admission form was reviewed. If any questions regarding the name or dosage of a home medication arose, they were clarified with a nurse or the patient. At discharge, the pharmacist performed medication reconciliation using the patient chart and electronic orders. The medication reconciliation discharge form included medications at admission as well as all inpatient medications. The form allows prescribers to check off "Continue" or "Discontinue" for each individual medication. The form is then signed by the prescriber and checked by the nurse. Prescribers then provide either hard copy prescriptions to patients or telephone orders to their community pharmacy. A discharge summary is sent to the patient's community physician, and patient instructions are given to the patient. Medication reconciliation by the pharmacist involved review of the form for discrepancies, which included inappropriate medication selection, inappropriate dosing or frequency, drug duplication, missing medications, and/or

**Table 1.** Patient Demographics.

Variables	Patients Without Readmission (n = 21)	Patients With Readmission (n = 4)
Age (years), mean (SD)	74.7 (7.05)	71.3 (6.13)
Male, n (%)	8 (38)	3 (75)
Caucasian, n (%)	16 (76)	4 (100)
Use of chronic oxygen or oral corticosteroids, n (%)	9 (43)	2 (50)
History of admission for COPD exacerbation, n (%)	10 (48)	4 (100)
Comorbid conditions, n (%)		
Systolic heart failure	4 (19)	1 (25)
Asthma	3 (14)	0 (0)
Diabetes type 2	7 (33)	2 (50)
Chronic kidney disease	5 (24)	0 (0)
Coronary artery disease	8 (38)	1 (25)
Hypertension	13 (62)	3 (75)
Dyslipidemia	9 (43)	1 (25)
Current smoker, n (%)	6 (29)	0 (0)
Pneumococcal and influenza vaccinations up to date, n (%) <sup>a</sup>	19 (90)	2 (50)

Abbreviation: COPD, chronic obstructive pulmonary disease.

<sup>a</sup>Patients received vaccinations either before initial hospitalization or during initial hospitalization.

inappropriate duration of therapy. The pharmacist used information from the discharge summary to identify missing or extra medications. Potential medication discrepancies were reported to an inpatient prescriber. In addition, the pharmacist double-checked that the discharge patient instructions matched the medication reconciliation discharge form. The pharmacist used the pharmacist order entry system to track the dates for each discharge as well as dates of readmissions.

### Data Analysis

The original study described above did not differentiate between admissions for acute exacerbation of COPD versus any other admission. Analysis is presented for a substudy, which evaluated data only for those patients admitted for a COPD exacerbation. Patients who died within 30 days of discharge were excluded from analysis.

The 30-day readmission rate was calculated by dividing the number of patients readmitted by the total number of patients admitted between January 31, 2012, and February 29, 2012. This rate was compared with the baseline number from March 1, 2011, to March 31, 2011. Only 1 readmission per discharge was evaluated. Medication discrepancies are included as a descriptive analysis. The length of stay and cost for admissions and readmissions were compared. The calculation of return on investment is presented in full-time equivalents (FTE), assuming that the pharmacist would work for 40 hours per week to achieve 1.0 FTE. Analysis of time spent by the pharmacist included all patients aged 65 years and older admitted for exacerbation of COPD for whom medication reconciliation was performed.

### Results

A total of 60 patients were enrolled between January 31, 2012, and March 1, 2012. Of the enrolled patients, 29 were admitted for a COPD exacerbation. Of the 29 patients, 4 died within 30 days of discharge, and 4 patients were readmitted within 30 days of discharge. A total of 25 patients were included in the analysis.

### Demographics

Out of 4 readmitted patients, 3 were male, and the average age was 71.3 years. All readmitted patients were Caucasian, had a history of admission for COPD, and lived in the community. None were active smokers. Of the readmitted patients, 2 required chronic oxygen therapy or oral corticosteroids at home prior to admission, and 2 were not up-to-date with pneumococcal and influenza vaccinations (Table 1).

### Medication Discrepancies

A total of 6 medication discrepancies were identified and reported to prescribers for 3 patients admitted for a COPD exacerbation (12%). Medication discrepancies were identified at discharge for 1 of the 4 (25%) readmitted patients versus 2 of the 21 (9.5%) patients who were not readmitted. Four were transcribing errors, including 1 therapy duplication (acetaminophen with diphenhydramine ordered twice); 1 home medication discrepancy (resulting from therapeutic interchange of a proton pump inhibitor); and 2 medications that were missing from the patient instructions and medication reconciliation discharge form (ie, fluticasone/salmeterol and prednisone). Two prescribing errors by the inpatient

**Table 2.** Comparison of Length of Stay and Cost for Readmitted Patients.

Readmitted Patients (n = 4)	Admission			Readmission		
	Admitting Diagnosis	Length of Stay (Days)	Cost of Stay	Admitting Diagnosis	Length of Stay (Days)	Cost of Stay
1 <sup>a</sup>	Atrial fibrillation, shortness of breath/COPD	7	\$11 342.16	Respiratory failure, pneumonia	5	\$7882.42
2	Respiratory failure, COPD exacerbation	9	\$14 027.07	Gastrointestinal bleed, COPD exacerbation	6	\$10 001.62
3	Respiratory failure, pneumonia versus COPD	14	\$19 369.69	Pneumonia, COPD exacerbation	16	\$25 304.43
4	COPD exacerbation	3	\$6130.61	Respiratory failure	5	\$11 089.58
Averages	—	8.25 (4.57) <sup>b</sup>	\$12 717.38	—	8 (5.35) <sup>b</sup>	\$13 569.51

Abbreviation: COPD, chronic obstructive pulmonary disease.

<sup>a</sup>Indicates patients with medication discrepancies at initial discharge.

<sup>b</sup>Mean (SD).

teams were identified. Both were an inappropriate increase of fluticasone/salmeterol inhaler to 500/50 twice daily—a dose that is not approved by the Food and Drug Administration (FDA) to treat COPD. One outpatient prescriber was contacted regarding an inappropriate dosage because the inpatient prescriber chose to defer the decision. In addition, the pharmacist helped dose 2 medications, clarified a medication for a skilled nursing facility, and performed rescue inhaler counseling.

### Readmission Rate

The rate of readmission after admission for an exacerbation of COPD from March 1, 2011, to March 31, 2011, was 22.2%. The readmission rate for January 31, 2012, to February 29, 2012, was lower at 16% (4/25). All 4 patients were readmitted for a respiratory cause. A slight decrease in average length of stay and a slight increase in cost of admission were observed from admission to readmission for those 4 patients (Table 2). It is unlikely that these changes were affected by medication reconciliation alone because many other factors may affect readmissions, including outpatient medication adherence and patient counseling.

Baseline data estimated that the average length of stay for patients aged 65 or older admitted for COPD exacerbation was 5.8 days, and the average cost was \$9666.37. For the 4 patients readmitted during the study period, both admissions and readmissions were higher than the average length of stay and cost compared with baseline. When comparing admissions with readmissions, a slight decrease in length of stay and a slight increase in cost was observed.

### Justification for a Full-time Pharmacist

The pharmacist spent an estimated 20 minutes per patient to review and clarify the medication reconciliation admission

form, review the electronic medical record, perform medication reconciliation, and contact prescribers. For a total of 29 patients admitted for a COPD exacerbation in 30 days, this equates to 580 minutes (9.6 hours). Although this is not enough time to constitute an entire FTE, pharmacists in a transitions-of-care position could easily extend their medication reconciliation responsibilities to other patient populations at risk for readmission.

### Discussion

The study demonstrated that the addition of a pharmacist to the discharge medication reconciliation process resulted in identification of more medication discrepancies. Reduction of medication discrepancies may decrease the readmission rate, but this was unlikely in this study because all 4 readmitted patients returned for a respiratory cause. Patients who are admitted for an exacerbation of COPD may present a unique challenge because many patients are still active smokers. However, in this study, patients who were readmitted were no longer smokers. Of the 4 readmitted patients, 2 required chronic oxygen or oral corticosteroids at admission, which may indicate more severe disease and thus a greater chance for readmission.

To justify the position for a full-time pharmacist, medication reconciliation should be performed for more patients per month. In addition, estimated cost savings should be documented for each intervention made. It would be beneficial to expand to other chronic disease states for that purpose as well. The value of the pharmacist could be justified if a statistically significant reduction in the readmission rate occurred as well as a reduction in health care costs when inexpensive but appropriate medications are selected for patients. Larger studies may provide a greater potential for reducing costs because the expenses saved from a decreased readmission rate may

outweigh the expense of those patients who are readmitted for a more costly stay.

This study has several limitations. The small sample size of this study limits the significance of results as well as the ability to compare with other studies in which large patient populations are reviewed through use of databases. Medical record data were not confirmed with prescribers and/or patients, and therefore, past medical history may not have been completely accurate or updated. The pharmacist order entry system used to flag eligible patients may have missed patients with different diagnostic terms such as *bronchitis* or ICD-9 codes such as *chronic airway obstruction*. Pulmonary function was not consistently documented; thus, staging of COPD is not included in demographics. Whether or not patients had an outpatient primary care provider was not always mentioned in the medical record. In addition, the source for the home medication list was not identified and may have affected the accuracy of the medications given during the hospital stay and continued at discharge. The patients included in this study are representative of one community hospital system, and opportunities for medication discrepancies may differ at other institutions.

Other study limitations include unknown information regarding patient ability to afford medications, outpatient medication adherence, and outpatient follow-up after discharge. Involvement of a case management/care coordination team may be beneficial to remove any gaps in care caused by these variables. The National Transitions of Care Coalition supports the role of a pharmacist to help these teams with discharge planning.<sup>6</sup>

Although the baseline readmission rate was only representative of 1 month, the variation from month to month may not be significant. Jencks et al<sup>7</sup> found that seasonal variation in readmission rates was less than 0.2 percentage points, based on evaluation over a 12-month period. The authors estimated a 30-day readmission rate of 22.6% for patients admitted for COPD between October 1, 2003, and December 31, 2003. The most frequent reasons for readmission of patients discharged for COPD were COPD (32.6%) and pneumonia (11.4%), similar to this study. Patients who were 70 years or older were most likely to be readmitted after discharge for any medical condition.<sup>7</sup>

Errors of omission place patients at risk for readmission. This study identified 2 missing medications at discharge (one for long-term use, the other for short-term use) after review of medication reconciliation forms and discharge instructions. Bell et al<sup>8</sup> evaluated rates of potentially unintentional discontinuation of medications at discharge for 396 380 patients aged 66 years or older. Errors of omission were documented if a prescription for a long-term medication was not refilled within 90 days after discharge. The adjusted odds ratios (ORs) for hospitalized patients to experience potentially unintentional discontinuation of medications versus controls ranged from 1.18 to 1.86. Adjusted ORs were statistically significant for statins, antiplatelets or

anticoagulants, levothyroxine, and gastric acid suppressants. In addition, results showed that patients with an unintentionally discontinued statin or antiplatelet/anticoagulant had a higher risk of death, emergency department visits, or emergent hospitalizations at the 1-year follow-up.<sup>8</sup>

The addition of comprehensive patient counseling at discharge to medication reconciliation may be valuable. In a prospective cohort study, 400 patients who were discharged from a large academic hospital were evaluated.<sup>9</sup> Based on chart reviews and telephone interviews that occurred 24 days after discharge, the authors concluded that patients had a decreased risk of adverse drug events if they were able to recall having medication side effects explained at discharge (OR = 0.4; 95% CI = 0.2 to 0.8). Whereas 83% of patients in the study confirmed that a health care provider discussed their medications before discharge, only 62% of patients confirmed that the side effects were described.<sup>9</sup> Reinforcement of discharge instructions by several health care providers, use of written patient education materials, and use of the “teach-back” method may be needed to improve recall for patients.<sup>10</sup>

Mulhem et al<sup>11</sup> evaluated medication adherence rates for 46 patients aged 65 years or older. Family medicine residents made home visits 24 to 48 hours after discharge from a general medicine or surgical unit in the hospital and reviewed the medications that patients reported to be currently taking. These medications were then compared with the list at hospital discharge in the medical record as well as patient discharge instructions. Each set of discharge instructions included an average of 9.98 prescription medications and 1.83 nonprescription medications. Results showed that just 3 of the 46 patients (6.5%) had followed the list of discharge medications. In terms of nonadherence, 36 patients (78.2%) were taking between 1 and 15 prescription medications not on the list, 20 (43.4%) were missing between 1 and 6 medications, 20 (43.4%) were taking between 1 and 3 medications at the wrong dose, and 19 (41.3%) were taking between 1 and 4 medications at the wrong frequency.<sup>11</sup>

Other studies have found medication reconciliation by a pharmacist to be beneficial. Musgrave et al<sup>12</sup> conducted a prospective, observational study to evaluate medication errors identified by a pharmacist for 64 patients discharged following transplantation. A total of 119 out of 191 errors were identified by a pharmacist at discharge. The remaining 72 errors were identified by another pharmacist during the first outpatient follow-up visits. A severity score was used to classify the errors as serious, significant, minor, or “no error.” This information was compared with data for a retrospective group of 128 patients who did not receive medication reconciliation by a pharmacist. There was a statistically significant difference between medication errors identified at discharge and during the initial outpatient follow-up visit for the prospective group versus the retrospective group. In addition, there was a statistically significant difference in the number of significant and minor

medication errors identified between the 2 groups.<sup>12</sup> Another study evaluated the impact of pharmacist medication reconciliation within 3 to 7 days after discharge for high-risk patients. *High-risk* was defined as a patient with a current readmission, complex care plan, primary diagnosis of chronic disease, important medication changes during hospital stay, and/or concerns regarding ability to self-manage care. Pharmacist medication reconciliation postdischarge involved a phone conversation that included a comprehensive medication therapy assessment, review of unexplained discrepancies or drug therapy problems, and answering of patient questions. Patients who were contacted by a pharmacist versus those who were not had a statistically significant lower readmission rate at 7 days (0.8% vs 4%,  $P = .01$ ) and 14 days (5% vs 9%,  $P = .04$ ) postdischarge.<sup>13</sup>

## Conclusion

Medication reconciliation at discharge by a pharmacist decreased discrepancies for patients aged 65 years and older admitted for exacerbation of COPD in a community teaching hospital. The rate of 30-day all-cause readmissions was lower than the baseline rate but may have been affected by many other factors that were not measured in the study. Successful care transitions for elderly patients admitted for exacerbation of COPD should also include identification of patient-specific barriers to adherence, patient counseling, and postdischarge outpatient follow-up in order to further improve rates of readmission. A transitions-of-care pharmacist could perform these responsibilities in addition to medication reconciliation.

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## Author's Note

This article describes results, data, and figures for a substudy of patients admitted for exacerbation of COPD. The original study

included results, data, and figures for patients with a history of COPD admitted for any cause. The original study has been published as a poster for the 2013 American Geriatrics Society meeting and presented as a platform presentation for the 2012 Southeastern Residency Conference. However, the results, data, and figures from the original study are not included in this article.

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