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Community Level Association between Home Health and Nursing Home Performance on Quality and Hospital 30-day Readmissions for Medicare Patients

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Abstract

We evaluated whether community-level home health agencies and nursing home performance is associated with community-level hospital 30-day all-cause risk-standardized readmission rates for Medicare patients used data from the Centers for Medicare & Medicaid Service from 2010 to 2012. Our final sample included 2,855 communities that covered 4,140 hospitals with 6,751,713 patients, 13,060 nursing homes with 1,250,648 residents, and 7,613 home health agencies providing services to 35,660 zipcodes. Based on a mixed effect model, we found that increasing nursing home performance by one star for all of its 4 measures and home health performance by 10 points for all of its 6 measures is associated with decreases of 0.25% (95% CI 0.17–0.34) and 0.60% (95% CI 0.33–0.83), respectively, in community-level risk-standardized readmission rates.

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Keywords

Outcomes measurement; Quality Improvement; Continuity of Care Transition and Discharge Planning; Teamwork; Readmission

INTRODUCTION

Community-level post-acute care, which includes nursing homes, home health, rehabilitation, and long-term care, covered under the Medicare program plays a key role in the entire episode of patient care. The importance of post-acute care and its reform have been emphasized recently under the Affordable Care Act to incentive a more efficient mix of acute and post-acute care services.^{1–5} At a community level, the two main post-acute care services are nursing homes, which provide institutional post-acute care services to patients who reside in a local nursing home, and home health agencies, which provide services to both local and non-local patients who are homebound.^{6,7} In 2013, there were approximately 15,000 Medicare-certified nursing homes providing services to more than 3 million beneficiaries and 10,800 Medicare-certified home health agencies serving approximately 3.5 million beneficiaries with nearly 123 million visits, nationwide.^{8,9} In 2013, 42% of Medicare Fee-for-Service patients discharged to either a nursing home or under home health care,¹⁰ in 2011, approximately 25% of nursing home residents experienced hospitalizations,⁸ and between 2009 and 2010 approximately 21% of Medicare Fee-for-Service beneficiaries were readmitted within 30 days after being discharged to nursing homes following their hospitalization.¹¹

The goal of post-acute care is to shorten a patient's hospital stay and better post-acute care may prevent unplanned readmissions.^{12–18} Over the past decade, national efforts have been initiated to monitor and improve the quality of post-acute care for both nursing home and home health performance.^{19–23} Nevertheless, it is unclear whether nursing home and home health performance is associated with hospital readmission rates at the community level, a level that largely encompasses a patient's healthcare utilization. Previous studies, which were conducted at a patient level and were limited to single institutions, conditions, data sources, or regions,^{11, 24–30} have noted some mixed findings on the relationship between nursing home performance and hospital readmissions. Because post-acute care largely occurs at the community level, a community-level analysis might provide unique insights into the impact of community practice patterns. Accordingly, we used national hospital-wide readmission, nursing home performance, and home health performance data, all publicly available from the Centers for Medicare & Medicaid Service (CMS) (<http://www.medicare.gov/download/downloaddb.asp>), to evaluate whether community-level performance in nursing homes and home health agencies is associated with community-level hospital 30-day all-cause readmissions for Medicare patients discharged with any condition during 2011–2012.

METHODS

Study Sample

The 30-day hospital-wide readmission data, at the individual hospital level, includes the rate of risk-standardized readmission and the total number of discharges for each acute-care hospital from July 1, 2011 to June 30, 2012. We restricted hospitals to those with at least 30 discharges over the 1-year period to ensure that each hospital had an adequate sample. The nursing home performance data, at the individual nursing home level, includes performance measures and nursing home characteristics for each federally-certified nursing home from May 2010 to September 2012, a time period that is comparable with the hospital readmission data. We excluded 1,307 (8.3%) nursing homes that had less than 30 residents and 559 (3.6%) nursing homes that did not provide services to Medicare patients over the study period. Home health data, at the individual agency level, includes performance measures and home health agency characteristics from October 1, 2011 to September 30, 2012, a time period that is also comparable with the hospital readmission data.

Measures of Nursing Home and Home Health Performance

CMS measures nursing home performance with four measures: health inspection, quality of care, registered nurses, and total staffing hours per resident day.²¹ Each of these measures has its own star rating, ranging from 1 to 5, with 5 representing top performance for that measure. Although CMS rolls up these measures into an overall star rating, again ranging from 1 to 5 stars, we opted not to use this overall rating score because CMS calculations heavily weights the health inspection measure.³¹ We combined these four measures into one composite measure by cumulating their scores with equal weighting. This composite measure ranged from 1 to 20 stars. We excluded 738 (4.7%) nursing homes that had unavailable or missing information for all four measures.

CMS measures home health performance based on 27 performance indicators that are categorized to 6 composite measures: managing daily activities, managing pain and treating symptoms, treating wounds and preventing pressure sores (bed sores), preventing harm, preventing unplanned hospital care, and patient satisfaction survey results (Table S1).²² For each home health agency, we calculated a score for each measure by taking an average of all indicators' values within a measure with equal weighting. We excluded 4,519 (37.1%) agencies that had missing data for all the patient satisfaction survey indicators (n=5, Table S1) and additional 49 (0.4%) agencies that had missing data for all 27 indicators. Most of these excluded agencies were small and overall they covered less than 14% of zipcodes nationwide. All measures were scored from 0 to 100, where a score of 100 represents the highest performance. For the preventing unplanned hospital care measure, the initial indicators were designed to have a low score to indicate better performance. To align with the other measures, we subtracted those two indicators from 100 so that a high score indicated better performance. Finally, we combined these six measures into one composite measure by cumulating these six measures' scores. This composite measure ranged from 0 to 600.

Outcome and Healthcare Community

CMS measures hospital 30-day all-cause readmission rates based on the risk-standardized method for profiling hospitals.^{32–34} Our primary interest was the healthcare community-level 30-day all-cause risk-standardized readmission rates. We used the hospital service area approach^{35,36} to define a healthcare community and linked nursing home data, home health agency data, and hospital readmission data at the hospital service area level. A hospital service area includes a set of zipcodes where the greatest proportions of Medicare beneficiaries were hospitalized in that area. There were approximately 3,436 hospital service areas nationwide and we assigned each hospital and nursing home to one of these areas based on zipcodes. A home health agency is assigned to a hospital service area if it provides services for patients in that area. For each hospital service area, we aggregated the nursing home performance scores weighted by the number of nursing homes, home health agency performance scores weighted by the number of zipcodes that home health agencies provide services to, and hospital 30-day readmission rates weighted by the number of hospitals in the hospital service area.

Characteristics of Nursing Home, Home Health, Hospital, and Healthcare Community

Nursing home characteristics include ownership (not-for-profit, yes/no), location inside a hospital (yes/no), and the number of resident beds. Home health agency characteristics include years of Medicare certification, partial service (yes/no), and proprietary rate. We used the American Hospital Association's 2012 Annual Survey Database to obtain hospital characteristics, including teaching status (teaching vs. non-teaching), Joint Commission certification status (yes/no), hospital geographic location (urban vs. rural), ownership (public, private not-for-profit), and number of beds. For each healthcare community, we included the number of hospitals, number of nursing homes, number of home health agencies that provided services to patients in that area, median income, and the proportion below the poverty level, black, Hispanic, aged 65 years or older, and male, all obtained from the United States Census 2012 estimates (www.census.gov).

Statistical Analysis

We classified each healthcare community into one of three mutually exclusive categories based on its hospital readmission rate: 1) Low, if the risk-standardized readmission rate is lower than the 25th percentile of the national rate; 2) High, if the risk-standardized readmission rate is greater than the 75th percentile of the national rate; and 3) Average, if otherwise. We performed descriptive analysis to show nursing home, home health, hospital, and healthcare community characteristics across the three categories. We fitted a mixed model to model the community-level risk-standardized readmission rate as a function of the community-level nursing home performance and home health performance. To better interpret the association between the risk-standardized readmission rate and nursing home and home health agency performance, we rescaled the home health agency performance from a 1-point interval to a 10-point interval. We repeated the model with adjustments for nursing home, home health agency, hospital, and healthcare community characteristics. Geographically, each hospital service area is clustered under its up-level geographic area, such as a state. Also, some of the nursing home performance scores were assigned based on

state distributions not national distributions. To take into account such a clustering structure all models were fitted with state random intercepts to account for within-state and between-state variations, weighting by the community-level number of total discharges. Analyses were conducted using SAS version 9.3 64-bit (SAS Institute Inc, Cary, North Carolina). The unit of analysis was healthcare community-level (defined as hospital service area).

RESULTS

Study Sample

The final sample consisted of 2,855 healthcare communities (82.4% of all hospital service areas) that included 4,140 hospitals (92.5% of all acute-care hospitals in the readmission data), 13,060 nursing homes (83.3% of all nursing homes in the nursing home compare data), and 7,613 home health agencies (62.5% of all home health agencies in the home health compare data). These 2,855 healthcare communities covered 6,751,713 patients discharged for any medical or surgical condition, 1,250,648 nursing home residents, and 35,660 unique zipcodes (86% of all zipcodes nationwide) that home health agencies served. The community-level mean (standard deviation [SD]) numbers of hospitals, nursing homes, and zipcodes served by home health agencies were 1.5 (1.7), 4.6 (6.7), and 24.6 (41.4), respectively. The median (inter-quartile-range [IQR]) distance between a home health agency and a patient's home was 15.9 (19.2) miles and approximately 94.5% of home health agencies provided services within a 60-mile range. Table 1 shows community-level characteristics of hospitals, nursing homes, home health agencies, and healthcare communities.

Nursing Home and Home Health Performance and Hospital Readmission Rate

The community-level nursing home composite performance score was 12.1 (SD=2.32) stars out of 20 stars (Figure 1, top panel). Overall, 54.5% of nursing homes scored 3 stars or higher on one or more measures, but only 4.7% of nursing homes scored 4-stars or higher on all four measures (Figure S1). The community-level home health composite performance score was 481 (SD=15) out of 600 (Figure 1, bottom panel, Figure S2). The community-level mean hospital 30-day risk-standardized readmission rate was 16.0% (SD=0.93, IQR=1.17%) (Figure 1, bottom panel).

Association between Nursing Home and Home Health Performance and Hospital 30-day Readmissions

The unadjusted mixed model showed that higher performance in nursing home and home health was statistically significantly associated with lower a readmission rate (Figure 2). Accounting for nursing home, home health agency, hospital, and healthcare community characteristics (Table S2), increasing community-level nursing home performance by one star for all of the four measures is associated with a decrease of 0.25% (95% CI 0.17–0.34) in community-level hospital 30-day risk-standardized readmission rates; increasing community-level home health performance by 10 points for all of the six measures is associated with a decrease of 0.60% (95% CI 0.33–0.83) in community-level hospital 30-day risk-standardized readmission rates (Figure 2).

DISCUSSION

In this large and comprehensive study, we found that healthcare communities with higher performing nursing homes and higher performing home health agencies were more likely to have lower 30-day risk-standardized readmission rates. Our study extends the results of previous patient-level studies,^{11,24–30} which used different measurement approaches and targeted specific conditions. For example, Ogunneye et al.²⁶ studied the relationship between quality ratings of skilled nursing facilities and 30-day risk-adjusted readmission rates for 603 patients discharged from a single hospital to 17 skilled nursing facilities after hospitalization for acute decompensated heart failure. They found that the all-cause readmission rate was 18% for higher-quality and 22% for lower-quality skilled nursing facilities. Neuman et al.¹¹ used the national Medicare fee-for-service data to assess the relationship between skilled nursing facilities quality and readmission for Medicare patients discharged to a skilled nursing facility after an acute care hospitalization between September 1, 2009, and August 31, 2010 at the individual patient level. They found that available nursing home performance measures were not consistently associated with differences in the adjusted risk of readmission. Our study however, focused at the healthcare community level's relationship of post-acute care with hospital all-cause readmissions, an important and actionable perspective since improvement efforts require system changes beyond the reach of the individual healthcare practitioner and patient.

Our findings indicate that overall there is substantial room for improvement in both nursing home and home health performance. During the study period, the mean nursing home performance scores of the four measures was 3 out of 5 stars, and 67% of nursing homes were in the range of greater than 2-stars and less than 4-stars; the mean home health single performance score was approximately 80 points but no agency achieved 80 or higher for all six measures scored. Furthermore, given that the difference in risk-standardized readmission rates between the 25th percentile and the 75th percentile hospital groups was only 1.2%, if both nursing homes increased their performance by one star for all four measures and home health agencies increased their performance by 10 points for all six measures, hospitals with high readmission rates at the 75th percentile would go down to the 50th percentile position, which could substantially reduce readmissions.

Our study also extends our view of how readmission risk may be influenced by quality beyond its traditional hospital-focused perspective to post-acute care, in which nursing homes and home health agencies play an important role.^{8,37–39} The association between nursing home and home health performance and hospital readmissions at the community level could be a marker for overall quality of care and practice patterns in a community rather than a result of a specific nursing home's or and nursing home agency's quality of care. Hospitals, nursing homes, and home health agencies serve patients in the same community, which highlights their need to become partners in patient care. Moreover, hospitals, nursing homes, home health agencies, patients, patients' primary care providers, and patients' families should form a community-level cross-continuum care team to ensure that patients receive the best care in all the venues in which they are treated. Because CMS penalizes hospitals with high readmission rates and bundled payments are considered one potential approach to improving coordination for targeted illnesses covering all costs

associated with care for a 30-day period after discharge,⁴⁰ hospitals now have a business case to support efforts to continuously improve the quality of care they offer. The path might include coordinating with their out-of-hospital partners and helping them to excel in the provision of high quality post-acute care.

Our study has limitations. Because we were not able to determine how many patients from a given hospital went to a specific nursing home or were cared for by a home health agency following their hospital discharge, we were not able to weight these post-acute care providers based on their actual levels of patient care. In an urban area, it is typical that a given nursing home might receive referrals from multiple hospitals and some hospitals may also concentrate their nursing home referrals to certain facilities. However, we were unable to gather information on such hospital-nursing home referral patterns. Given that, we weighted all facilities in a community equally. In addition, not all performance measures reported by CMS are designed for preventing unplanned readmissions, but each of these measures is related to delivery of high quality post-acute care. We only focused on publicly available nursing home and home health agency performance measures reported by CMS and were unable to include other measures that may associate with quality of care, such as antipsychotic medication use, staff stability, or consistent assignment. Moreover, CMS measures nursing home and home health performances based on everyone, not just those Medicare fee-for-service patients who were recently discharged from an acute care hospital. Restricted by available data sources, we were unable to address this gap. Nevertheless, Medicare patients are the majority population to receive services provided by nursing homes and home health agencies. In February 2015, CMS revised its nursing home 5-star quality rating system by including use of antipsychotics in calculation of the star ratings, improving calculations for staffing levels, and expanding the focused surveys that are designed to improve the accuracy of resident assessment information. While it is too early to evaluate how these changes will impact our findings, we hope that these changes will strengthen our results.

In conclusion, nursing home and home health performance is associated with hospital-wide 30-day readmission rates for Medicare fee-for-service patients at a healthcare community level. Hospitals, nursing homes, and home health agencies serve patients in a same community, which highlights their need to become partners in patient care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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A. Distribution of community-level nursing home performance

B. Distribution of community-level home health performance

C. Distribution of community-level hospital 30-day risk-standardized all-cause readmission rate (%)

Figure 1.

Distributions of nursing home (top panel) and home health agency (middle panel) performance scores, and hospital 30-day risk-standardized all-cause readmission rate (bottom panel).

Figure 2.

Point estimates and 95% confidence intervals of the association between nursing home and home health performance and hospital risk-standardized all-cause readmission rate at the healthcare community level. These estimates were obtained under an unadjusted model that includes nursing home and home health performance scores and an adjusted model that includes the nursing home and home health performance scores as well as nursing home, home health, hospital, and healthcare community characteristics. Under the unadjusted model, increases by one star for all of the four measures in the nursing home performance is associated with a decrease of 0.41% (95% CI 0.33 to 0.50) in hospital 30-day risk-standardized readmission rates and increases of 10 points for all of the six measures in the home health performance is associated with a decrease of 1.26% (95% CI 1.08 to 1.44) in community-level hospital 30-day risk-standardized readmission rates.

Table 1

Healthcare Community-level characteristics of hospitals, nursing homes, home health agencies, and healthcare communities, stratified by community-level readmission rate groups.

Characteristics	Healthcare Community-level Hospital Risk-standardized Readmission Rate (%)		
	Lower than 25th percentile (12.7–15.3)	25th to 75th percentile (15.3–16.5)	Higher than 75th percentile (16.5–20.8)
Healthcare community (as defined by hospital service area), median (inter-quarter range)			
Total, no.	713	1474	668
Median income, \$1000	48.9 (16.4)	47.0 (14.4)	44.6 (20.7)
Proportion below poverty level	13.6 (6.6)	14.1 (7.3)	16.0 (8.9)
Average number of home health agencies	12.5 (18.0)	12.0 (16.0)	15.0 (19.0)
Average number of nursing homes	3.0 (4.0)	2.0 (3.0)	3.0 (4.0)
Average number of hospitals	1.0(0.0)	1.0 (0.0)	1.0 (0.0)
Proportion of black population	1.8 (4.8)	2.4 (8.3)	5.4 (15.8)
Proportion of Hispanic population	4.6 (8.6)	3.8 (8.1)	3.6 (10.4)
Proportion of elder (age 65 years or older) population	14.3 (4.3)	14.8 (4.7)	14.3 (4.2)
Proportion of male	48.4 (1.6)	48.3 (1.8)	47.9 (1.8)
Nursing home, median (inter-quarter range)			
Average number of nursing home's beds	102.0 (34.2)	99.0 (45.7)	109.7 (39.3)
Located within a hospital	<0.01 (0.0)	<0.01 (0.0)	<0.01 (0.0)
Not-for-profit nursing home	16.7 (42.9)	<0.01 (50.0)	<0.01 (33.3)
Home health agency, median (inter-quarter range)			
Years since certified	22.9 (9.8)	22.9 (10.8)	24.0 (11.7)
Proprietary	57.7 (44.9)	62.2 (48.3)	66.7 (44.9)
Types of services less than 6	10.2 (23.1)	13.3 (30.2)	10.1 (24.0)
Hospital, median (inter-quarter range)			
Mean patients discharged from associated hospitals	1005.05 (1585.0)	478.0 (1381.0)	1195.0 (1901.6)
Large teaching hospitals	<0.01 (0.0)	<0.01 (0.0)	<0.01 (0.0)
Joint Commission certified	100.0 (100.0)	100.0 (100.0)	100.0 (100.0)
Located in rural area	50.0 (100.0)	100.0 (100.0)	<0.01 (100.0)
Average number of beds	115.0 (164.0)	79.8 (143.2)	131.0 (183.2)
Number of critical access hospitals	<0.01 (33.3)	<0.01 (100.0)	<0.01 (0.0)