

Thirty-Day Readmissions: Relationship to Physician Attending Type and Social Connectedness

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ABSTRACT

OBJECTIVES: Given the substantial interest in understanding the drivers of readmissions among patients with chronic illness, our study aimed to identify patient and healthcare system factors associated with 30-day readmissions in a hospital with a Pioneer accountable care organization.

STUDY DESIGN: Retrospective cohort study.

METHODS: Rates of readmission from 2013 to 2015 were analyzed by attending type, diagnosis, payer, and demographic and clinical factors. Interviews of a matched subset of readmitted and nonreadmitted patients examined patient-reported reasons for readmission.

RESULTS: The readmission rate for the penalty diagnoses of congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and pneumonia for those managed by geriatricians was lower than the overall readmission rate (11.0% vs 14.1%, respectively). Being divorced was associated with a significantly higher readmission rate (15.7%), whereas Asian/Pacific Islander or “other” race (7.1% and 6.8%, respectively; $P < .00001$) and having private insurance (8.3%; $P < .00001$) were associated with significantly lower readmission rates. Interviews revealed that readmitted patients were more likely than those who were not readmitted to lack an outpatient connection to a primary care provider (10.7% vs 0.0%), to be unable to complete activities of daily living without assistance (32.1% vs 11.1%), and to lack the support of family members during their inpatient stay.

CONCLUSIONS: This study found a lower readmission rate for those with CHF, COPD, and pneumonia who were admitted by geriatricians, supporting the notion that enhanced care coordination lowers readmissions. Patient with lower social connectedness were more likely to be readmitted. These findings support the value of rigorous identification of individual risk factors for readmission and of tailoring discharge planning.

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In a 2009 analysis of Medicare claims data from all hospital discharges in 2003 and 2004, nearly 1 in 5 patients was readmitted within 30 days of discharge. In monetary terms, this amounts to approximately \$17 billion in costs per year.¹

In an attempt to curb 30-day readmissions and their associated costs, the Hospital Readmissions Reduction Program was implemented in 2012 as part of the Affordable Care Act.² As a result, CMS began reducing Medicare payments to hospitals whose readmission rates for patients treated for myocardial infarction, congestive heart failure (CHF), and pneumonia were higher than expected for a hospital with a similar patient mix.² Over the next few years, several admitting diagnoses were added to the list of Medicare “penalty diagnoses”: chronic obstructive pulmonary disease (COPD), total knee replacement, and total hip replacement. This program led healthcare institutions to evaluate and work to better understand the drivers of readmission for patients with these chronic illnesses and acute problems associated with higher rates of readmission.³⁻⁷

In this retrospective study of 2013-2015 patient-level data, we sought to contextualize and characterize the 30-day readmission experience of an academic community hospital in Massachusetts. We evaluated factors that were correlated with 30-day readmissions to the medicine service, including the penalty diagnoses of COPD, CHF, and pneumonia; attending physician type; and a number of demographic and patient-specific factors, such as age, gender, race/ethnicity, and marital status.⁸ As functional status has also been identified as a specific factor that could predict acute care readmission,⁷ we also collected data on activities of daily living (ADLs). Because previous studies have demonstrated the importance of patient-specific factors

on readmission rates^{9,10} and the contribution of patients' experience and postdischarge follow-up to the understanding of quality of care and readmission rates,¹¹ we examined these factors as well.

METHODS

Quantitative Substudy

It was our goal to examine all patients who were admitted to the medicine service at Mount Auburn Hospital (Cambridge, Massachusetts) and readmitted within 30 days between January 1, 2013, and December 31, 2015. This study was reviewed and approved by the Institutional Review Board of Mount Auburn Hospital. We obtained lists of all patients hospitalized on the medicine service and readmitted within 30 days during this time frame. We analyzed patient outcomes (readmitted or not) by 3 types of variables: demographic characteristics, which included age, sex, race/ethnicity, marital status, and payer type; care characteristics, which included attending type (hospitalist, primary care, or specialist) and discharge disposition (home, home with services, or an acute care facility); and clinical characteristics, which included primary diagnosis and length of stay (LOS).

Statistical Analysis

We performed a univariate analysis, examining each demographic characteristic among readmitted patients, and used the χ^2 test to determine which of the factors were significant.

We examined readmitted patients versus nonreadmitted patients by admitting attending type and determined the readmission rate by each type of admitting attending: hospitalist, geriatrician, cardiologist, intensivist, or primary care physician (PCP). We analyzed readmission rates for each category of attending type, stratified by diagnosis. We chose to look at 3 of the Medicare penalty diagnoses (CHF, COPD, and pneumonia) for those years and compared them with all other diagnoses. We then examined the readmission rates for those selected penalty diagnoses in 2013, 2014, and 2015 by 2 attending types, geriatricians and hospitalists, and compared their rates with the overall readmission rates of all attending types. These 2 types of attendings were compared because of the difference in the amount of care coordination and continuity provided by their services; we hypothesized that these differences might be associated with differences in readmissions. Finally, we sought to investigate the readmission rates to other hospitals among this group of patients.

Interview Substudy

We developed an interview instrument containing both structured and semi-structured qualitative questions and items. The interview substudy focused primarily on several categories of variables that the investigator team believed might be associated with readmission. These included social support, functional status, connection to primary care, connection to relevant specialty care, and experiences with care during and after the index admission. We identified

patients from the administrative list who were readmitted within 30 days of an index admission in 2014 with a primary diagnosis of CHF, COPD, or pneumonia. Each patient was contacted by telephone by 1 of 2 interviewers on our study staff (SL or OV) to obtain consent and conduct the interview among those who agreed to participate. Only 2 attempts were made to reach each patient. The interview was conducted only if the patient or a caregiver (designated by the patient) spoke English and was able to understand the consent process. For each patient who agreed to be interviewed, we selected a control patient of the same age and gender who was admitted in 2014 with the same index diagnosis but was not readmitted. If there were multiple potential matches, we chose the first on the list alphabetically who agreed to participate. If there was not a match by age, we chose a patient who was matched in all other ways but the next one chronologically by age (ie, older).

We performed a thematic analysis on the semi-structured items. For the structured items, we performed standard means and compared the means of several variables of the admitted and nonreadmitted patients, including English as a first language, the presence of a PCP in the patient's care, if the discharge instructions were reviewed, if a family member was involved during the admission, if the patient recalled receiving instructions about who to call post discharge if problems developed, if the patient managed their own medications, if the patient was independent with ADLs, and if the patient felt ready to be discharged at the time of the index admission discharge day.

RESULTS

There were 17,099 admissions to the medicine service from January 1, 2013, through December 31, 2015. As shown in **Table 1**, the median age of the patients was 75 years and women accounted for 53.6% of the admissions. With respect to race, we found that 88.3% of those admitted were white, 6.2% were black/African American, 2.4% were Asian or Pacific Islander, and 3.2% identified as "other" race. In terms of marital status, 37.8% were married, 26.1% were widowed, 25.8% were single, and 9.9% were divorced or legally separated. With respect to insurance type, 69.2% of the total admission population had Medicare, including 26.3% who had Medicare fee-for-service and 25.5% who were in our Pioneer accountable care organization (ACO). A subset of Medicare patients were enrolled in Medicare Advantage programs, of which the largest subset was Tufts Medicare Preferred, which included 17.0% of the total admissions. We found that 24.3% of the total admissions had private payers and 6.4% had Medicaid.

Overall, 2226 readmissions occurred within 30 days following an index admission to the medicine service in 2013, 2014, and 2015, for an overall readmission rate of 13.0%. When we examined the demographics of readmitted patients compared with the overall group of admitted patients (**Table 2**), we found no significant difference in gender between the 2 groups. However, when we examined marital status, we found that being divorced or legally separated (15.7%; $P < .00072$) and widowed (15.7%; $P < .00001$) were associated

Table 1. Patient Demographics of Medicine Service Admissions

Characteristics		
Total (N)	17,099	
Median age (years)	75	
	Patients (n)	% of Total
Gender (female)	9169	53.6
Race		
White	15,092	88.3
Black/African American	1059	6.2
Asian/Pacific Islander	407	2.4
Other	541	3.2
Marital Status		
Divorced/legally separated	1699	9.9
Widowed	4462	26.1
Single	4414	25.8
Married	6455	37.8
Payer		
Medicare	11,840	69.2
Fee-for-service	4486	26.2
Accountable care organization	4357	25.5
Tufts Medicare Preferred	2822	17.0
Medicaid	1101	6.4
Private payer/other	4158	24.3

with significantly higher readmission rates compared with being married (11.6%). Those identifying as Asian or “other race” had a significantly lower readmission rate (7.1%; $P < .00019$; and 6.8%; $P < .000001$, respectively) compared with those of other races. Looking at insurance, we found that the readmission rate for patients with private insurance (8.3%) was significantly lower ($P < .00001$) than that for Medicare patients (14.7%), but this was likely confounded by the lower average age and primarily employer-based insurance of those with private payers. Mean LOS was 3 days for all admissions and 4 days for the readmissions.

The patients were admitted by a diverse group of attending types. Whereas the majority ($n = 12,719$; 74.3%) of the patients were admitted by hospitalists, 2300 (13.4%) were admitted by PCPs, 1141 (6.6%) were admitted by geriatricians, 707 (4.1%) were admitted by cardiologists, and 232 (1.3%) were admitted by intensivists.

We endeavored to examine readmission rates for each of these attending types for the penalty diagnoses of CHF, COPD, and pneumonia. Therefore, we stratified readmission numbers and rates by attending type by these 3 diagnoses grouped together. We found that the geriatricians had significantly lower readmission rates for the penalty diagnoses of CHF, COPD, and pneumonia (11.0%) compared with other attending types: hospitalists (13.7%), cardiologists (18.5%), intensivists (17.4%), and PCPs (16.7%) (Table 3).

When we analyzed all readmissions over the 3 years of the study, we saw an increase in readmission rates from 11.5% in 2013 to 13.65% in 2014 and 13.66% in 2015. However, we were surprised to see that the geriatricians' readmission rate did not follow the general trend. Instead, readmission rates for geriatricians decreased from 16.7% in 2013 to 13.7% in 2014 and to 12.7% in 2015. For hospitalists, the readmission rates increased from 10.8% in 2013 to 13.6% in 2014 and to 13.7% in 2015 (Figure 1).

To examine whether readmissions of our patients to other hospitals might change these findings, we obtained data on readmissions to other hospitals. These data were only available for our Medicare risk-based contracts: Pioneer ACO and a Medicare Advantage program, Tufts Medicare Preferred. We found that although readmissions to other hospitals represented a very small proportion of all readmissions (1.72% for all attending types), geriatricians had lower rates of readmission (0.59%), as shown in Figure 2.

Interview Results

We interviewed 58 patients with COPD, CHF, or pneumonia, 29 readmitted and 29 nonreadmitted, matched by age, gender, and primary diagnosis of the index admission. The average age was 77 years for readmitted patients and 78 for nonreadmitted, and there were equal numbers of men and women in the groups. We collected data on a diverse array of variables, which we postulated would be related to risk of readmission or explain the cause of readmission from the patient's perspective. We found that, overall, the readmitted patients were quite ill and had a poor functional status (Figure 3). Specifically, they were almost 3 times as likely as those who were not readmitted to indicate that they were not able to complete 1 or more ADLs without assistance (32.1% vs 11.1%, respectively). This was 1 of several ways that readmitted patients differed from nonreadmitted patients; for example, readmitted patients were more than twice as likely to have a first language other than English (17.9% vs 7.1%). They were more likely to lack an outpatient connection to a PCP (10.7% vs 0.0%) and to say they did not recall having their discharge instructions reviewed with them prior to discharge (14.3% vs 0.0%). They were 1.6 times more likely to report that they lacked the support of family members, a significant other, or close friends during their inpatient stay (17.9% vs 10.7%). The readmitted patients were more likely to report that they did not know whom to call with questions or concerns about their health following discharge (10.7% vs 0.0%); they were also more than 3 times as likely as the

Table 2. Characteristics of Medicine Service Readmitted Cohort

Characteristics				
Total (N)	2226			
Median age (years)	78			
	n (%)	Readmission Rate	P	
Gender (female)	1179 (53.0)	12.9%		
Race				
White	2014 (90.5)	13.3%	<.00042	
Black/African American	146 (6.6)	13.7%		
Asian/Pacific Islander	29 (1.3)	7.1%	<.00019	
Other	37 (1.6)	6.8%	<.000001	
Marital Status				
Divorced/legally separated	267 (12.0)	15.7%	<.00072	
Widowed	700 (31.4)	15.7%	<.000001	
Single	509 (22.9)	11.5%	<.00062	
Married	750 (33.7)	11.6%	<.00001	
Payer				
Medicare	1744 (78.4)	14.7%	<.000001	
Fee-for-service	640 (28.8)	14.2%		
Accountable care organization	671 (30.1)	15.4%		
Tufts Medicare Preferred	417 (18.7)	14.8%		
Medicaid	138 (6.2)	12.5%		
Private payer/other	344 (15.5)	8.3%	<.000001	

Table 3. Readmission and Readmission Rates of Penalty Diagnoses (CHF/COPD/pneumonia), by Attending Type^a

Attending Specialty	Total Admissions (n)	Readmitted (n)	Readmitted (%)
All specialties	2559	361	14.1
Hospitalist	1875	257	13.7
Geriatrics	200	22	11.0
Cardiology	27	5	18.5
Intensivist	23	4	17.4
Primary care	434	73	16.8

CHF indicates congestive heart failure; COPD, chronic obstructive pulmonary disease. ^aNo comparisons were statistically significant.

nonreadmitted patients to report that they did not manage their own medications at home (35.7% vs 10.7%).

However, we did not find substantial differences between the admitted and nonreadmitted patients when it came to educational status or problems with their medications. These medication-related problems included reporting changes to their medications in

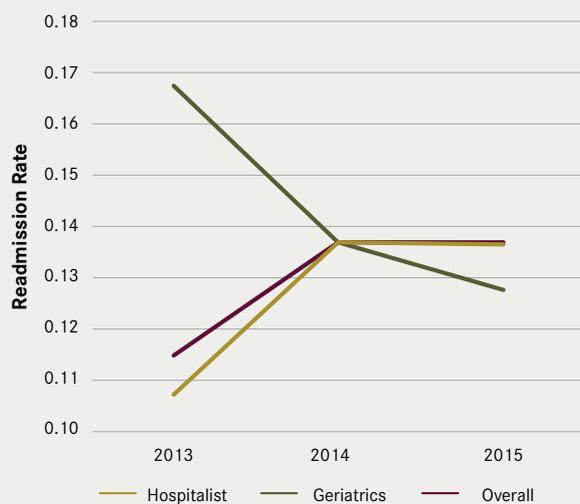
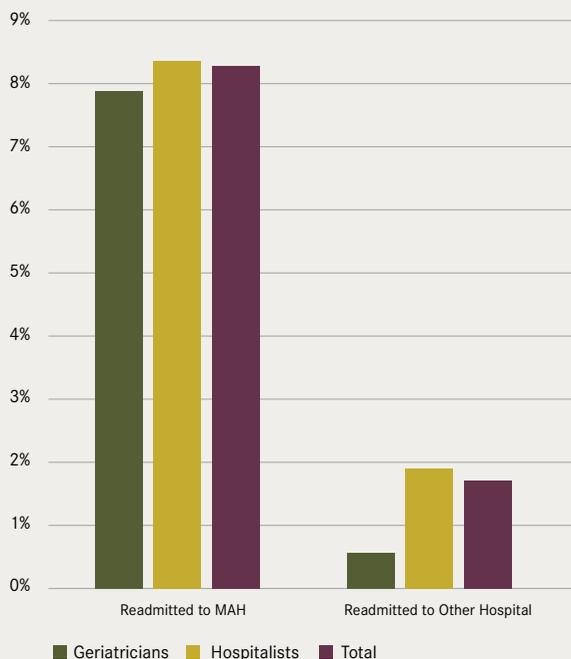
the hospital, whether they agreed with the mediation changes (or not), reporting difficulty obtaining prescriptions after discharge, or reporting experiencing adverse effects as a result of taking new medications.

DISCUSSION

This mixed-methods study adds to our understanding of the individual and health-care system drivers of 30-day readmissions. We found that readmission rates, particularly for the penalty diagnoses of CHF, COPD, and pneumonia, varied significantly by admitting physician attending type. Specifically, we found that geriatricians had lower 30-day readmission rates for the key penalty diagnoses of COPD, CHF, and pneumonia than did other attending types. Small sample sizes did not allow us to achieve statistical significance in this comparison. However, when examining the geriatric service more closely, we noted a continued decrease in readmission rates over time compared with an increase in readmission rates among other services.

To our knowledge, this is the first study to examine the association of attending type with 30-day readmissions. Several elements may have contributed to the lower readmission rates of geriatricians. First,

they provide continuity of care to their own patients across the inpatient and outpatient settings. This supports the notion that a comprehensive approach to care during hospital admission and follow-up after discharge reduce the risk of readmissions.¹² In addition, they have developed a highly coordinated care model that includes the use of postdischarge home visits, utilizing a multidisciplinary care team familiar with the patient, enhanced use of palliative care, and attention to goals of care. As was previously shown, continuity of care¹³ may contribute to their lower readmission rates, but the robust infrastructure of the geriatric service probably plays a crucial role as well. All of these special aspects of the geriatrics care model, at least in our hospital, are likely key contributors to their lower readmission rates. Adoption of similar models by other attending types for high-risk patients may be an effective strategy for lowering readmission rates. Furthermore, over the time period of this study, the geriatricians in our hospital focused on strategies for optimizing the discharge process and transitions of care and they hired a nurse practitioner to assist with care of chronically ill patients. They also instituted postdischarge home visits for their most complex patients.

Figure 1. Readmission Rates, by Attending Type**Figure 2. Readmission Rates to MAH and Other Hospitals, by Attending Type**

MAH indicates Mount Auburn Hospital.

On the individual level, the patient's social context was also found to be associated with readmission. As in prior studies showing a correlation between community factors, such as access to care, and readmission rates,¹⁴ we found that some key social factors increased

the risk of readmissions, including lack of social support of a spouse/partner during and after the inpatient stay, lack of a PCP or provider to call with questions, difficulty communicating in English, not remembering discharge instructions, and dependence on others for assistance with medications or ADLs. These findings suggest the need for rigorous identification of individual risk factors for readmission and for tailoring of discharge planning to mitigate the likelihood of readmission for those found to be at high risk.

Limitations

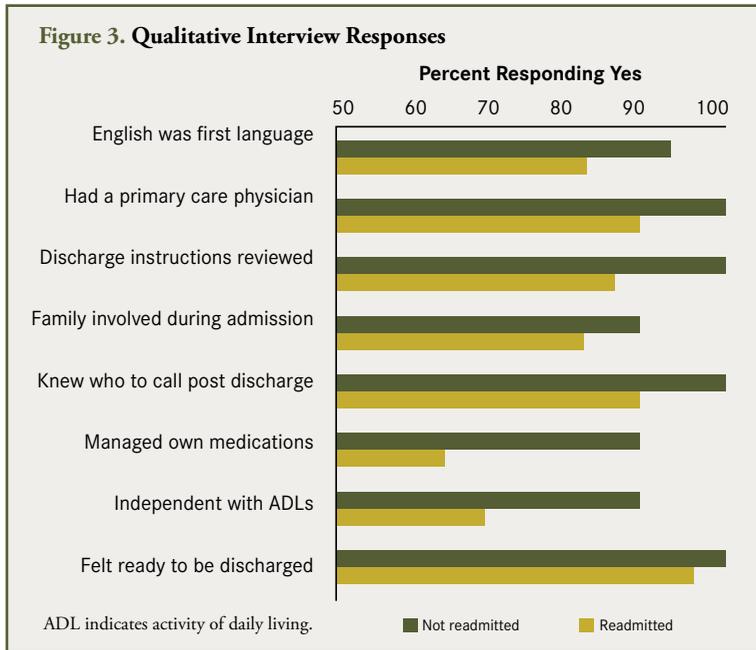
This study had several limitations. This was a single-center study with a limited number of patients. Therefore, future research is warranted in a larger cohort that involves multiple hospitals. Furthermore, we had data for readmissions to other hospitals only for 2 types of insurers: Medicare Pioneer ACO and Medicare Advantage (Tufts Medicare Preferred). These data included the majority of patients older than 65 years, but we did not have data for other age groups or insurance plans. Finally, the number of successful telephone interviews was lower than ideal, which emphasizes the need to do this type of research either in real time immediately following discharge or on a larger scale with multiple healthcare centers. Finally, it would have been helpful if we had data on LOS by attending types, as this information might explain the lower readmission rates for the geriatricians (ie, if their LOS was significantly higher).

CONCLUSIONS

This study adds to the literature regarding effective strategies to decrease 30-day readmissions. However, like many such studies, it consists of a bundled set of interventions studied at a single institution.¹⁵ Nonetheless, we believe that we have described another promising strategy for decreasing readmissions, which warrants further study in a larger number of patients and institutions. Taken together, these data suggest that efforts to reduce 30-day readmissions should include comprehensive care teams that focus on the needs of elderly patients with chronic illness and provide continuity in the care team during and following hospitalizations. Furthermore, we show that more attention should be paid to the context of patients' lives as discharge plans are developed, which may enable identification of those at highest risk of readmission and the provision of enhanced services to meet their needs and mitigate this risk.

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REFERENCES

- Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program [erratum in *N Engl J Med*. 2011;364(16):1582. doi: 10.1056/NEJMx110014]. *N Engl J Med*. 2009;360(14):1418-1428. doi: 10.1056/NEJMsa0803563.
- Readmissions Reduction Program (HRRP). CMS website. cms.gov/Medicare/medicare-fee-for-service-payment/acuteinpatientPPS/readmissions-reduction-program.html. Published 2016. Accessed January 21, 2016.

- Wasfy JH, Zigler CM, Choirat C, Wang Y, Dominici F, Yeh RW. Readmission rates after passage of the Hospital Readmissions Reduction Program: a pre-post analysis. *Ann Intern Med*. 2017;166(5):324-331. doi: 10.7326/M16-0185.

- Allaudeen N, Vidyarthi A, Maselli J, Auerbach A. Redefining readmission risk factors for general medicine patients. *J Hosp Med*. 2011;6(2):54-60. doi: 10.1002/jhm.805.

- Hansen LO, Young RS, Hinami K, Leung A, Williams MV. Interventions to reduce 30-day rehospitalization: a systematic review. *Ann Intern Med*. 2011;155(8):520-528. doi: 10.7326/0003-4819-155-8-201110180-00008.

- Goodman DC, Fisher ES, Chang C-H; Dartmouth Atlas Project. The revolving door: a report on U.S. hospital readmissions. The Dartmouth Atlas of Health Care website. dartmouthatlas.org/pages/readmissions2013. Published February 11, 2013. Accessed July 18, 2015.

- Silow-Carroll S, Edwards JN, Lashbrook A. Reducing hospital readmissions: lessons from top-performing hospitals. The Commonwealth Fund website. commonwealthfund.org/publications/case-studies/2011/apr/reducing-hospital-readmissions. Published April 6, 2011. Accessed July 20, 2015.

- Hu J, Gonsahn M, Nerenz DR. Socioeconomic status and readmissions: evidence from an urban teaching hospital. *Health Aff (Millwood)*. 2014;33(5):778-785. doi: 10.1377/hlthaff.2013.0816.

- Retrum JH, Boggs J, Hersh A, et al. Patient-identified factors related to heart failure readmissions. *Circ Cardiovasc Qual Outcomes*. 2013;6(2):171-177. doi: 10.1161/CIRCOUTCOMES.112.967356.

- Boulding W, Glickman SW, Manary MP, Schulman KA, Staelin R. Relationship between patient satisfaction with inpatient care and hospital readmission within 30 days. *Am J Manag Care*. 2011;17(1):41-48.

- Manary MP, Boulding W, Staelin R, Glickman SW. The patient experience and health outcomes. *N Engl J Med*. 2013;368(3):201-203. doi: 10.1056/NEJMp1211775.

- Dharmarajan K, Hsieh AF, Lin Z, et al. Diagnoses and timing of 30-day readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia. *JAMA*. 2013;309(4):355-363. doi: 10.1001/jama.2012.216476.

- Kim CS, Flanders SA. Transitions of care. *Ann Intern Med*. 2013;158(5 pt 1):ITC3-1. doi: 10.7326/0003-4819-158-5-20130305-01003.

- Herrin J, St Andre J, Kenward K, Joshi MS, Audet AM, Hines SC. Community factors and hospital readmission rates. *Health Serv Res*. 2014;50(1):20-39. doi: 10.1111/1475-6773.12177.

- Hansen LO, Young RS, Hinami K, Leung A, Williams MV. Interventions to reduce 30-day rehospitalization: a systematic review. *Ann Intern Med*. 2011;155(8):520-528. doi: 10.7326/0003-4819-155-8-201110180-00008.