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ORIGINAL RESEARCH

Hospitalists Assess the Causes of Early Hospital Readmissions

Douglas Koekkoek, MD* , K. Bruce Bayley, PhD , Allen Brown, BS , D. Leif Rustvold, MA, MS

Providence Health & Services, Oregon Region, Portland, Oregon.

BACKGROUND: Hospital readmissions are receiving increasing attention as an indicator of health care quality and waste. Hospitalists provide a unique perspective on the underlying processes that result in acute care readmissions and the extent to which readmissions can be prevented.

OBJECTIVE: The study assessed the views of hospitalists on the preventability of readmissions and the most important ways to prevent future readmissions.

DESIGN AND MEASUREMENTS: A group of 17 hospitalists serving four community hospitals reviewed the details of 300 consecutive 21-day readmissions. Each used a structured data collection form to code information from inpatient and outpatient charts on patient characteristics, process measures, preventability, and potential interventions.

RESULTS: Overall, 15% of readmissions were rated as overtly preventable, but with wide variation among hospitalists in their ratings of preventability. Perceptions of preventability appear to be a function of readmission timing, the similarity of diagnoses between admissions, medication issues, and the presence of certain chronic diseases (eg, chronic obstructive pulmonary disease [COPD]). Hospitalists were more likely to recommend familiar interventions under their control for a readmissions termed preventable, such as extending the initial hospital stay or addressing medications and patient education at discharge. They less often identified outpatient case management, home services, or physician nursing home visits as viable prevention strategies.

CONCLUSIONS: The study points to the multifactorial nature of interventions needed to prevent readmissions, the tradeoffs between hospital length of stay and readmission, and the importance of fostering a culture of optimism and engagement to outpatient components of the health system to reduce hospital readmissions. *Journal of Hospital Medicine* 2011;6:383–388. © 2011 Society of Hospital Medicine

Hospital readmissions have become a focus of national attention as a potential indicator of poor quality and health care waste.[1–3] Geographic variations in readmission rates, a high rate of "unplanned" readmissions, and the emergence of promising interventions all suggest that some portion of readmissions are preventable.[4,5] This work adds to the work of the Agency for Healthcare Research and Quality (AHRQ) on reports of preventable hospital admissions, using hospitalization rates for ambulatory-sensitive conditions as "prevention quality indicators."[6]

The actual proportion of preventable readmissions is unknown. In previous research using physician reviewers, estimates have ranged from 5% to 38%.[7–13] More recently, studies using a methodology based on relationships between diagnoses at the initial and subsequent hospitalizations have flagged as many as 76% of 30-day readmissions as preventable.[14]

Understanding the preventability of readmissions is important if we are to gauge the true size of this quality and cost opportunity. Moreover, it is important to assess the beliefs of the front-line clinicians who will be playing key roles in prevention.

The objective of the current study was to examine readmission preventability from the perspective of hospital medicine experts practicing at a community hospital. Through detailed chart review, we identify patient factors and care processes that affect preventability and describe clinicians' ideas for preventing future readmissions.

METHODS

Setting

The study took place within four community hospitals in Portland, OR, all staffed by a single hospitalist group. The hospitals included two large (483 and 525 bed) tertiary facilities with internal medicine residency programs and two smaller (77 and 40 bed) suburban hospitals, one of which has a family practice residency. The hospitalists are part of an employed medical group owned by the health care system. Each of the hospitalists is assigned as a liaison to a single primary care clinic as a means of fostering collaboration between primary care physicians and their hospital medicine colleagues.

Patients

Eligible patients were those discharged from one of these four hospitals, between January 2009 and May 2010, who had a hospitalist consult during their stay and were cared for in a system primary care clinic. The vast majority of patients were discharged by one

***Address for correspondence and reprint requests:** Douglas Koekkoek, MD, Providence Health & Services, Oregon Region, 4400 NE Halsey, Portland, OR 97213; Telephone: 503-893-6447; E-mail: douglas.koekkoek@providence.org

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of the internal medicine hospitalists (and all had an internal medicine consultation), thus most had medical rather than surgical diagnoses. Acute care and ambulatory care charts were reviewed for all patients readmitted within 21 days after their discharge date. The 21-day window (rather than the customary 30-day time period) was chosen to emphasize near-term returns to the hospital. Hospital transfers and patients discharged to inpatient rehabilitation or inpatient mental health were excluded from the study as not representing a true readmission.

A total of 300 consecutive patient charts meeting these criteria were reviewed. These included patients readmitted multiple times. Each readmission was counted as a separate case.

Reviewers

Hospitalist reviewers came from each of the four participating hospitals. All are board certified internal medicine physicians, who perform both admitting and rounding of patients. None are nocturnists and none have specialist training or experience (in skilled nursing care, geriatrics or palliative care, or fellowship training). There were 11 male reviewers and 6 female; 12 were working full time and 5 part-time. Two had previous primary care experience. The mean age was 38.1 (range, 31–48 years) with an average 7.9 years of experience (1–19 years).

Six hospitalists accounted for 83% of the reviews. Among these top volume reviewers, the lowest was 17 cases and the highest was 61. There was variability in the number of reviews per hospitalist for two reasons: Some hospitalists joined in the review project earlier than others, and some hospitalists served as liaison for more primary care clinics (or larger ones) and thus had more readmissions to cover. For the purposes of analysis, the six top volume reviewers were compared to each other and to the group of remaining reviewers.

Data Collection

Data were collected via review of both inpatient and ambulatory charts by a hospitalist assigned as liaison to the primary care clinic where the patient had received care prior to hospital admission. In almost all cases (96%), the reviewer was not the discharging hospitalist, in order to provide a fresh perspective on the reasons for readmission.

A structured data collection form was developed in successive iterations by the hospitalists, starting with narrative text to describe the readmission scenario and gradually adding coded fields as themes emerged. A trial form was developed and then modified to final form by consensus discussion, in order to facilitate collection of essential information on patient diagnoses and care process issues (Appendix A). The form includes room for the reviewer to explain in narrative form the circumstances of the initial (index) admission, the readmission, and what happened in the interim. Reviewers were also asked to give their best judgment regarding the relationship between the initial and subsequent admission, whether the readmission was preventable, and potential interventions that could have prevented the readmission. The form went through slight modifications within the study, to eliminate the need for reviewer calculations and to add the more frequent diagnoses and prevention ideas appearing in the ''Other'' category.

The 17 physician reviewers were trained by one of the authors (D.K.). For key judgment ratings, definitions were agreed upon by the reviewer group. For ascertaining *related* admissions, definitions were linked to admitting diagnoses for the readmission and diagnoses listed in the discharge summary of the index admission. For ascertaining *preventability*, the reviewer decided whether a change in the discharge plan or immediate posthospitalization plan of care would have reduced the likelihood of readmission. Definitions and examples are provided in Appendix B. The two dimensions were intended to be different—the degree of relatedness of a readmission did not dictate the degree of preventability.

Inter-rater reliability analyses were not conducted, but data were analyzed by reviewer to determine the importance of reviewer on survey items requiring substantial reviewer judgment. In particular, reviewers were statistically compared on their rating of the ''relatedness'' of the initial and subsequent diagnoses using chi-square. Over the course of the study, additional questions were added to the data collection form, resulting in different numbers of responses for some items.

PASW version 18[15] was used for quantitative analyses, to profile readmitted patients and to identify factors important in preventability using the chi-square and *t* test statistics. Stata version 11[16] was used for hierarchical logistic regression modeling, to gauge the independent effect of various predictors of preventability while controlling for the possible unintended influence of the particular chart reviewer. The study was approved by the local health system institutional review board (IRB).

RESULTS

Two hundred thirteen patients (85%) had a single readmission. Another 33 patients had 2 readmissions, and 5 patients accounted for 21 readmissions for a total sample of 300 cases. Table 1 provides characteristics of readmitted patients. They were likely to be elderly; the mean (SD) age was 75.3 (15.3), and more than 48% were 80 or older. Sixty-six percent of patients were taking more than ten medications, and a quarter (25%) had more than three new medications prescribed at discharge. Frequent diagnoses at the index admission included renal insufficiency, heart failure, dementia, atrial fibrillation, and chronic

TABLE 1. Characteristics of Readmitted Patients

Characteristics	No.	%
Clinical parameter (n = 300 except where noted)		
Age 80 or older	144	48
More than 10 medications at discharge	197	66
More than 3 new medications at discharge	75	25
Diagnoses at index admission*		
Dementia/delirium/altered MS	86	29
Renal insufficiency	85	28
Heart failure	77	26
COPD	56	19
Atrial fibrillation	51	17
Pneumonia	47	16
History of noncompliance	40	13
Respiratory failure	38	13
Urinary tract infection	30	10
Depression/anxiety	30	10
Chemotherapy patient	17/165	10
Anticoagulation medication issues	22	7
Sepsis	21	7
Falls	12/165	7
MI	18	6
CVA	18	6
Readmission culminated in hospice referral	16	5
Sleep apnea	9/165	5
Patient with ongoing substance abuse	10	3

Abbreviations: altered MS, altered mental status; COPD, chronic obstructive pulmonary disease; CVA, cerebrovascular accident, MI, myocardial infarction. * More than one possible.

TABLE 2. Characteristics of the Initial Stay and Readmission

Characteristics	No.	%
Initial admissions LOS (n = 290)		
1 day	33	11
2–3 days	112	39
4–7 days	108	37
8+ days	37	13
Discharge location (n = 286)		
Home	130	45
SNF or ICF	76	27
Home with HH	55	19
Assisted living facility	17	6
Adult foster care	8	3
Readmit interval in days (n = 296)		
1–7 days	171	58
8–14 days	85	29
15–21 days	40	14
Related diagnosis? (n = 299)		
Unrelated	75	25
Related	107	36
Same	117	39
Follow-up appointment did not occur as recommended (n = 166)	114	69
No PCP follow-up prior to readmission (n = 300)	172	57
No evidence of PCP contact with patient in between hospitalizations (n = 300)	183	61
No evidence of primary care case management prior to readmission (n = 300)	236	79

Abbreviations: HH, home health; ICF, intermediate care facility; LOS, length of stay; PCP, primary care physician; SNF, skilled nursing facility.

obstructive pulmonary disease (COPD). The majority of cases had more than one diagnosis identified at their first admission. These diagnoses are what hospitalists believe are significant patient issues rather than the hospital-coded principal and secondary diagnoses.

Sixty-four percent readmitted cases had been discharged to home (including those with home services), and 36% were discharged to a care facility (skilled nursing facility [SNF], foster care, assisted living) (Table 2). Fifty-eight percent of cases were readmitted within seven days of the index admission, and another 29% within the first two weeks. Exactly 75% of the time, the readmission was for the same or related diagnosis as the index admission. Primary care follow-up did not occur as recommended 69% of the time, and 57% of the time the patient was readmitted prior seeing their primary care physician (PCP).

Overall, only 15% of readmissions were termed "preventable" by the hospital reviewers, although another 46% were deemed "possibly preventable." Preventability ratings varied by reviewer, ranging from a high of 27% to a low of 0% among hospitalists rating ten or more cases (Table 3). There was similar variation in the number of recommended interventions. For readmissions deemed preventable or possibly preventable, the number of potential interventions ranged from more than three per patient to less than one per patient.

The most frequently mentioned intervention that could have prevented a readmission was to extend the hospital stay by one to two days (Table 4). An earlier

TABLE 3. Rating of Preventability and Number of Interventions by Reviewing Hospitalist

Top Volume Reviewers	No. Cases Reviewed	No. (%) Termed Preventable or Possibly Preventable	Total No. Interventions Suggested	Interventions per Preventable Case
A	17	3 (18)	3	1.00
B	41	31 (76)	95	3.06
C	61	48 (79)	111	2.31
D	31	12 (39)	4	0.33
E	34	11 (32)	6	0.55
F	64	52 (81)	120	2.31
All others	50	27 (54)	35	1.30
Total	298	184 (62)	374	2.03

PCP appointment was suggested for another 21% of readmissions. Other interventions received a scattering of mentions. The types of recommended interventions varied with the rater's perception of preventability (Figure 1, available online). Hospitalists were more likely to recommend a longer initial stay, medication changes, or additional education at discharge, and earlier contact from a care facility, for readmissions they thought were preventable. For *possibly* preventable readmissions, these same recommendations were important, but hospitalists were also likely to recommend case management, disposition to a higher level of care, or a home health visit.

Table 5 shows the most important characteristics associated with preventability, using a cutoff of 0.2 in

TABLE 4. Interventions That Might Have Prevented a Readmission*

Interventions	n	%	Total N
Extend hospital stay by 1–2 days	68	23	300
Earlier PCP follow-up appointment	56	21	269
Primary care case management	55	18	300
More end-of-life discussion or palliative care consult	50	17	300
Different discharge medications/dosage	48	16	300
Disposition to a higher level of care	17	13	134
Better education re: home management	17	13	134
Hospice	38	13	300
Home health/home physical therapy visit	30	11	269
Nursing home visit by MD or SNF specialist	24	9	269
Earlier contact from care facility (SNF, ICF, ALF)	14	5	268
Improve medication reconciliation or education	10	4	269

Abbreviations: ALF, assisted living facility; ICF, intermediate care facility; MD, medical doctor; PCP, primary care physician; SNF, skilled nursing facility. *More than one possible.

TABLE 5. Relationship of Case Characteristics to Preventability

Characteristic	Value	Preventable Portion (%)	*P* value
Index vs. readmission diagnosis	Same	28.2	<0.001
	Related	8.4	
	Unrelated	4.1	
New discharge medications	More than 3	25.7	0.004
	3 or fewer	11.8	
Timing of PCP follow-up	Readmitted prior to PCP follow-up	19.8	0.009
	Readmitted after PCP follow-up	8.7	
Readmission interval	1 week or less	19.3	0.012
	More than 1 week	8.8	
COPD diagnosis	With COPD	25.5	0.018
	Without COPD	12.8	
Index admission site	Hospital 1	14.3	0.078
	Hospital 2	15.1	
	Hospital 3	7.1	
	Hospital 4	22.7	
Depression/anxiety diagnosis	With depression	20.0	0.083
	Without depression	9.0	
Patient on anticoagulation	Anticoagulation	27.3	0.098
	No anticoagulation	14.1	
Age	Greater than 80	12.0	0.144
	80 or less	18.1	

Abbreviations: COPD, chronic obstructive pulmonary disease; PCP, primary care physician.

statistical significance. Readmissions for the same diagnosis were more likely than others to be rated ''preventable,'' as were cases with a short readmission interval, more than three new medications at discharge, and patients with COPD or depression/anxiety. Initial hospital length of stay did not influence preventability, nor did it influence the likelihood of a reviewer recommending a longer initial stay.

Potential predictors associated with preventability were included in a hierarchical logistic regression model, with hospital site and reviewer included as random effects. In this modeling, preventable readmissions were more likely than nonpreventable readmissions to be influenced by three process factors: having the same index and readmission diagnosis; readmission in the first post-hospital week; being readmitted prior to a primary care follow-up; and three patient factors: having more than three new discharge medications, having anticoagulation treatment, and having a COPD diagnosis (data available online). Other chronic diseases, age, discharge location, or previous readmissions were not important in the rating of preventability. When entered as random effects in a hierarchical logistic regression model, the categorical variable representing hospital site did not significantly improve prediction ($P = 0.42$), but the reviewer variable (categorized by the top six reviewers and ''others'') had marginal significance at $P = 0.088$.

DISCUSSION

Reported high Medicare 30-day readmission rates and associate excess costs have created a national climate for eliminating unnecessary hospital readmissions.[1] Recently passed healthcare legislation in the USA will put in place diagnosis-related group (DRG) payment reductions for excess readmission rates by 2013. As the definitions and methodologies for determining the relatedness and preventable nature of readmissions continues to be clarified, this study contributes to the understanding of preventability and specific preventative strategies from a physician perspective. Although potential savings in readmission reduction work is attractive, our study indicates that most front-line clinicians are not convinced that a large portion of readmissions are preventable.

The proportion of preventable readmissions found in our study is very much in line with previous research.[7–13] Certain predictors of preventable readmissions were also similar. Several researchers have found that preventable readmissions are more likely to be early,[8,10,12] and have the same or related diagnosis as the initial stay.[8] On the other hand, our data did not show an independent effect of age on preventability, as others have suggested.[9,17] Patients with a large number of diagnoses and medications have been shown to be at risk for preventable readmissions,[9] but the importance of new discharge medications has not been widely researched and is a factor that deserves further exploration.

One key message from our study was found in the variation in the ratings of preventability by individual physicians. At first blush, it may appear to reflect a lack of inter-rater reliability or understanding of the underlying concept of preventability. We believe this is unlikely, given the discussions among raters and the clear descriptions offered in writing. Moreover, there was much less variation in other judgments such as the ratings of ''relatedness'' of the readmission diagnosis (chi-square = 21.7, $P = .041$)

There are a number of possible reasons for variation in reviewer ratings of preventability. Reviewers did

vary with regard to age, experience, tenure in the organization, gender, and full/part-time status. They practiced at different hospitals. None of these factors were related to ratings of preventability. On the other hand, three explanations are worth noting.

First, the hierarchical regression models found that reviewer only slightly improved prediction ($P = 0.088$), above and beyond the other diagnosis and process factors. This would lead us to reject the factor of reviewer as the most important predictor of preventability; the other case characteristics mentioned above were more important.

Second, the three hospitalists who were more optimistic (rated more cases as preventable) reviewed more charts than others. It is possible that these three were more engaged, not only in the chart review process, but more eager to uncover potential remedies to prevent readmissions. While generating more ideas about how to do that, they rated more readmissions as preventable. We do not believe that actually doing more reviews caused them to rate a greater portion as preventable; none of the reviewers showed progression to more preventable ratings over time (analysis not shown).

Finally, it is worth noting that two of the more optimistic physicians had previous primary care experience. This is an intriguing explanation that would benefit from further research. First-hand experience with primary care case management, rapid appointment follow-up, home service referrals, and the like may give the practicing hospitalist reason to believe that actions in the ambulatory setting can prevent readmissions.

Regardless of the source, the variation demonstrates cultural or philosophical biases among clinicians regarding how much influence additional planning, education, and care coordination can have on readmissions. We believe that this variation must be addressed in the implementation of readmission reduction programs. Physician engagement will be more likely if there is optimism about the potential to prevent readmissions. In addition, it will be important to develop more consensus about effective interventions from the perspectives of hospital physicians, primary care physicians, nurses, and patients, as others have alluded.[18,19]

The significant rate of related readmissions (75%) has implications for the potential Centers for Medicare and Medicaid Services (CMS) methodology that will be used to reduce DRG payments, given the legislation's current intent to exclude only unrelated and planned readmissions from the calculations. Providing clear definitions on relatedness and a methodology to code this criterion in administrative datasets may need to be developed. The views of hospitalists in the current study suggest that the relatedness methodology may be overly sensitive and not yet specific enough to isolate truly preventable readmissions. Less than a quarter of related readmissions were deemed preventable by these raters.

Hospitalists found both patient and process factors important in assessing the preventability of a readmission. This kind of analysis can point to subgroups with potential for targeted intervention. For example, over a third of patients readmitted within a week for the same diagnosis were rated as preventable, indicating a critical follow-up period for some patients. Higher ratings of preventability among the readmissions for patients on anticoagulation or who were given more than three new medications at discharge indicates that better medication management may indeed be a fruitful strategy for readmission reduction.

The finding that increasing the length of the initial hospital stay was rated as the most prevalent strategy to mitigate against readmission in our retrospective review was surprising. It emphasizes the tension between efficient hospital throughput which reduces unnecessary hospital days and the necessity for appropriate monitoring to ensure clinical stability prior to discharge. Excess hospital days can prolong the exposure to a multitude of hospital acquired conditions (HAC), and this risk must be weighed against a longer length of stay and the time required delivering the appropriate hospital services.

Exploring alternative strategies to reduce readmissions without increasing the hospital length of stay is a reasonable response to this tension. Better discharge education and attention to discharge medications and dosages were also recommended strategies for preventable readmissions. These are interventions hospitalists are familiar with and can control. Relatively smaller percentages of patients were thought to benefit from case management, hospice, home health, or an MD visit to their nursing home, and hospitalists were more likely to recommend these for the "possibly preventable" patients. These interventions are not fully implemented within the study health system so there is understandably less confidence in them.

Limitations of this study include its relatively small sample size and the fact that all patients were served by a single medical practice. No extensive inter-rater reliability checks were performed, although all reviewers were trained in the definitions of the most important judgment items. Other limitations include possible confounding biases which were not controlled, such as the number of charts reviewed, timing of review, and hospital reviewed (ie, each reviewer did not review the same proportion of charts from each hospital).

SUMMARY

We have presented a retrospective chart review study of hospital readmissions in a community hospital

setting. This study adds to the increasing literature describing the factors that contribute to hospital readmissions, how preventable they are, and what strategies may reduce the likelihood of readmission. This study is unique in its contribution to the understanding of hospital readmissions by studying front-line clinician (hospitalist) perceptions of those factors.

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