Effect of Hospital Follow-up Appointment on Clinical Event Outcomes and Mortality

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Background: Decreasing hospital readmission and patient mortality after hospital dismissal is important when providing quality health care. Interventions recently proposed by the Centers for Medicare and Medicaid Services to reduce avoidable hospital readmissions include providing patients with clear discharge instructions and appointments for timely follow-up visits. Although research has demonstrated a correlation between follow-up arrangements and reduced hospital readmission in specific patient populations, the effect of hospital follow-up in general medicine patients has not been assessed.

Methods: For this study, we reviewed hospital dismissal instructions for general medicine patients dismissed in 2006 from Mayo Clinic hospitals in Rochester, Minnesota (n=4989), and determined whether specific appointment details for follow-up were documented. Survival analysis and propensity score–adjusted proportional hazards regression models were developed to investigate the association of follow-up appointment arrangements with hospital readmission, emergency department visits, and mortality at 30 and 180 days after discharge.

Results: Of the 4989 dismissal summaries, 3037 (60.9%) contained instructions for a follow-up appointment. No difference was found between those with a documented follow-up appointment vs those without regarding hospital readmission, emergency department visits, or mortality 30 days after dismissal. However, those with a documented follow-up appointment were slightly more likely to have an adverse event (hospital readmission, emergency department visit, or death) within 180 days after dismissal.

Conclusions: Improved discharge processes, including arrangement of hospital follow-up appointments, do not appear to improve readmission rates or survival in general medicine patients. Therefore, national efforts to ensure follow-up for all patients after hospital dismissal may not be beneficial or cost-effective.

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Health care professionals are ethically charged with providing patients with the best quality care possible. One measure of care improvement can be accomplished by decreasing avoidable hospital readmission. Previous research has suggested that an adverse event complicates 1 of every 5 hospital discharges, often leading to an emergency department visit or hospital readmission. In the Medicare population alone, 19.6% of patients dismissed from the hospital will be readmitted within 30 days and 34.0% of patients will be readmitted within 60 days. These striking statistics underscore the vulnerability of patients during their transition from the hospital to home or another care setting. These high rates of adverse events, emergency department visits, and readmissions after hospital dismissal are thought to result in part from discharge processes that are not optimal.

Strategies to reduce hospital readmissions are important to provide quality health care and to save costs owing to the expense of hospital readmissions. Estimates suggest that avoidable hospital readmissions cost Medicare up to $12 billion per year. With the move toward pay for performance, the Medicare Payment Advisory Commission has proposed reducing payments for hospital readmissions. The Medicare Payment Advisory Commission has proposed several interventions to reduce the number of avoidable readmissions, including providing patients with clear discharge instructions and scheduling timely follow-up visits.

Unfortunately, there has been minimal research done regarding the importance of arranging and documenting follow-up appointments before patient dismissal.
To our knowledge, previous research has not addressed the association between follow-up appointment instructions and short-term outcomes in general medicine patients. For this study, we examined the effect of documented follow-up arrangements at hospital discharge on hospital readmission, emergency department visits, and mortality in general medicine patients within 30 days and within 6 months after discharge.

METHODS

STUDY SETTING

We retrospectively reviewed all hospital discharge records for patients dismissed in 2006 from general internal medicine inpatient services at Mayo Clinic in Rochester, Minnesota. Dismissal summaries, which are entered directly into the electronic medical record by the discharging health care professional or a clinical assistant, were used for the study. Records of patients dismissed to a long-term care facility or hospice or transferred to another inpatient service, as well as those without research authorization, were excluded from analysis. Of the 7153 general internal medicine patients, 2164 (30.3%) were excluded for the following reasons: 344 because of no research authorization, 12 because of a discharge note date occurring more than 2 days before the discharge date, 130 because of inpatient transfer, 1669 because of discharge to someplace other than home (eg, another inpatient facility, nursing home, or hospice), and 9 because of in-hospital death. Patients discharged to home with home health services were included, whereas patients who were discharged to home with skilled nursing services were not included.

ANALYSIS

A data set consisting of 4989 free-text dismissal records was manually reviewed by a health services analyst to determine whether the instructions included follow-up appointment arrangements. To be considered complete, documentation needed to provide specific date, time, and either location or physician for the appointment. Appointments with either primary care providers (ie, physicians, nurse practitioners, and physician assistants) or specialists were considered appropriate follow-up, but appointments for procedures or therapy were not. Locations could be specific departments, clinics, buildings, or desks to which to report. Appointments with health care professionals within and outside the Mayo Health System were included.

To assess the reliability of the manual abstraction, appointment elements were manually reviewed by another reviewer from a random sample of 140 discharge records. The raw agreement between data from the 2 reviewers was 0.97, and chance-corrected agreement (κ) was 0.94 (95% confidence interval [CI], 0.885-0.998). This high agreement validated the use of the original reviewer’s assessment of follow-up appointment instructions.

Administrative data were reviewed within our system to determine potential hospital readmission or emergency department visits after hospital discharge. Potential mortality was assessed through review of the administrative data and state death certificates. Patient follow-up was censored at the last visit or known contact date within our system.

The primary end points were hospital readmission, emergency department visit, and mortality. Two composite end points were also created. The primary composite end point was composed of the first incidence of hospital admission or emergency department visit. The secondary composite end point was made up of the first incidence of any event, including death, hospital admission, or emergency department visit. Survival analysis using Kaplan-Meier methods and proportional hazards regression models were developed to investigate the association between documented follow-up instructions and time to hospital readmission, time to emergency department visit, mortality, and the composite end points within 30 and 180 days after hospital discharge. The data were adjusted for patient demographics (age and sex) and severity of illness based on the all-patient refined–diagnosis related group weight of the hospitalization. The data were also stratified according to the distance traveled to the Mayo Clinic to help account for the increased capture of rehospitalizations in local patients. We included indicators in our models for the following categories: local (Olmsted County, Minnesota, and adjacent counties), regional (within 120 miles), and distant (beyond 120 miles). To account for the possibility that patients more likely to be readmitted to the hospital were also more likely to have received a follow-up appointment, a propensity score for the provision of discharge appointments was developed using a logistic regression model that included patient demographics and severity of illness (C = 0.381). The multivariate proportional hazards models were then stratified by propensity score quintiles to adjust for possible bias regarding which patients received the appointments.

Secondary analyses included the assessment of interaction between the presence of discharge appointment arrangements and the adjustment factors used in the models for readmissions within 30 days, specific analysis within each of the geographic groups to determine the possible effect of incomplete follow-up, the length of time from discharge until the scheduled appointment, and examination of subgroups of patients with differing principal diagnoses categorized into Clinical Classification System codes. Furthermore, we explored the possibility that discharge appointments may have stronger effects on readmissions and visits to the emergency department related to the initial stay. Related readmissions and emergency department visits were identified following the algorithm used by the University Healthsystem Consortium, which essentially identifies a return visit as related if it is for the same principal diagnosis as the index admission (within group), same type of procedure, or a complication of care.

RESULTS

Our results showed that 3037 of the 4989 patient records (60.9%) reviewed for this study contained detailed follow-up appointment instructions. These follow-up appointments were scheduled from the same day as discharge to 9 months after discharge, with a median of 6 days after discharge (25th and 75th percentiles, 3 and 10 days). The mean (SD) age of patients with follow-up arrangements was significantly older (P = .02) than those without...
follow-up arrangements: 62.3 (19.2) years vs 61.0 (19.2) years. Patients with follow-up arrangements also had a longer length of stay (3.3 [3.5] days vs 2.7 [3.2] days, \( P < .001 \)) and a higher all-patient refined–diagnosis related group weight (1.1 [0.9] vs 1.0 [0.8], \( P = .003 \)). Follow-up was arranged more often for patients who resided closer to the Mayo Clinic than for patients who did not reside in close proximity. Specifically, 2053 of the 3181 patients (64.5%) who resided in Olmsted and surrounding counties had an arranged follow-up, whereas 492 of 839 (58.6%) and 492 of 969 (50.8%) of those whose disease was classified as regional or distant, respectively, had a follow-up appointment scheduled (\( P < .001 \)). Other details of the demographic characteristics of the population are given in Table 1.

When the data were adjusted for patient age, sex, distance traveled to the Mayo Clinic, and all-patient refined–diagnosis related group weight and then stratified for the propensity of receiving a follow-up appointment, no association between an arranged follow-up appointment and hospital readmission or the primary composite end point were found 30 days after dismissal (Table 2). Patients with follow-up appointments had no difference in rehospitalizations or emergency department visits compared with those without follow-up appointments (hazard ratio [HR] = 1.05, \( P = .42 \)). In addition, no associations were seen between an arranged follow-up appointment and emergency department visits 30 days after hospital dismissal, mortality, or secondary composite end point (HR = 1.11, \( P = .36 \); 0.67, \( P = .20 \); and 1.04, \( P = .56 \), respectively; results not shown).

At 180 days after hospital dismissal, patients with follow-up appointment arrangements were more likely than those without to have either a hospital readmission or an emergency department visit (HR = 1.10, \( P = .03 \)) when the data were adjusted for other factors (Table 3). No difference was found between those who had a documented follow-up appointment at hospital dismissal vs those who did not in regard to mortality 180 days after dismissal in the adjusted data analysis (HR = 0.78, \( P = .20 \); results not shown).

The findings for the effect of discharge appointments on subsequent readmission or visit to the emergency department were consistent across our analyses within patient geographic region. The 3 HRs for 30-day readmission ranged from 0.92 (95% CI, 0.67-1.29) among regional patients to 1.08 (0.92-1.27) among local patients. The other outcomes had similar results. Among the subset of patients who had follow-up appointments at discharge, a significant relationship was found between the length of time to the scheduled appointment and the likelihood of hospital readmission. Patients with a longer span between discharge and scheduled follow-up appointment were less likely to be readmitted within 30 days (HR = 0.99 per day; 95% CI, 0.99-1.00; HR = 0.92 per week; 0.85-0.99). Results were similar for the primary composite end point. When assessing the effect of having a scheduled appointment within 7 days, no significant relationship was seen with any of the 30-day outcomes. When applying the University Healthsystem Consortium logic to the readmissions and visits to the emergency department to determine relatedness, only 341 of 867 readmissions (39.3%) within 30 days were related to the previous stay, whereas only 115 of 331 emergency department visits (34.7%) were considered related. Twelve percent of related readmissions were complications, with the remaining cases being readmitted for a similar problem. No significant associations were found between the presence of a scheduled follow-up appointment at discharge and related hospital readmission within 30 days (HR = 0.99; 95% CI, 0.80-1.24) or related emergency department visit (0.84; 0.58-1.23).

Additional secondary analysis assessed potential interactions and whether the effect of discharge appointments on the composite readmission and emergency department visit rate within 30 days was evident among any of the subgroups of patients classified by principal diagnosis category. No significant interactions were seen with follow-up appointment arrangements. Patients with infectious or parasitic disease were more likely (HR = 2.71; 95% CI, 1.99-3.51; \( P = .003 \)) to have an event when the discharge appointment was present, but patients with signs, symptoms, or ill-defined conditions were less likely (0.68; 0.47-0.97; \( P = .03 \)) to have an event when follow-up arrangements were made.

### Table 1. Demographic Characteristics for Patients With and Without Arranged Follow-up Appointments at Hospital Dismissal

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No Follow-up Arrangement (n=1952)</th>
<th>Follow-up Arrangement (n=3037)</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, No. (%)</td>
<td></td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td>Female</td>
<td>1034 (53.0)</td>
<td>1598 (52.6)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>918 (47.0)</td>
<td>1439 (47.4)</td>
<td></td>
</tr>
<tr>
<td>Age group, y, No. (%)a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-50</td>
<td>593 (30.4)</td>
<td>839 (27.6)</td>
<td></td>
</tr>
<tr>
<td>51-60</td>
<td>296 (15.2)</td>
<td>445 (14.7)</td>
<td>.09</td>
</tr>
<tr>
<td>61-70</td>
<td>326 (16.7)</td>
<td>499 (16.4)</td>
<td></td>
</tr>
<tr>
<td>71-80</td>
<td>413 (21.2)</td>
<td>664 (21.9)</td>
<td></td>
</tr>
<tr>
<td>81-90</td>
<td>274 (14.0)</td>
<td>485 (16.0)</td>
<td></td>
</tr>
<tr>
<td>APR-DRG weight, mean (SD), d</td>
<td>1.0 (0.8)</td>
<td>1.1 (0.9)</td>
<td>.003</td>
</tr>
<tr>
<td>Length of stay, mean (SD), d</td>
<td>2.7 (3.2)</td>
<td>3.3 (3.5)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Surgery, No. (%)</td>
<td></td>
<td></td>
<td>.39</td>
</tr>
<tr>
<td>No</td>
<td>1793 (91.9)</td>
<td>2810 (92.5)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>159 (8.2)</td>
<td>227 (7.5)</td>
<td></td>
</tr>
<tr>
<td>Geographic group, No. (%)</td>
<td></td>
<td></td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Local</td>
<td>1128 (57.6)</td>
<td>2053 (67.6)</td>
<td></td>
</tr>
<tr>
<td>Regional</td>
<td>347 (17.8)</td>
<td>492 (16.2)</td>
<td></td>
</tr>
<tr>
<td>Distant</td>
<td>477 (24.4)</td>
<td>492 (16.2)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: APR-DRG, all-patient refined–diagnosis related group.

aPercentages do not total 100.0 because of rounding.

### COMMENT

Physicians and hospital administrators have sought strategies to reduce hospital readmissions, improve patient care, and reduce health care costs. Despite our original hypothesis that specific instructions regarding a hospital follow-up appointment would be associated with fewer hospital readmissions, we found that having documented specific follow-up instructions at dismissal was actually associated with a slightly higher likelihood of having either an emergency department visit or hospital re-

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admission 180 days after dismissal. However, no difference in survival was found between the patients who had a documented follow-up appointment and those patients who did not have a documented follow-up appointment at dismissal when the data were adjusted for patient age, sex, severity of illness, or distance traveled to the Mayo Clinic. Even when stratifying our results according to geographic location and using a propensity score to minimize the potential bias that patients with a higher severity of illness may be more likely to receive follow-up appointments, our findings were consistent.

Our secondary analysis further supported our findings. An arranged follow-up appointment was not associated with decreased readmissions or emergency department visits whether or not either happened because of a problem related to the original admission. The surprising finding that most readmissions were unrelated to the original admission further calls into question the concept of using readmissions as a quality indicator for the original hospitalization.

These findings are important at a time when governmental agencies and hospital administrators are working diligently to reduce hospital readmission and health care costs. Pay-for-performance initiatives and public reporting measures are being developed to reduce avoidable readmissions. Currently, the Centers for Medicare and Medicaid Services is suggesting a number of interventions identified as best practices to prevent avoid-
able readmissions, which include timely physician follow-up. Our findings suggest that some initiatives aimed to improve hospital follow-up to ultimately reduce hospital readmission may not achieve desired outcomes.

Although timely physician follow-up after hospital dismissal is good medical practice, health care payers must exercise caution when implementing financial incentives for initiatives that have not been clearly shown to improve outcomes. Measures focused on hospital documentation do not guarantee that patients will comply with discharge instructions. Although evidence suggests that hospital follow-up reduces hospital readmission, the studies were not randomized controlled trials, and hospital follow-up was usually 1 element of an aggregate of interventions with a demonstrated reduction in hospital readmission. In addition, a Cochrane systematic review assessed the effects of follow-up telephone calls after hospital discharge. Telephone follow-up in addition to usual care did not improve outcomes. At a time when it is especially important to reduce unnecessary health care costs, health care organizations need to focus on productive measures. As an example, consuming resources for hospital follow-up for a young, healthy patient hospitalized for an acute exacerbation of back pain may not be beneficial. These resources may be better used to improve medication reconciliation or hospital care. Physicians often have strict time constraints in busy outpatient practices. Providing incentives to providers to spend extra time at follow-up with patients with comorbidities or those who had prolonged hospital stays may be more beneficial than encouraging follow-up for all patients. Furthermore, when health care payers entice providers to follow checklists out of concern for reduced payments, providers and health care organizations may not be as creative in developing programs that actually improve outcomes rather than complying with process measures. For instance, nurse visits may be more effective or efficient. These interventions may also be easier for patients.

This study also highlights the difficulty in quantifying health care quality through surrogates such as hospital readmission. Before health care payers consider reducing payments for hospital readmissions, more research is needed to identify avoidable readmissions. Implementing financial incentives to reduce readmissions may have unintended consequences. Health care providers may unnecessarily prolong hospital stays or discharge patients to settings with more intensive postdismissal care (such as nursing homes) to avoid readmission. Hospitals may also refuse to provide care to populations most likely to be readmitted. These unintended consequences could potentially increase health care costs and may reduce access to care.

Our secondary analysis suggested subgroups of patients defined by principal diagnosis categories for which discharge appointments were associated with the likelihood of short-term readmissions or visits to the emergency department after hospital dismissal. The clinical significance of these findings is not clear; they could be statistical artifacts resulting from our large sample size and multiple testing. However, it is possible that patients with a parasitic or infectious disease were rehospitalized or went to the emergency department more often because of better surveillance. Furthermore, the group of patients in the category of signs, symptoms, or ill-defined condition may have had decreased events because of reassurance, education, or special care provided at a follow-up appointment.

The strength of our study is that we analyzed a large group of patients at a major medical center for a long period. Although Mayo Clinic serves as a large referral center, this center is also the major primary medical center for Olmsted County. Our study has several limitations. First, it was a cohort study rather than a prospective randomized controlled trial, but, to our knowledge, it is the first study to address this issue among general medical patients. In the future it would be interesting to conduct a randomized controlled trial in which patients were randomized to having a documented follow-up appointment at hospital discharge vs usual discharge procedures. In addition, although we gathered data on whether a follow-up appointment was arranged before discharge, we did not investigate compliance with follow-up appointments. Finally, we were only able to gather data regarding hospital readmission and emergency department visits within our medical record system. Some of the patients discharged from our hospital may have used medical care at other centers after dismissal, although sensitivity analysis suggested that this finding did not differ for those patients who did not reside locally. Among Medicare readmissions from all geographical areas, 67% of readmissions among patients with acute myocardial infarction and 93% of readmissions among patients with pneumonia occurred at our hospital according to data recently released to institutions in preparation for the Centers for Medicare and Medicaid Services Hospital Compare Web site.

Our study only examined whether having a documented follow-up appointment at dismissal was associated with clinical outcomes, and much more information is needed to determine the effectiveness of follow-up visits. Research is lacking about whether actually attending follow-up appointments is associated with improved outcomes in general medicine patients and should be studied further. Research addressing specific patient populations who may receive the greatest benefit from timely follow-up is needed. Perhaps regulation that addresses specific discharge diagnoses would be more valuable than blanket policy that requires the same surveillance for all conditions. More information about the effect of timing of follow-up appointments on health outcomes is also needed. Our results, which indicated that earlier discharge appointments led to higher readmission rates, could be explained by closer surveillance, clinician insight into predicting which patients would need follow-up sooner, or other factors. Moreover, comparing the outcomes in patient populations who have received interventions such as follow-up telephone calls, nurse visits, or physician follow-up would be useful.

In conclusion, in a large sample of patients discharged from inpatient general medicine services at a major tertiary care center, documentation of detailed follow-up appointment instructions was not associated with reduced hospital readmission or mortality at 30 or 180 days after discharge. Before health care payers such as
the Centers for Medicare and Medicaid Services reduce hospital payment for readmissions that are thought to be avoidable, a clearer understanding of the factors that may reduce hospital readmission is needed. Efforts to ensure follow-up for all patients after dismissal may not be beneficial or cost-effective.

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Author Contributions: Drs Grafft and McDonald, and Messrs Johnson and Naessens had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Grafft, McDonald, Ruud, Johnson, and Naessens. Acquisition of data: Grafft, Ruud, Johnson, and Naessens. Analysis and interpretation of data: Grafft, McDonald, Liesinger, Johnson, and Naessens. Drafting of the manuscript: Grafft, McDonald, Ruud, Liesinger, Johnson, and Naessens. Critical revision of the manuscript for important intellectual content: Grafft, McDonald, Johnson, and Naessens. Statistical analysis: McDonald, Johnson, and Naessens. Obtained funding: McDonald. Administrative, technical, and material support: Grafft, McDonald, Ruud, Liesinger, Johnson, and Naessens. Study supervision: McDonald and Naessens.

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REFERENCES