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ORIGINAL RESEARCH

Improving the Discharge Process by Embedding a Discharge Facilitator in a Resident Team

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BACKGROUND: Hospital discharges are vulnerable periods for patient safety, especially in teaching hospitals where discharges are done by residents with competing demands. We sought to assess whether embedding a nurse practitioner on a medical team to help physicians with the discharge process would improve communication, patient follow-up, and hospital reutilization.

METHODS: A 5-month randomized controlled trial was conducted on the medical service at an academic tertiary-care hospital. A nurse practitioner was randomly assigned to 1 resident team to complete discharge paperwork, arrange follow-up appointments and prescriptions, communicate discharge plans with nursing and primary care physicians, and answer questions from discharged patients.

RESULTS: Intervention patients had more discharge summaries completed within 24 hours (67% vs 47%, $P < 0.001$). Similarly, they had more follow-up appointments scheduled by the time of discharge (62% vs 36%, $P < 0.0001$) and attended those appointments more often within 2 weeks (36% vs 23%, $P < 0.0002$). Intervention patients knew whom to call with questions (95% vs 85%, $P = 0.003$) and were more satisfied with the discharge process (97% vs 76%, $P < 0.0001$). Attending rounds on the intervention team finished on time (45% vs 31%, $P = 0.058$), and residents signed out on average 46 minutes earlier each day. There was no significant difference between the groups in 30-day emergency department visits or readmissions.

CONCLUSIONS: Helping resident physicians with the discharge process improves many aspects of discharge communication and patient follow-up, and saves residents' time, but had no effect on hospital reutilization for a general medicine population. *Journal of Hospital Medicine* 2011;6:494–500. © 2011 Society of Hospital Medicine

Recent studies have shown that a patient's discharge from the hospital is a vulnerable period for patient safety.[1–4] With the reduction in length of stay (LOS) and the increase in patient acuity over the past decade, patients are discharged from acute care settings "quicker and sicker," resulting in management of ongoing illness in a less-monitored environment.[5,6] In addition, in teaching hospitals, residents are supervised by hospital-based physicians who are rarely the primary care physician (PCP) for the residents' patients, which creates discontinuity of care.

One in 5 medical discharges is complicated by an adverse event believed, in part, to be due to poor communication between caregivers during this transition time.[2] Discharge summaries, a key form of that communication, are not always done in a timely fashion and may lack key pieces of information.[7,8] For approximately 68% of patient discharges, the PCP will not have a discharge summary available for the patient's first follow-up visit.[9–11] In a survey of PCPs whose patients were in the hospital, only 23% reported direct communication with the hospital care team.[12] This leaves PCPs unaware of pending test results or recommended follow-up evaluations.[10,11,13,14] All of these factors are believed to contribute to adverse events, emergency department (ED) visits, and readmissions.

A recently published consensus statement on transitions of care by 6 major medical societies emphasizes the need for timely communication and transfer of information.[15] These important processes are especially challenging to meet at academic medical centers, where discharge summaries and transition communication are done by residents in a hectic and challenging work environment, with multiple simultaneous and competing demands including outpatient clinic and required conferences.[12] Residents have little formal training in how to write an effective discharge

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summary or how to systematically approach discharge planning. One study found higher error rates in discharge summaries written by residents compared with attending physicians.[16] While the Accreditation Council for Graduate Medical Education (ACGME) limits the number of admissions per intern for both patient safety and educational reasons, the number of discharges per day is not limited despite the considerable amount of time required for appropriate discharge planning and communication.

Many interventions have been tried to improve the discharge process and reduce patient adverse events.[17] Arranging early follow-up appointments to reduce emergency department visits and readmissions has shown mixed results.[13,18–20] Interventions that focus on specific populations, such as the elderly or patients with congestive heart failure, have been more successful.[21–23] Some interventions employed additional resources, such as a discharge form, transition coach, or discharge advocate, again with varying impact on results.[18,24–27] A recent study by Jack et al. used nurse discharge advocates (DAs) to help with discharge planning and communication at an academic medical center.[25] These DAs were independent of the care team, and focused on patient education and follow-up plans, and reduced hospital reutilization in a selected population.

No studies have assessed the potential benefit of helping residents with the physician components of the discharge process. Prior studies have mainly focused on patient communication and follow-up appointments, yet safe transitions also involve timely discharge summaries, physician-to-physician communication, physician-to-nurse communication, and medication reconciliation. Without support and time, these tasks can be very challenging for resident physicians with work-hour limitations. We undertook a randomized, controlled trial to evaluate the impact on the discharge process of embedding a discharge facilitator in a resident medical team to help with the physician discharge process. We studied the effect for all the patients discharged from the resident team, rather than focusing on a select group or patients with a single diagnosis.

METHODS

Study Setting and Participants

This study was conducted on 2 of the 5 resident general medical teams on the inpatient teaching service at Massachusetts General Hospital (MGH), Boston, Massachusetts—a large, 907-bed, urban hospital. The residents' teams are regionalized and each care for approximately 20 patients on a single floor. Each of the study teams consists of a junior resident, 4 interns, and 1 to 2 attendings who rotate on the floor for 2-week or 4-week blocks. Attending rounds, which occur 10 AM to 12 PM weekdays, are for new patient presentations and discussion of plans. Interdisciplinary rounds occur 9:30 AM to 10 AM. Sign-out rounds occur in the afternoon whenever all work is complete. The junior resident is responsible for all the discharge orders and communication with PCPs, and the discharge summaries for patients going to facilities. The interns are responsible for discharge summaries for patients discharged home; these summaries are not mandatory at the time of discharge. The majority of patients were admitted under the team attending(s). Patients were assigned to the teams by the admitting office, based on bed availability. All patients discharged from both resident medical teams over a 5-month period were included in this study. Those who were not discharged from the hospital by the study teams (ie, transfers to intensive care units or deaths) were excluded. These exclusions accounted for less than 12% of all team patients. Partners Healthcare System Institutional Review Board approved all study activities.

Intervention

We randomly assigned a discharge facilitator (DF), a master's level nurse practitioner with prior inpatient medicine experience, to 1 of the 5 resident medical teams. She had no prior experience on this specific floor. A similar resident team, on a different floor, served as the control. For the intervention team, the DF attended daily resident work rounds and interdisciplinary discharge rounds. The resident and DF collaborated in identifying patients being discharged in the next 1 to 3 days, and the DF scheduled all follow-up appointments and tests. The DF performed medication reconciliation, wrote prescriptions and faxed them to pharmacies, and arranged all anticoagulation services. In collaboration with the resident, the DF called PCPs' offices with discharge information and faxed discharge summaries to PCPs' offices outside the Partners Healthcare System. The DF wrote part or all of the computer discharge orders and discharge summaries at the request of the resident and interns. All discharge summaries still needed to be reviewed, edited, and signed by the resident or interns. The DF also noted pending tests and studies at time of discharge, and followed up on these tests for the team. The DF met with all patients to answer any questions about their discharge plan, medications, and appointments; while residents are encouraged to do this, it is not done as consistently. She provided her business card for any questions after their discharge. Follow-up patient calls to the DF were either answered by her or triaged to the appropriate person. The DF also communicated with the patient's nurse about the discharge plans. For all patients discharged over a weekend, the DF would arrange the follow-up appointments on Mondays and call the patients at home.

For both teams, residents received letters at the start of their rotation notifying them of the study and asking them to complete discharge summaries within 24 hours. All residents in the program were

expected to do an online discharge tutorial and attend a didactic lecture on discharge summaries. The residents on the intervention team received a 5-minute orientation on how best to work with the DF. Residents were given the autonomy to decide how much to use the DF's services. The scheduling of follow-up appointments on the control team was the responsibility of the team resident as per usual care. The nursing component of the discharge process, including patient discharge education, was the same on both teams. Nurses on both floors are identically trained on these aspects of care. The nurses on both teams were surveyed about perception of the discharge process prior to the intervention and after the intervention. A research assistant (RA) called patients discharged home on both teams, 1 week after discharge, to ask about satisfaction with the discharge process, to determine if the patients had any questions, and to verify patient knowledge regarding whom they should contact for problems. The RA also noted the end time of attending rounds each day and the start time of resident sign-out.

Outcome Measures and Follow-Up

At the time of discharge, the RA collected baseline data on all patients discharged from both teams, including the number of follow-up appointments scheduled. Patients were tracked through electronic medical records to see if and when they attended their follow-up appointments, whether they changed the appointment, and whether patients returned to a hospital emergency department or were readmitted to MGH or an affiliated Partners hospital within 30 days. For patients outside the MGH–Partners system, the research assistant contacted primary care physician offices to document follow-up. The remaining patient data was obtained through the MGH–Partners computerized information system.

The primary outcomes of the study were length of stay, time of discharge, number of emergency department visits, hospital readmissions, numbers of discharge summaries completed in 24 hours, time from discharge to discharge summary completion, and whether the discharge summary was completed before follow-up. Secondary outcomes were number of follow-up PCP appointments made at time of discharge, percentage of follow-up appointments attended and time from discharge to attending a follow-up appointment, patient phone survey results, and nursing perception of the discharge process, as well as the percentage of attending rounds that ended on time and the time of resident sign-out.

Statistical Analyses

Patient characteristics were compared between intervention and control teams using 2-sample *t* tests or Wilcoxon rank sum tests for continuous variables, and chi-square tests for categorical variables. Hours to discharge summary completion and hospital length of stay were summarized using median and interquartiles (IQR), and compared between the 2 teams using Wilcoxon rank sum tests. Categorical outcomes were compared using chi-square tests. Two-sided *P* values ≤ 0.05 were considered statistically significant. SAS version 9.2 (SAS Institute Inc, Cary, NC) was used for all statistical analyses.

RESULTS

Study Sample

During the 5-month intervention (November 12, 2008 to April 14, 2009), a combined total of 999 patients were admitted to the intervention and control general medical teams. We excluded 96 patients who were not discharged but transferred to another service or intensive care units, and 24 patients who died. We also excluded 7 patients who were discharged from both teams the first day of the study, because the DF was not involved with the patients' discharge planning. That left 872 patients discharged to either home, a facility, or having left against medical advice (AMA) included in the study: 440 patients on the intervention team and 432 patients on the control team (Figure 1). Baseline patient demographic and clinical characteristics were similar across both teams with only gender being significantly different (Table 1). The mean age was 63 years (range, 18–96) and the mean comorbidity score was 2.3 (range, 0–12). Of note, about a quarter of patients were discharged to facilities, about half were Medicare recipients, and approximately 80% had a PCP. The DF participated in the discharge process for nearly all of the intervention patients; she reported contributing approximately 50% of the content to the discharge summaries.

Primary Outcomes

Primary outcomes from the 2 medical teams are listed in Table 2. In the intervention group, significantly more discharge summaries were completed within 24 hours compared to the control group (293 [67%] vs 207 [48%]; $P < 0.0001$). Since nearly all patients discharged to facilities must have a discharge summary at the time of discharge, the overall difference in completion rates came mainly from patients discharged home or having left AMA from the intervention team (177 [56%] vs 112 [34%]; $P < 0.0001$). For all discharge summaries, the median time to completion on the intervention team was 18.9 hours compared with 73.1 hours on the control team ($P < 0.0001$). More discharge summaries were completed before the first follow-up appointment on the intervention team (393 [89%] vs 330 [76%]; $P < 0.001$). The DF intervention had no effect on 30-day readmission or emergency department visits. For patients on the DF team, 88 (20%) were readmitted within 30 days of discharge, as compared with 79 (18%) on the control team ($P = 0.55$). Similarly, 40 (9%) of the

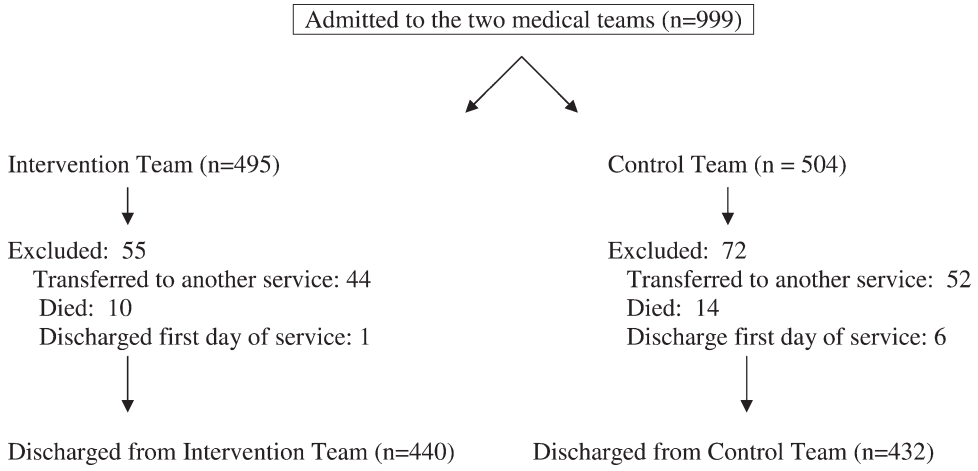

FIG. 1. Enrollment of Patients.

TABLE 1. Baseline Participant Characteristics

Characteristics	Intervention Team n = 440	Control Team n = 432
Mean age (SD), year	63 (18)	63 (18)
Women, n (%)*	181 (41)	207 (48)
Race, n (%)		
White non-Hispanic	267 (61)	243 (56)
Black non-Hispanic	24 (5)	33 (8)
Hispanic	21 (5)	17 (4)
Unknown/other	128 (29)	139 (32)
Health insurance, n (%)		
Medicare	213 (48)	226 (52)
Medicaid	85 (19)	81 (19)
Private	110 (25)	91 (21)
Other	32 (7)	34 (8)
PCP on admission, n (%)	370 (84)	356 (82)
Discharge disposition, n (%)		
AMA	12 (3)	14 (3)
Home	305 (69)	315 (73)
Facility	123 (28)	103 (24)
Mean comorbidity index score (SD)†	2.3 (2.4)	2.3 (2.4)
Diagnoses		
Congestive heart failure	30 (6%)	27 (5%)
COPD/asthma	34 (7%)	47 (9%)
Cardiovascular disease	54 (11%)	50 (8%)
Alcohol/substance abuse	29 (6%)	34 (7%)
Gastrointestinal bleeds/ulcers	38 (8%)	41 (8%)
Hepatobiliary disease	30 (6%)	36 (7%)
Renal failure/kidney disease	33 (7%)	37 (7%)
Pneumonia	36 (7%)	22 (4%)
Musculoskeletal disease	26 (5%)	23 (5%)
Neurologic disease	22 (4%)	25 (5%)
Other	163 (33%)	172 (35%)

Abbreviations: AMA, against medical advice; COPD, chronic obstructive pulmonary disease; PCP, primary care physician; SD, standard deviation.
* $P < 0.05$; no other comparisons were statistically significant.
† Deyo Modification of the Charlson Comorbidity Index.

intervention team patients, as compared with 39 (9%) of the control team patients, visited the emergency department at least once within 30 days ($P = 1.0$). There was no difference in length of stay (LOS) between the 2 teams (median 4.0 days for both teams, $P = 0.84$).

Secondary Outcomes

Table 3 shows secondary outcomes from the 2 medical teams. Among the patients discharged from the DF team, 264 (62%) had scheduled follow-up appointments with PCPs compared to the control team 151 (36%) ($P < 0.0001$). (Many patients going to rehabilitation hospitals are not given PCP appointments at the time of discharge.) Despite having more scheduled appointments, patients' actual follow-up with PCPs was similar during the 5-month study period among both intervention and control group (234 [65%] vs 223 [63%]; $P = 0.58$). However, there was earlier follow-up with the primary provider in the first 2 or 4 weeks in the intervention group. At 2 weeks, 129 (36%) patients in the intervention group saw their provider compared to 81 (23%) patients in the control group ($P < 0.0002$), and at 4 weeks, 159 (44%) of the intervention group was seen compared to 99 (28%) of the control group ($P < 0.0001$). Of note, among the 415 patients on both teams discharged with scheduled appointments, only 53 (13%) of patients did not show up for the scheduled appointment and this no-show rate was the same on both teams.

Attending rounds ended on time (12 PM) 45% of the time in the intervention group compared to 31% in the control group ($P = 0.058$). Mean start time of resident sign-out rounds was 1638 hours on the intervention team and 1724 hours on the control team ($P = 0.0007$).

We obtained patient reported outcome data by telephone within 2 to 4 weeks of discharge. Of the 620 patients discharged to home, 6 died or were readmitted to the hospital before being reached by phone. For the remaining 614 patients, we were able to contact 444 (72%). Of those, 321 (52%) agreed to participate in the phone interview. We surveyed similar proportions of intervention and control group patients (158 [52%] vs 163 [52%]) (Table 4). Both groups reported similar rates of having questions about their hospital

TABLE 2. Primary Outcomes

Variables	Intervention Team n = 440	Control Team n = 432	*P* Value
Discharge summaries completed 24 hr, n (%)	293 (67)	207 (48)	<0.0001
Discharges to facilities	116 (94)	95 (92)	0.60
Discharges to home/AMA	177 (56)	112 (34)	<0.0001
Median hours to discharge summary completion for discharges to home/AMA (IQR)	18.9 (0–138)	73.1 (4.3–286)	<0.0001
Discharge summary complete before time of follow-up appointment.	393 (89)	330 (76)	<0.0001
Emergency department visits in 30 days, n (%)	40 (9)	39 (9)	1.0
Readmissions in 30 days, n (%)	88 (20)	79 (18)	0.55
Median length of stay, days (IQR)	4.0 (3–7)	4.0 (2–8)	0.84
Discharges to facilities	6.0 (5–11)	8.0 (5–13)	0.17
Discharges to home/AMA	4.0 (2–6)	3.0 (2–6)	0.61
Discharged by noon, n (%)	38 (9)	42 (10)	0.64

Abbreviations: AMA, against medical advice; IQR, interquartile range.

TABLE 3. Secondary Outcomes

Variables	Intervention Team	Control Team	*P* Value
No. of eligible patients*	428	418	
Patients with follow-up appointments to primary providers, n (%)	264 (62)	151 (36)	<0.0001
No. of eligible patients†	359	354	
Attended follow-up appointment with primary provider during study, n (%)	234 (65)	223 (63)	0.58
Within 2 weeks of discharge	129 (36)	81 (23)	0.0002
Within 4 weeks of discharge	159 (44)	99 (28)	<0.0001
No. of days round times were recorded	100	99	
No. of attending rounds ending by 12 PM	45 (45%)	31 (31%)	0.058
Mean start time of sign-out rounds	16:38	17:24	0.0007

* Against medical advice (AMA) patients excluded.
† Patients excluded if AMA, readmitted, died after discharge, or discharged to hospice.

TABLE 4. Secondary Outcomes Continued: Patient Survey Results

	Intervention Team	Control Team	*P* Value
Patients discharged home*	304	310	
Patients contacted by phone after discharge, n (%)	213 (70)	231 (75)	0.24
Agreed to participate in phone interview, n (%)	158 (52)	163 (53)	0.94
Among those agreed to participate, n (%)			
Did you have questions about your hospital stay?	43 (27)	49 (30)	0.62
Would you know who to call if you had questions after discharge?	150 (95)	138 (85)	0.003
Satisfied with the discharge process?†	153 (97)	124 (76)	<0.0001
Did you understand your follow-up plans?†	157 (99)	141 (87)	<0.0001
Did you understand your medications?†	152 (96)	142 (87)	0.001
Did you feel safe going home?	153 (97)	151 (92)	0.07

* Patients excluded if died or readmitted prior to phone call.
† Questions were answered on a 5-point Likert scale. The number/percentage reflects participants who responded with the top 2 categories on the scale.

stay after discharge (43 [27%] vs 49 [30%]; $P = 0.62$). The intervention group could better identify whom to call with questions (150 [95%] vs 138 [85%]; $P = 0.003$). The intervention group reported better understanding of their follow-up plans (157 [99%] vs 141 [87%]; $P = 0.001$) and better understanding of their discharge medications (152 [96%] vs 142 [87%]; $P = 0.001$). More patients in the intervention group were satisfied with the discharge process (153 [97%] vs 124 [76%]; $P < 0.0001$).

Compared with nurses on the control team, nurses on the intervention team more often reported paperwork being completed in a timely fashion (56% vs 29%; $P = 0.041$) and being less worried about the discharge plan (44% vs 57%; $P = 0.027$). The intervention team nurses also reported fewer issues with medications/prescriptions (61% vs 82%) and being included more often in the discharge planning (50% vs 38%). However, neither of these results reached statistical significance ($P = 0.81$ and 0.50, respectively).

DISCUSSION

Our study embedded a nurse practitioner on a busy resident general medical team to help with all aspects of the discharge process for which physicians are responsible. Previous studies have been limited to patients with specific diagnoses, age, or disposition plans.[18–25] In this study, we included all general medical patients. Our intervention improved several important quality of care elements: the timeliness of completion of discharge summaries; and increased number of early follow-up appointments, with more patients seen within 2 and 4 weeks after discharge. Patients reported better understanding of their follow-up plans and more satisfaction with the discharge process. While not statistically significant, there was a trend towards better communication with nurses. For residents with work-hour limitations, there was time savings with a trend towards finishing attending rounds on time and statistically significant earlier sign-out rounds (46 minutes earlier). This intervention had no effect on patient length of stay, readmissions, or emergency department visits in the 30 days after discharge.

Despite improving many aspects of the discharge process and communication that have previously been raised as areas of concern for patient safety, there was no improvement in readmissions rates and ED utilization which are often used as the quality indicators for

effective discharge planning. Similar types of interventions on general medical patients have generally also failed to show improvement in readmission rates.[18–20,25] Weinberger et al. arranged follow-up appointments within 1 week for patients discharged from a Veterans Administrative hospital; while patients were seen more often, the intervention actually increased readmission rates.[20] Fitzgerald et al. had a case manager contact patients at home and encourage follow-up, which increased follow-up visits, but again had no effect on readmission.[19] Einstadter et al. had a nurse case manager coordinate outpatient follow-up on a resident team and also did not effect readmission rates or ED visits.[18] Jack et al. in project reengineered discharge (RED) did show a significant reduction in combined hospital utilization measures. However, their study focused on a more limited patient population, and employed both a discharge advocate to arrange follow-up and improve patient education, and a pharmacist to make postdischarge phone calls.[25]

So why did readmissions rates and ED visits not change in our study? It would be reasonable to think that having earlier follow-up appointments, better and timely physician-to-physician communication, and a facilitator for patient questions should improve the quality of the discharge process. In a recent study, Jha et al. found there was no association between chart-based measures of discharge quality and readmissions rates, and only a modest association for patient-reported measures of discharge quality and readmission rates.[28] The authors suggest readmission rates are driven by many factors beyond just improved discharge safety. Perhaps readmission rates are too complex a measure to use to assess discharge process improvement. For fiscal reasons, it is understandable that hospitals, insurance companies, and the Centers for Medicare and Medicaid want to reduce readmission rates and ED utilization. Jencks et al. noted the cost of readmissions in 2004 was 17.4 billion dollars.[29] However, sweeping efforts to improve the discharge process for all general medical patients may not yield significant reductions in readmissions, as this study suggests. We may need to focus aggressive intervention on smaller target populations, as prior studies on focused groups suggest.[21–23]

There are no evidence-based studies to suggest when optimal follow-up should occur after discharge.[26] Several medical society guidelines recommend 2 weeks. More patients on the intervention team were seen within 2 weeks, but readmission rates were not affected. The University Health System Consortium recently reported that the majority of readmissions occurred within 6 days, with the average being about 2 to 3 days.[30] In this study, the median days to readmit were 12 for the intervention team and 10 for the control. It is possible that even with our improved 2-week follow-up, this was not early enough to reduce readmissions. Follow-up may need to be within 1–3 days of discharge for highly vulnerable patients, to significantly change readmission rates. Further studies focusing on this question would be helpful.

Finally, with ACGME limitation of work hours, many residency programs are looking for ways to reduce residents' workload and increase time for education. With a significant trend towards finishing attending rounds on time, it is likely that more residents on the intervention team were able to attend the noon-time educational conferences. We speculate that this was due to fewer interruptions during rounds because the DF was available for nurses' questions. Sign-out rounds occurred significantly earlier, possibly because of improved resident efficiency due to the DF's help with the discharge process. While residents may lose some educational experience from not performing all discharge tasks, they gain experience working in interdisciplinary teams, have increased time for education, and reduced work hours. Since the ACGME limits the number of residents per program and increasing the residency size is not an option, a DF should be considered as a possible solution to ACGME work-hour restrictions.

This study had several limitations. First, the intervention team had 1 specific person embedded, and therefore the results of this study may have limited generalizability. Second, the limited number of residents working with the DF could have biased the intervention, as not all residents worked equally well with the DF. However, this may represent the real-world experience on any teaching service, given variation in working styles and learning curves of residents over their training. Third, this study was done at 1 university-affiliated urban Academic Medical Center, making it potentially less generalizable to resident teams in community hospitals. Fourth, we were not able to capture readmissions and ED visits at institutions outside the MGH–Partners Healthcare System. However, given that patients were assigned at random to either team, this factor should have impacted both teams equally. Fifth, the study occurred during Massachusetts healthcare reform which requires everyone to have health insurance. This may have affected the rates of ED visits and readmission rates, especially with a shortage of primary care physicians and office visits. Finally, this intervention was not cost-neutral. Paying for a nurse practitioner to help residents with the work of discharge and providing patients with additional services had many advantages, but this quality improvement project did not pay for itself through shorter LOS, or decreases in ED visits or readmissions.

While readmission rates and ED utilization are important patient outcomes, especially in the current healthcare climate, what determines readmissions and ED visits is likely complex and multifactorial. This study suggests that, in the nationwide effort to reduce readmissions, solely improving the discharge process for all general medical patients may not produce the

hoped-for financial savings. Improving the discharge process, however, is something valuable in its own right. Adding a DF to a resident team does improve some quality markers of the discharge process and decreases work hours for residents.

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