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Impact of structured interdisciplinary bedside rounding on patient outcomes at a large academic health centre

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Abstract

Background—Effective communication between healthcare providers and patients and their family members is an integral part of daily care and discharge planning for hospitalised patients. Several studies suggest that team-based care is associated with improved length of stay (LOS), but the data on readmissions are conflicting. Our study evaluated the impact of structured interdisciplinary bedside rounding (SIBR) on outcomes related to readmissions and LOS.

Methods—The SIBR team consisted of a physician and/or advanced practice provider, bedside nurse, pharmacist, social worker and bridge nurse navigator. Outcomes were compared in patients admitted to a hospital medicine unit using SIBR (n=1451) and a similar control unit (n=770) during the period of October 2016 to September 2017. Multivariable negative binomial regression analysis was used to compare LOS and logistic regression analysis was used to calculate 30-day and 7-day readmission in patients admitted to SIBR and control units, adjusting for covariates.

Results—Patients admitted to SIBR and control units were generally similar ($p \geq 0.05$) with respect to demographic and clinical characteristics. Unadjusted readmission rates in SIBR patients were lower than in control patients at both 30 days (16.6% vs 20.3%, p=0.03) and 7 days (6.3% vs 9.0%, p=0.02) after discharge, while LOS was similar. After adjusting for covariates, SIBR was

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not significantly related to the odds of 30-day readmission (OR 0.81, p=0.07) but was lower for 7-day readmission (OR 0.70, p=0.03); LOS was similar in both groups (p=0.58).

Conclusion—SIBR did not reduce LOS and 30-day readmissions but had a significant impact on 7-day readmissions.

INTRODUCTION

Effective communication between healthcare providers and patients and their family members is an integral part of daily care and discharge planning for hospitalised patients. Because patients are typically seen by multiple physicians, nurses and other healthcare practitioners at different points in time during an inpatient stay, breakdowns in communication between individual providers and between providers and patients are common. In response, interdisciplinary team-based care has emerged as a promising approach to improve interdisciplinary rounding (IDR) in which members of the patient's care team review progress and develop an integrated care plan.

Several studies have been conducted to assess impact of IDR.[1] These studies varied in terms of patient of care settings (academic vs community), study design, outcomes of interest, geographic clustering of the patients, team composition and format of IDR (eg, bedside vs conference room rounding). In these studies, outcomes of interest included but not limited to hospital length of stay (LOS), readmission rates, costs, telemetry, rates of adverse events (eg, venous thromboembolism, falls, pressure ulcers, hospital acquired infections), patient and provider satisfaction.[2 3] Some studies found that conference room IDR is associated with improved LOS,[4 5] decreased mortality[6] and improved teamwork but no reduction in adverse events.[7] Based on these studies, the Institute of Healthcare Improvement proposed general guidelines to support the use of IDR[1 8] and interdisciplinary team-based care as a mechanism for identifying patient safety risks and determining daily goals.[1]

Earlier models of IDR were predominantly built around conducting team- based rounds in a conference room, which largely isolated attendees from patients and their family members.[1 4 5] A few more recent studies employed a different model of IDR that was built around team-based care at bedside—structured interdisciplinary bedside rounding (SIBR).[2 3] The goal of SIBR is to improve communication among healthcare providers and the patient by bringing discussion of daily treatment plan along with anticipated discharge plan and needs at the bedside of the patient. A prior study that used SIBR examined attitudes and perceptions of providers but did not examine other key end points, such as LOS or readmission rates.[2 3] A second study that examined SIBR found a reduction in mortality.[9]

The goal of our study was to determine the potential benefit of implementing SIBR on a hospital medicine unit at a large academic medical centre. We hypothesised that patients receiving SIBR would have lower readmission rates and LOS, compared with patients receiving standard care.

METHODS

Model of care

Our study was conducted in a single large academic medical centre. Our SIBR model was built around bedside team-based rounds that included the attending physician, advance practice professional (eg, nurse practitioner or physician assistant), bedside nurse, pharmacist, social worker and occasionally a fourth-year medical student. SIBR rounds were guided by a standardised communication tool and protocol was designed for team-based rounding at the patient's bedside (online supplementary appendix 1). To implement SIBR, all members of the team received initial training on how to perform structured interdisciplinary team-based bedside rounding. This included watching a simulation and training video, practice rounding for at least 1 week prior to implementation of SIBR (link to training videos included in online supplementary appendix 1). The implementation and progress of SIBR was closely monitored both by the Medical Director of the units and the Nursing Leader. A key member of our study was a 'bridge nurse navigator' who rounded with the care team and made postdischarge follow-up phone calls ensuring seamless transition of patient care from hospital to home. In addition, the bridge nurse navigator coached SIBR team members during the initial implementation period, recorded the time taken to perform SIBR for each patient and provided feedback to the team members in real time to standardise the process and alleviate individual variability during SIBR rounds.

SIBR was implemented on a single 24-bed hospital medicine unit. During SIBR, each individual (starting from case worker, patient's nurse of the day, pharmacist, patient's providing physician or advance practice provider(APP)) discussed and informed the patient about his/her daily management, treatment plan and/or modification, clinical and/or laboratory updates and discharge plan, anticipated discharge time, any barrier to discharge and solution to those barriers. Patients were also given the opportunity to ask team members questions about their care plan. A geographically separate 14-bed hospital medicine unit on the same floor of the hospital was selected as a control unit. Control unit providers typically performed brief interdisciplinary rounding on patients in a conference room on the unit.

Patients

The eligible population included patients admitted to two geographically distinct hospital medicine units at our institution between October 2016 and September 2017. Patients were admitted to both units from the emergency room or from outpatient clinics or were transferred from intensive care units or from outside hospitals. All patients on the intervention unit received SIBR with the exception of patients with encephalopathy or altered mental state because of the unlikely benefit of the team-based rounding; SIBR was resumed on such patients with their mental status improved or if family was present at the bedside. SIBR was also not performed on patients awaiting placement at a skilled nursing facility for >15 days, given that disposition has already been determined and that such patients had significant barriers to discharge.

Outcome

The primary study outcomes were LOS and 30-day readmission. LOS in days was calculated by subtracting the date of discharge from the date of admission. Patients admitted and discharged on the same day were considered to have a LOS of 1 day. Readmission was defined as a subsequent admission of patients to the study hospital with any diagnosis from the date of discharge within 30 days. Readmission within 7 days was a secondary study outcome.

Data

Study data were obtained from our Translational Data Warehouse, which receives daily extracts from the Clarity data tables from our Epic electronic health record. Study data elements included demographics, admission and discharge dates, admission source, International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10 CM) diagnoses associated with study admissions and prior encounters, body mass index, primary health insurance (categorised as Medicare, Medicaid, commercial and uninsured), discharge order time and discharge time, discharge vital status, discharge disposition (categorised as home, nursing home or assisted living facility) and dates of subsequent hospital admissions. The presence of specific medical comorbidities (eg, hypertension, coronary artery disease, congestive heart failure (CHF), diabetes mellitus, chronic kidney disease, chronic obstructive pulmonary disease (COPD)) was determined using previously validated ICD-10 CM diagnosis code algorithms and measured by the Charlson Comorbidity Index.

Statistical analysis

Analyses were completed using SAS V9.4 (Cary, North Carolina, USA). Patient characteristics and outcomes were compared in patients on the SIBR and control units using Wilcoxon rank-sum test and χ^2 test for continuous and categorical variables, respectively. P values <0.05 were considered significant for group comparisons. We performed adjusted analyses of intervention group and study end points to address potential confounding. We employed a similar modelling strategy for all end points: LOS, 30-day readmission and 7-day readmission. Variables that were associated (p<0.1) with the end point were entered into a multivariable regression model that also included the intervention group. Adjusted analysis of LOS was conducted using negative binomial regression to accommodate overdispersion. Adjusted analysis of readmission (yes/no) within 7 days and 30 days were conducted using logistic regression. The primary explanatory predictor of interest was intervention group versus control. Covariates considered for inclusion of the adjusted models included age, gender, race, ethnicity, payer type, hospital admission source, comorbid conditions and transfer from an ICU. In supplemental tables, we present beta-coefficients, estimates (rate ratios for LOS outcome and ORs for readmission outcome), and p values for univariate and multivariable models. We also visually presented rate ratios and ORs within forest plots for the LOS and readmission models, respectively.

We conducted additional regression analyses to determine if there was a differential effect of SIBR in subgroups stratified by admission from an ICU (yes vs no), age (<65 years vs 65 and older), gender, race (white vs non-white) and comorbidity (Charlson Comorbidity Index

(CCI) scores of level (0–3 vs >3)). These analyses include an interaction term between SIBR and the subgroup. We assessed if there was a significant differential effect of intervention (SIBR) versus control using the p value of the interaction coefficient.

RESULTS

A total of 2221 patients were included in the final analysis, after applying the exclusion criteria. Of these, 1451 (65.3%) patients were included in the intervention group and 770 (34.6%) patients in the control group. Demographic and clinical characteristics of the intervention and control group are presented in table 1. The two groups were similar (p>0.05) with respect to age, gender, race, ethnicity, type of health insurance and admission source. The groups also had generally similar rates of comorbid conditions, with the exception of diabetes with complications (16.5% and 20.3% in intervention and control patients, respectively; p = 0.02). In addition, the two groups were similar with respect to admission source, discharge disposition and in the percentages of patients who were admitted from ICU and who were transferred to an ICU during their admission. Patients on the SIBR unit had a lower rate of 30-day readmission (16.6% vs 20.3%, respectively; p=0.03) than patients on the control unit and a lower rate of 7-day readmission (6.3% vs 9.0%, respectively; p=0.02). LOS was similar (6.7 vs 6.6 days, respectively; p=0.93).

A number of variables were significantly associated with LOS. Online supplementary table 1 and figure 1 show the results of negative binomial regression. Variables which were significant on univariate regression for LOS (p<0.1) included age, gender, race, payer, admission source, CHF, COPD, diabetes, hypertension, liver disease, neurological complications, renal failure and admission from an ICU. In analysis adjusting for these significant covariates (table 2), there was no difference in LOS between SIBR and control patients (p=0.58).

Variables which were significantly associated (p < 0.1) with 30-day readmission (Online supplementary table 2, figure 2) in univariate analyses included ethnicity, payer type, admission source, CHF, COPD, diabetes, hypertension, liver disease, pulmonary circulation, renal failure, CCI and ICU stay. In multivariable analysis after adjusting for these covariates, SIBR was not significantly related to 30-day readmission (OR 0.81, p = 0.07).

Similar analyses were performed for 7-day readmission (online supplementary table 3, figure 3). In multivariate analyses, adjusting for covariates, the odds of 7-day readmission were lower for SIBR patients, relative to control patients (OR, 0.70; p = 0.03). In analyses that included interaction terms to assess the relative impact of SIBR in subgroups, gender was the only interaction term that was significant, with lower odds of readmission in women (online supplementary table 4).

DISCUSSION

The current study evaluated the impact of implementing SIBR on a hospital medicine unit in a large academic medical centre inpatient setting. We found patients admitted to the SIBR unit had similar LOS as patients admitted to the control unit and similar odds of being readmitted within 30 days of discharge. However, SIBR patients had a

30% lower odds of being readmitted within 7 days, and while the lower odds of 30-day readmission did not achieve statistical significance (p = 0.07), the observed difference (19%) is clinically significant. While 30-day readmission is widely used as a hospital performance metric, a prior study[6] found that earlier readmissions are more likely to be preventable than 30-day readmissions and that readmissions occurring after 7 Strengths of the study include a large sample size, days are less likely to be impacted by hospital-based use of standardised protocol for SIBR rounding and interventions and are likely to be more sensitive well-ascertained end points. While patients were not to follow-up outpatient care delivered by primary randomised to SIBR and control units, the units were and specialty care providers and by population similar with respect to patient populations, were on the health interventions. Thus, 7-day readmission may same floor, had similar physician and nursing leader-be a more sensitive measure of hospital quality and ship and used similar nursing protocols for fall preven-performance than 30-day readmission.[6]

Strengths of the study include a large sample size use of standardized protocol for SIBR rounding and well-ascertained end points While patients were not randomized to SIBR and control units, the units were similar with respect to patient populations, were on the same floor, had similar physician and nursing leadership and used similar nursing protocols for fall prevention and reducing other adverse events. Moreover, hospital medicine physicians staffed both the SIBR and control units at different times during the study period, making it less likely that the observed differences resulted from differences in physician training and expertise.

Several potential factors may underlie the lower 7-day readmission we observed. SIBR is designed to improve communication among practitioners and between practitioners and patients. Such enhanced communication may enhance practitioners' awareness of postdischarge needs and lead to more informed postdischarge care plans. The interdisciplinary nature of SIBR may also enhance recognition of medical and behavioural problems and of financial and social needs that put patients at a risk for readmission and may enable providers to address these problems in a more proactive and effective manner. For example, having a pharmacist and social worker participate in SIBR enhanced awareness of financial barriers that may limit patients' ability to obtain discharge medications and may identify less costly alternatives. Enhanced communication may also lead to better understanding by patients and families of postdischarge plans, of medication changes made during hospitalisation and of patients' underlying acute and chronic medical conditions. In analyses to identify differential effects of SIBR, we noted that SIBR had a larger impact on reducing 7-day readmission in women compared with men. Reasons behind this finding are unclear, but may reflect gender-related differences in compliance with patient instructions.[10]

In contrast to our findings, a prior study by O'Mahony *et al* led to lower LOS and did not require additional resources. The difference in findings may reflect cross-institutional variability in the team-based rounding processes. Prior studies of IDR without bedside rounding found a trend towards decreased LOS.[11 12] It is important to note that these studies were comparing IDR and traditional rounding that lacked interdisciplinary communication among team members. Our study was focusing on the comparison between IDR and SIBR, which had similar key principles of IDR but done at bedside. It is also possible that

SIBR enhances the identification of barriers to safely discharging patients that may require additional hospitalisation days to facilitate safe discharge. Thus, increasing LOS for some patients may be a means of improving quality of care.[13]

A further factor underlying the potential benefits of SIBR is geographic alignment of patients, given prior studies showing that geographic fragmentation contributes to interprofessional silos and hierarchies, adversely affects team work and clarity in plans and leads to communication gaps.[14 15] In contrast, geographic alignment fosters mutual respect, cohesiveness, communication, timeliness and face-to-face problem solving, which may improve hospital outcomes.[14 15] Building on the Stein *et al* model of an accountable care unit, our SIBR unit encompassed unit-based teams and unit level performance reporting[9] and sought to cultivate a positive work environment and a sense of collaborative practice, which in turn may improve communication and shared decision-making.[16]

Our results should be interpreted in the context of several potential methodological limitations. First, as noted previously, hospitalists and APPs may have managed patients on both SIBR and control units, which may have led to contamination of the intervention and less ability to detect differences in outcomes between SIBR and control patients. Second, although patients appeared generally similar on SIBR and control patients and although we adjusted for potential confounding factors, unmeasured residual confounding remains a possibility. Third, similar to other organisational interventions, SIBR may be subject to variability in practitioner fluency in implementing the model. Moreover, although steps were taken to train practitioners in implementing SIBR using a standard protocol, data on the fidelity of the intervention across individual patients were not obtained.

CONCLUSION

SIBR did not reduce LOS and 30-day readmissions, but has a significant positive impact on 7-day readmissions. We believe that SIBR merits further study as a means of improving hospital care and patient outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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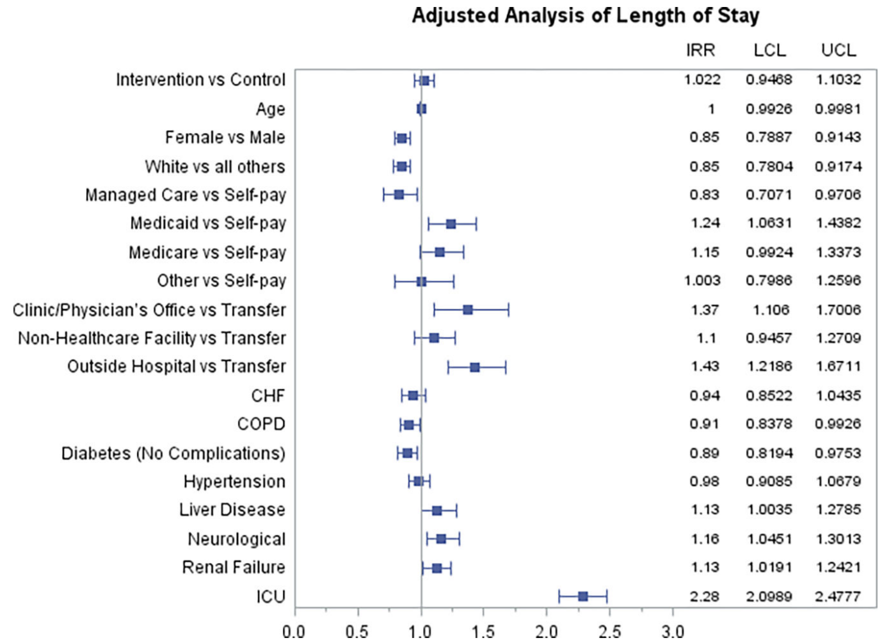

Figure 1.

Adjusted mean length of stay (from negative binomial regression). CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; IRR, incidence rate ratio; LCL, Lower Control Limit; UCL, Upper Control Limit.

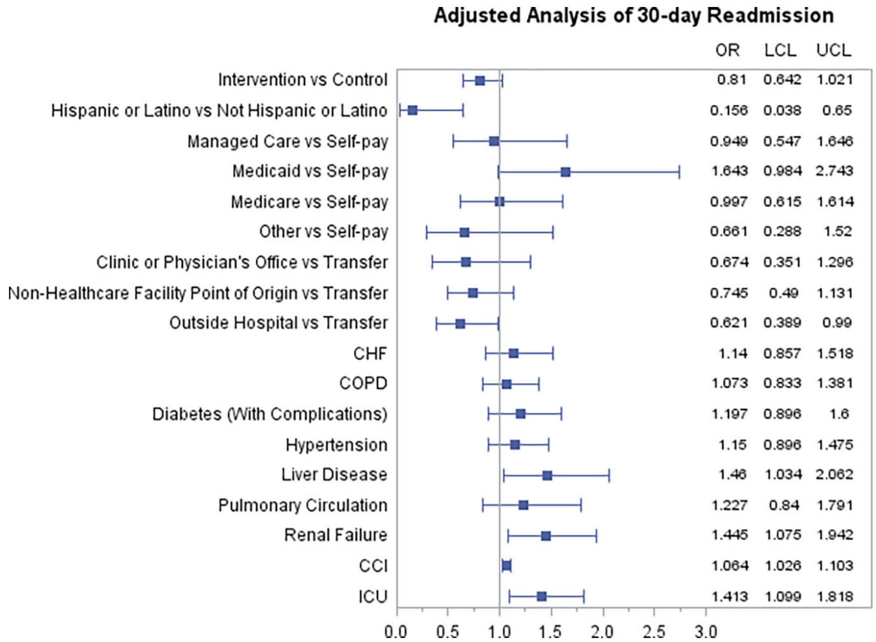

Figure 2.

Adjusted odds of 30-day readmission (from logistic regression). CCI, Charlson Comorbidity Index; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; LCL, Lower Control Limit; UCL, Upper Control Limit

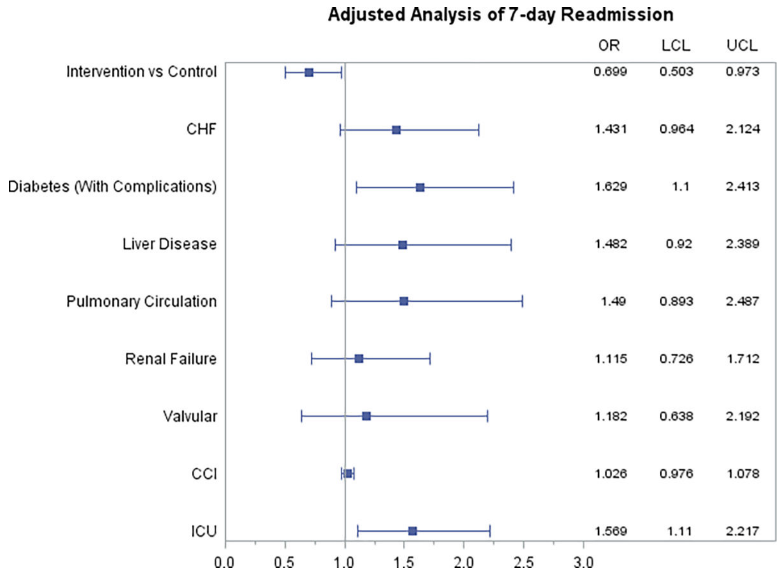

Figure 3.

Adjusted odds of 7-day readmission (from logistic regression). CCI, Charlson Comorbidity Index; CHF, congestive heart failure; ICU, intensive care unit; LCL, Lower Control Limit; UCL, Upper Control Limit.

Table 1

Characteristics of patients on the intervention (SIBR) and control units

	Control (n=770)	Intervention (SIBR) (n=1451)	
	Number (%) or mean (SD)	Number (%) or mean (SD)	P value
Age	61.5 (17.7)	60.3 (17.7)	0.14
Gender (female)	388 (50.4)	695 (47.9)	0.26
Race*			
American Indian or Alaska Native	13 (1.7)	21 (1.5)	0.93
Asian	4 (0.5)	8 (0.6)	
Black or African-American	202 (26.3)	376 (26.0)	
White/Caucasian	526 (68.5)	990 (68.4)	
Other	23 (3.0)	53 (3.7)	
Hispanic or Latino*	18 (2.4)	50 (3.5)	0.15
Payer			
Managed care	108 (14.0)	200 (13.8)	0.77
Medicaid	120 (15.6)	221 (15.2)	
Medicare	453 (58.8)	834 (57.5)	
Self-pay	64 (8.3)	137 (9.4)	
Other	25 (3.3)	59 (4.1)	
Admission source			
Clinic or physician's office	28 (3.6)	84 (5.8)	0.091
Non-healthcare facility	516 (67.0)	926 (63.8)	
Outside hospital	178 (23.1)	333 (23.0)	
Transfer	48 (6.2)	108 (7.4)	
Comorbid conditions			
CHF	165 (21.4)	268 (18.5)	0.094
COPD	216 (28.1)	385 (26.5)	0.44
Diabetes (No Complications)	156 (20.3)	240 (16.5)	0.029
Diabetes (With Complications)	207 (26.9)	345 (23.8)	0.11
Hypertension	406 (52.7)	719 (49.6)	0.15

	Control (n=770)	Intervention (SIBR) (n=1451)	
	Number (%) or mean (SD)	Number (%) or mean (SD)	P value
Liver disease	66 (8.6)	147 (10.1)	0.23
Neurological	84 (10.9)	193 (13.3)	0.10
Pulmonary circulation	63 (8.2)	120 (8.3)	0.94
Renal failure	151 (19.6)	257 (17.7)	0.27
Valvular	49 (6.4)	76 (5.2)	0.27
Total comorbid conditions	2.03 (1.65)	1.90 (1.59)	0.061
Charlson Comorbidity Index *	4.1 (3.6)	4.0 (3.6)	0.47
ICU stay during hospital visit	203 (26.4)	360 (24.8)	0.42
ICU to floor	201 (99.0)	355 (98.6)	0.68
Floor to ICU	33 (16.3)	54 (15.0)	0.69
Discharge disposition			
Expired	5 (0.7)	1 (0.1)	0.46
Home	593 (77.0)	1137 (78.4)	
Nursing facility or rehabilitation	149 (19.4)	290 (20.0)	
Other facility	23 (3.0)	23 (1.6)	

*There were one to three missing patients in these groups.

†CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; SIBR, structured interdisciplinary bedside rounding.

Table 2

Comparing intervention (SIBR) vs control

Outcome	Unadjusted estimate	P value	Adjusted estimate	P value
Length of dtay (IRR)	1.01	0.89	1.01	0.58
30-day readmission (OR)	0.78	0.03	0.81	0.07
7-day readmission (OR)	0.68	0.02	0.70	0.03

IRR, incidence rate ratio; SIBR, structured interdisciplinary bedside rounding.