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A telephone-based surgical transitional care program with improved patient satisfaction scores and fiscal neutrality

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ABSTRACT

Background: Limited data exist regarding the downstream effects of surgical transitional care programs. We explored the impact of such programs on patient satisfaction and fiscal metrics.
Methods: A telephone-based surgical transitional care program enrolled patients undergoing complex abdominal surgery between 2015 to 2017. A matched cohort undergoing similar procedures between 2010 to 2015 were used as controls. Press Ganey scores were used to reflect patient satisfaction. Hospital costs, reimbursements, and margins were analyzed for index hospitalizations and readmissions within 90 days of surgery.
Results: There were 607 patients in the control group and 608 in the transitional care program; survey response rates were 37% and 35%, respectively. Transitional care patients rated their understanding of personal responsibilities in post-discharge care higher than controls (59% vs 69%, $P = .02$). Transitional care patients felt they received better educational materials about their condition or treatment (55% vs 68%, $P < .01$) and rated their global hospital experience higher (46% vs 57%, $P = .02$). The aggregate (index plus readmission) cost was greater for the transitional care ($22,814 vs $25,827, $P < .01$), but there was no difference in aggregate margin ($7,027 vs $4,698, $P = .25$). Multivariable adjustment yielded similar results for the aggregate cost (ref vs $2,232, $P = .03$) and margin (ref vs $1,299, $P = .23$).
Conclusion: The use of this dedicated abdominal surgery transitional care program is associated with improved Press Ganey patient education and global rating scores. The cost to support this program did not adversely affect the hospital margin when considering all factors. These data support broader investment in patient centered initiatives that may significantly enhance patient experience.

Introduction

Transition of care occurs when patients shift from one care level to another (ie, step-up care, step-down care, and discharge from hospital admission); these transitions are vulnerable and critical periods when adverse events frequently occur. The transitional care period between hospital discharge and first clinic follow-up is fraught with complications and high readmission rates, which can be as high as 30% for patients undergoing complex abdominal surgery.[1–4] With these alarming figures and the passage of the Hospital Readmissions Reduction Program associated with the Affordable Care Act, health care systems across the United States have begun to establish and implement programs in an effort to reduce readmission for both medical and surgical patient.[5–7]

Surgical transitional care programs have demonstrated promising, albeit mixed, results regarding reductions in readmissions, with some studies exhibiting a clear benefit while others showing no difference.[8,9] However, the fiscal impact of these surgical transitional care programs is not well established when compared with their medical counterparts. Beyond the quantifiable consequences of readmission and cost, transitional care programs may offer other less tangible benefits, such as a better patient experience and increased satisfaction. These programs offer and encourage

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individualized patient care through the use of telemedicine, which leads to more patient centric care. With patient-centered care being named 1 of 6 main elements of delivery of "high-quality care" by Institutes of Medicine,[10] its integration into practice has never been more encouraged. This care model has been associated with higher patient satisfaction, better patient adherence to treatment plans, and improved patient self-care, all of which may ultimately lead to better long-term clinical outcomes.[11–13]

Therefore, the aims of this study were to determine the effect of a dedicated abdominal surgery and telephone-based transitional care program on: (1) hospital cost and margin for readmissions within 90 days of surgery and (2) patient satisfaction using standardized assessments (Press Ganey patient surveys).

Methods

Surgical coordinated-transitional care development and protocol

Surgical Coordinated–Transitional Care (sC-TraC) is a telephone-based transitional care program for complex abdominal surgeries implemented at the University of Wisconsin in October 2015. The sC-TraC protocol was adapted using the CDC-endorsed Replicating Effective Program implementation theory model[14,15] with specific emphasis on addressing factors that lead to poor transitional care among surgical patients.[16] Patients were enrolled in sC-TraC before discharge and nurse-initiated phone calls to the patient began within 48 to 72 hours after hospital discharge and continued every 1 to 5 days until discharge from sC-TraC. The phone calls centered on 4 main areas: (1) medication reconciliation, (2) patient education about "red flags" symptoms that would warrant direct contact between the patient and sC-TraC nurse or their provider, (3) ensuring a clinical follow-up appointment is scheduled, and (4) guaranteeing the patient has sC-TraC nurse contact information. During the telephone calls, nurses worked to triage patient concerns. Benign problems were handled by the sC-TraC nurses, whereas "red flag" symptoms or major concerns were routed to their provider. In the latter situations, the provider would recommend either same-day clinic appointment, a visit to the emergency department, or direct admission to the floor depending on the clinical scenario. During the study period, video visits were not used. The protocols of this program have been previously published by Acher et al.[5]

Cohort creation

Patients in the sC-TraC cohort included those that were enrolled in this program from October 2015 to December 2017. Enrollment criteria for sC-TraC included discharge to home after pancreatectomy (including Whipple procedures and distal pancreatectomy-splenectomy), colectomy, proctectomy, gastrectomy, hepatectomy, multivisceral resections, new ostomy, discharge with a drain, major in-hospital complication, or clinician discretion (this included patients that refused home health, lived alone, or had other clinical concerns noted by the discharging team). Patients from the colorectal and surgical oncology service who met inclusion criteria were offered enrollment. Patients undergoing abdominal operations on gynecology, urology, or emergency surgery services were not enrolled due to program capacity restraints. Patients that were enrolled but failed to engage in the program (defined as not reachable for first phone call after 3 attempts) were excluded as we were unable to assess their postoperative course or adherence. Patients that for whom financial records were unable to be obtained were also excluded from analysis.

A control (pre-sC-TraC) cohort was created by nearest neighbor matching using Mahalanobis distance with stratification according to procedure (pancreatectomy, colectomy, etc). These patients were identified in a historical control group, 5 years prior to sC-TraC (2010–2015), using hospital billing data and Current Procedural Terminology codes of surgical procedures that were the same for sC-TraC cohort. Control patients were excluded if their discharge or length of stay (LOS) characteristics were not reflected in the sC-TraC group. This excluded patients with LOS of only 1 day or >40 days, those who lived >400 kilometers from University of Wisconsin Hospital, those who left against medical advice, and those discharged to skilled nursing or assisted living facilities or a Veterans Administration facility. Control and sC-TraC patients were grouped according to surgical procedure and matched within each procedural block. Matching variables included age, Charlson-Deyo comorbidity index, LOS, and postoperative complications occurring during the index hospital stay. After matching, covariate balance was checked using a logistic regression model to confirm treatment and control groups were not significantly different regarding covariates.

Definitions and data collection

Index admission was defined as the initial admission where patients underwent their principal operation for their diagnosis, and 90-day readmission defined as any rehospitalization to the University of Wisconsin within 90 days of the principle operation. Demographic data included age at surgery, sex, race, smoking status, and insurance. Clinical data included complications and any postsurgery interventions during the index admission, Charlson-Deyo comorbidity index, body mass index (BMI), surgical procedure performed during index admission, and LOS for all admissions. Overall, there was no significant change in faculty or case volume during the study period from 2010 to 2017.

Press Ganey patient satisfaction scores, measures of patient acuity, and fiscal data were collected from our health system's administrative databases for the index admission and all readmission within 90-days of the principle operation. Specific patient satisfaction questions were identified, and responses were collected, pertaining to the discharge process, patient education, and global rating of the hospital experience. Metrics for assessing patient acuity included Medicare Severity Diagnosis Related Groups payment weight, All Patients Refined Diagnosis Related Groups (APR-DRG) payment weight, severity of illness, and risk of mortality. A DRG is associated with a payment weight (or multiplier) to fiscally quantify the resources needed to treat a patient of a specific DRG.[17]

Fiscal data consisted of the payer-reimbursements and the hospital cost for each admission. Total hospital cost, our primary fiscal outcome of interest, was the sum of 4 categories (direct variable costs, direct fixed costs, indirect variable costs, and indirect fixed costs) and transitional care expenses (including salary and fringe). The cost of patient enrollment was not reflective of amortized expenses. The initial investment in infrastructure or hardware was minimal; the vast majority of resource investment was in FTE (ie, transitional care nurses). The hospital margin was calculated by subtracting the total hospital cost from the estimated reimbursement. Based on the recommendations from the Veteran Affairs Health Economics Resource Center,[18] fiscal data was adjusted for inflation and converted to 2017 dollars using the CPI of all urban consumers from the Bureau of Labor and Statistics.[19] Medical care Consumer Price Index was not used, as these adjustments do not account for changes in productivity and thereby tend to overstate increases in cost.[18,20]

Statistical analysis

All statistical analyses were conducted using SAS version 9.4 (Cary, NC). The data were split into 2 sets: all-patients and 90-day readmissions (only those readmitted within 90-days of their principle operation). Clinical and fiscal input data were compared between sC-TraC and control groups using a Wilcoxon rank-sum for continuous variables or a χ^2 for categorical variables. Predictive multivariable models of cost and margin were completed for 3 admission periods: index admission, all 90-day readmissions, and an aggregate of all admissions (the sum of index and readmission cost or margin). These predictive models aimed to estimate the cost or margin of a hospital admission based on available patient characteristics at the time of admission. Inputs into the multivariable model included variables that had between-group *P* values of $\leq$ .1 on univariate analysis, and other variable deemed clinically relevant such as transitional care program enrollment, age at surgery, sex, BMI, insurance model, smoking status, and Charlson-Deyo score. Variables that occurred during or were not known until after the index admission (eg, reoperation during index admission and index LOS) were excluded as inputs into the predictive multivariable models. These variables are not known at the time of admission and rather are an outcome of that particular admission. Therefore, these variables cannot be used as inputs to predict future cost or margin as they are temporally inappropriate. For example, the index LOS is not fully known at the time of admission, and as such cannot be a guiding factor in estimating cost or margin at the time of admission. A multivariable linear regression model with a backward selection set to a stay significance level of $P \leq .2$ was fitted adjusting for the above predictors. Results were reported as an effect estimate with a 95% confidence interval and *P* value testing whether the effect estimate is significantly different from 0, with a significance level set a priori as $P \leq .05$. Press Ganey responses on a 4, 5, or 10-point Likert scale were compared using a Wilcoxon rank-sum, while yes or no survey responses were compared with a Fisher exact test. These results were reported as percentage of respondents answering with highest value on the Likert scale (eg, if a survey question has a response scale from 1 to 5, the percentage of respondents answering with a “5” is reported) and *P* value, with a significance level set a priori as $P \leq .05$.

This study was approved by the institutional review board at the University of Wisconsin. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

There were 661 patients identified on the colorectal and surgical oncology services that had a qualifying major abdominal surgery (eg, laparoscopic cholecystectomy or appendectomy not included). Of the 661 patients offered enrollment into sC-TraC, and only 14 declined (98% enrollment). Patients that were enrolled but failed to engage in the program (defined as not reachable for first phone call after 3 attempts) were excluded; this accounted for approximately 5% of patients enrolled. Patients that for whom financial records were unable to obtained were also excluded from analysis; this was less than 2% of patients. Ultimately, 608 patients with accessible fiscal data engaged in the sC-TraC program.

Cost and margin for all patients enrolled

In total, there were 1,215 patients identified with 607 in the control (pre-sC-TraC) group and 608 in the sC-TraC cohort. Overall, most characteristics were similar between the control and sC-TraC groups. The sC-TraC had a greater percentage of hyperthermic intraperitoneal chemotherapy (HIPEC) procedures than the control ($P < .01$), but the control group had a larger percentage of multivisceral operations ($P < .01$). There were 306 readmissions in this study (readmission rate = 25%). There was no difference between groups in the number of readmissions within 90 days of the principle operation ($P = .21$; Table I). The cost of enrollment into the sC-TraC program was an additional $430 per patient.

Rank-sum comparison of all-patients for the index admission demonstrated a greater hospital cost for sC-TraC ($P = .05$), while the margin was not significantly different between groups ($P = .36$). On summation of hospital cost across all admission (index added to 90-day readmission), the aggregate cost was greater for transitional care ($P < .01$), but the aggregate margin was not significantly different between the 2 groups ($P = .25$; Table I).

After adjusting for confounders, the cost and margin of the index admission for all patients enrolled in the study were not significantly different between sC-TraC and controls (reference versus $986, $P = .23$; and reference versus $1,060, $P = .24$, respectively). Multivariable regression for aggregate cost (sum of index admission and 90-day readmission period costs) of all patients enrolled in the study demonstrated that sC-TraC patients had a higher cost with an average total of $2,232 per patient ($P = .03$). However, the aggregate margin (sum of the margins from index admission and 90-day readmission period) was not significantly different between groups ($P = .23$). Other drivers of increasing aggregate hospital cost included male sex ($P < .01$) and having a principle operation either being HIPEC ($P < .01$) or being multivisceral in nature ($P = .04$). In considering the aggregate margin, an increase in the BMI was associated with significant detriment to this fiscal measure ($P < .01$). In contrast, a private fee-for-service insurance model and HIPEC operations were associated with significant gains in the margin ($P < .01$ and $P < .01$, respectively; Table II).

Cost and margin for patients readmitted in 90 days

Of the 306 patients readmitted within 90 days, 143 were in the control group whereas the other 163 were enrolled in sC-TraC ($P = .21$). Most characteristics were similar between the 2 groups except for index admission APR-DRG and Medicare Severity Diagnosis Related Groups payment weights, which were higher for the control group ($P = .02$ and $P = .02$, respectively; Table III). Rank-sum comparison among this group yielded no difference in index admission cost or margin ($P = .28$ and $P = .99$, respectively). The cost or margin for the 90-day readmission period did not differ between groups ($P = .16$ and $P = .77$, respectively). The same was also true for aggregate cost and margin ($P = .87$ and $P = .96$, respectively; Table III).

On multivariable analysis for only those patients readmitted within 90-days, the cost and margin of the index admission were not significantly different among the 2 groups (reference versus $409, $P = .79$; and reference versus $2,274, $P = .25$, respectively). After multivariable adjustment, there remained no difference between sC-TraC and controls for both hospital cost and margin over the 90-day readmission period ($P = .23$ and $P = .70$, respectively). Other drivers of cost during this period included greater age at time of surgery ($P < .01$) and higher index APR-DRG payment weight ($P = .01$). In comparison, other inputs that increased hospital margin in the 90-day readmission window consisted of increasing index admission APR-DRG payment weight ($P = .02$) and private fee-for-service insurance model ($P < .01$; Table IV). The aggregate cost and margin (sum of index and readmission) for readmitted patients demonstrated a similar trend of no difference among groups

Table I
sC-TraC and control cohorts had similar characteristics

	Control (n = 607)	sC-TraC (n = 608)	P value
Age at surgery (y)	61 (50–68)	61 (49–69)	.29
Male, n (%)	282 (46.5)	288 (47.4)	.75
BMI (kg/m^2)	26.9 (23.6–31.1)	26.6 (22.7–30.9)	.13
Ever smoker, n (%)	286 (48.9)	290 (49.8)	.75
Race, n (%)			
White	578 (95.2)	579 (95.2)	.81
Black	14 (2.3)	15 (2.5)	
Asian	8 (1.3)	5 (0.8)	
Other	7 (1.2)	9 (1.5)	
Procedure, n (%)			
Pancreatectomy	94 (15.5)	92 (15.1)	.86
Colectomy	86 (14.2)	85 (14.0)	.93
Colostomy	70 (11.5)	71 (11.7)	.94
Ileostomy	205 (33.8)	207 (34.1)	.92
Colectomy, other	7 (1.2)	7 (1.2)	.99
Gall bladder/biliary	15 (2.5)	16 (2.6)	.86
Gastrectomy	18 (3.0)	18 (3.0)	.99
Small bowel	41 (6.8)	42 (6.9)	.92
Hepatectomy	21 (3.5)	21 (3.5)	.99
HIPEC	8 (1.3)	24 (4.0)	<.01
Retroperitoneal	16 (2.6)	15 (2.5)	.86
Multivisceral	20 (3.3)	4 (0.7)	<.01
Index inpatient complication, n (%)			
Infection	54 (8.9)	50 (8.2)	.68
Bleed	56 (9.2)	66 (10.9)	.34
Medical	14 (2.3)	14 (2.3)	.99
Other	105 (17.3)	102 (16.8)	.81
Charlson-Deyo, n (%)			
Score 0–1	368 (60.6)	369 (60.7)	.60
Score 2–3	193 (31.8)	184 (30.3)	
Score >4	46 (7.6)	55 (9.1)	
Insurance, n (%)			
Private capitated	53 (8.7)	59 (9.7)	.09
Fee-for-service	297 (49.0)	259 (42.6)	
Public	257 (42.3)	290 (47.7)	
Index admission reintervention, n (%)			
Reoperation	35 (5.8)	50 (8.2)	.09
IR bleed	1 (0.2)	1 (0.2)	.99
IR drain	14 (2.3)	15 (2.5)	.85
Index admission DRG payment weights			
All patients refined	1.8 (1.7–2.8)	1.7 (1.7–2.8)	.18
Medicare severity	2.8 (2.6–5.3)	2.5 (2–2.8)	.18
Index LOS (d)	6 (4–9)	6 (4–9)	.09
90-d readmits, n (%)	143 (23)	163 (27)	.21
Index admission ($)			
Hospital cost	21,018 (15,266–29,172)	21,974 (16,099–30,115)	.05
Hospital margin	5.980 (−1.326–18,560)	4.358 (−2.496–19,571)	.36
Aggregate admissions ($)			
Hospital cost	22,814 (15,892–33,484)	25,827 (18,155–35,892)	<.01
Hospital margin	7.027 (−1.369–20,734)	4.698 (−2.859–21,100)	.25

Continuous variable reported as median (Q1–Q3) with P value and categorical variables reported as count (percentage) with P value. Fiscal data are reported in United States Dollar. "Aggregate admissions" refers to the sum of the cost or margin of the index admission and 90-day readmission period.

(reference versus $1,240, P = .60; and reference versus $3,252, P = .20, respectively).

Press Ganey scores

The response rate to the Press Ganey survey for the controls and sC-TraC cohort was 37% (n = 224) and 35% (n = 213), respectively (P = .49). The mean completion time of Press Ganey surveys was 14 days after discharge for both groups. Control and sC-TraC patients rated their readiness for discharge and overall satisfaction with the discharge process similar (P = .12 and P = .10, respectively). However, transitional care patients rated their satisfaction with patient education higher, notably understanding their health responsibilities at home after leaving the hospital (P = .02) and the quality of their education materials about their condition and treatment (P < .01). Transitional care patients also rated their global hospital experience higher than their control counterparts (P = .02; Table V).

Discussion

In a matched cohort of adult patients undergoing complex abdominal surgery, we demonstrate that sC-TraC is associated with a marked improvement in patient satisfaction scores for patient education and overall hospital experience. Our analysis showed that sC-TraC did not increase the cost of readmissions occurring within 90-days of the principle operation, even when accounting for the cost of the program.

The readmission rate for this study was 25%. This is consistent with published reports from tertiary care centers, which is

Table II
After multivariable adjustment, the aggregate hospital cost remained greater for sC-TraC, but the margin also remained fiscally neutral

	Hospital cost (n = 1,215)		Hospital margin (n = 1,215)	
	Effect estimate (95% CI)	P value	Effect estimate (95% CI)	P value
Program enrollment				
Control	ref	–	ref	–
sC-TraC	2.232 (234–4.230)	.03	1.229 (−762–3.221)	.23
Age at surgery	–	.44	67 (−11–145)	.09
BMI	117 (−38–272)	.14	−291 (−446 to −136)	<.01
Sex				
Female	ref	–	ref	–
Male	4.245 (2.630–5.859)	<.01	1.547 (−446–3.539)	.13
Insurance model		.40		
Private capitated	–		ref	–
Fee-for-service	0		26,939 (23,362–30,515)	<.01
Public	–		−696 (−4.497–3.104)	.72
Smoking status			–	.27
Never smoker	ref	–		
Ever smoker	966 (−1.073–3.004)	.35		
Charlson-Deyo Score		.33		.83
Score 0–1	–		–	
Score 2–3	–		–	
Score >4	–		–	
Procedure				
HIPEC	12,617 (6.362–18,873)	<.01	7.607 (2.020–13,184)	<.01
Multivisceral	7.494 (332–14,656)	.04	–	.92

Reported with effect estimate in United States Dollar, 95% confidence interval, and P value significantly different than zero. "Ref" denotes which variable was the reference during analysis. If input was removed on backward selection, it is denoted by a dashed line (–); the P value for the last step of inclusion in the model is reported (ie, if a variable was removed on step 3 of backwards selection, that P value is reported).

estimated to be as high as 30% for complex abdominal operations.[1–4] Therefore, we believe that these results are generalizable to the tertiary care center population. There was no difference in readmission rates between cohorts, which unfortunately is a common theme for these well-intentioned programs. Jones et al[9] conducted a systematic review of postoperative transitional care interventions and their impact on hospital readmissions. From 1995 to 2015, they identified 3 randomized controlled trials and 7 observational cohort studies. Jones et al[9] found that interventions that focused primarily on patient education did not significantly reduce 30-day readmissions (P = .28); they also found that entirely telephone-based interventions, similarly, did not reduce 30-day readmissions (P = .40). Although education and telephone-based transitional care initiatives tend to not reduce admissions, these modalities usually possess lower overhead and start-up costs. For instance, in our study, there was no difference in the 90-day readmission cost, signifying that at a minimum these programs do not increase hospital expenses. This may support the use of education and telephone-based transitional care interventions in an effort to minimize expenses while also augmenting them with additional modalities (eg, discharge planning, home visits, etc) to reduce readmissions. More work is required to discern the best combination of these transitional care modalities.

After multivariable adjustment, there was no difference in the cost or margin for the index admission between sC-TraC and the controls. This may be a reflection of sufficient cohort matching. The matching algorithm primarily used index admission characteristics from the sC-TraC group to identify controls. Therefore, it is expected that these 2 cohorts would have similar fiscal outcomes for the index admission.

The increased aggregate cost for sC-TraC may indicate a discrepancy in the measurement of patient complexity, with the possibility that patients enrolled in sC-TraC may have higher complexity or acuity for their index admission than is reflected in the metrics assessed in this study. These metrics included diagnosis-related groups, severity of illness, and Charlson-Deyo comorbidity index. The enrollment criteria for sC-TraC included "clinician discretion," in that providers may deem a patient is "high risk" for adverse events including rehospitalization.[5] Providers may have identified these patients by factors that are not accounted for in the above acuity scores, which may include frailty and lack of social support. Both of which may be tied to more adverse events and likely higher costs. Additionally, perhaps, in this high-risk population a significant portion of readmissions could be classified as "unpreventable," meaning that even with close follow-up from the transitional care program, the readmission could not be averted. In such "unpreventable" readmissions, the principal problem that led to the rehospitalization may have a higher acuity status (compared with preventable readmission), and therefore tends to incur a greater cost to the hospital. Additional work is needed to determine the influence of such factors.

In spite of the higher aggregate hospital cost that sC-TraC incurs, these expenses are recuperated in the hospital margin even when the fiscal support of the program is considered. For both the aggregate and 90-day readmission periods, there is no loss to the hospital margin when patients are enrolled in sC-TraC, suggesting that aggregate reimbursements are greater for sC-TraC than controls. Reimbursements are influenced by a multitude of factors, including patient acuity, insurance model, prenegotiated terms, provider documentation, and so on. For this study, it is less likely that these reimbursements were significantly affected by changes in documentation as there were no departmental billing or coding initiatives during the study period. Additionally, there were no significant transitions in faculty or volume during the study period that would account for changes in reimbursement. Ultimately, due to the multifactorial nature of reimbursements, it is difficult to discern the principle driving force behind these results. Regardless, these data do support broader implementation of similar

Table III
For patients readmitted in 90 days, sC-TraC and control cohorts had similar characteristics

	Control (*n* = 143)	sC-TraC (*n* = 163)	*P* value
Age at surgery (y)	56 (42–67)	58 (42–67)	.77
Male, *n* (%)	66 (46.2)	83 (50.9)	.41
BMI (kg/m^2)	26.7 (23.3–31.4)	26.0 (22.5–30.5)	.30
Ever smoker, *n* (%)	66 (47.5)	68 (43.9)	.53
Race, *n* (%)			
White	136 (95.1)	156 (95.7)	.69
Black	2 (1.4)	3 (1.8)	
Asian	3 (2.1)	1 (0.6)	
Other	2 (1.4)	3 (1.8)	
Procedure, *n* (%)			
Pancreatectomy	20 (14.0)	19 (11.7)	.54
Colectomy	15 (10.5)	10 (6.1)	.17
Colostomy	16 (11.2)	18 (11.0)	.97
Ileostomy	70 (49.0)	96 (58.9)	.08
Colectomy, other	1 (0.7)	2 (1.2)	.99
Gall bladder/biliary	1 (0.7)	2 (1.2)	.99
Gastrectomy	5 (3.5)	2 (1.2)	.26
Small bowel	4 (2.8)	3 (1.8)	.71
Hepatectomy	2 (1.4)	2 (1.2)	.99
HIPEC	1 (0.7)	3 (1.8)	.63
Retroperitoneal	2 (1.4)	2 (1.2)	.99
Multivisceral	5 (3.5)	1 (0.6)	.08
Index inpatient complication, *n* (%)			
Infection	20 (14.0)	20 (12.3)	.66
Bleed	12 (8.4)	15 (9.2)	.80
Medical	6 (4.2)	6 (3.7)	.82
Other	28 (19.6)	32 (19.7)	.99
Charlson-Deyo, *n* (%)			
Score 0–1	89 (62.2)	99 (60.7)	.62
Score 2–3	40 (28.0)	52 (31.9)	
Score >4	14 (9.8)	12 (7.4)	
Insurance, *n* (%)			
Private capitated	16 (11.2)	18 (11.0)	.80
Fee-for-service	76 (53.2)	81 (49.7)	
Public	51 (35.7)	64 (39.3)	
Index admission reintervention, *n* (%)			
Reoperation	8 (5.6)	9 (5.5)	.98
IR bleed	0 (0)	1 (0.6)	.99
IR drain	4 (2.8)	7 (4.3)	.55
Index DRG payment weights			
All patients refined	2.1 (1.7–3.0)	1.7 (1.6–2.8)	.02
Medicare severity	2.6 (1.9–2.8)	2.5 (2.1–2.8)	.02
Index LOS (d)	7 (5–9)	7 (4–10)	.35
Index admission ($)			
Hospital cost	22,645 (18,081–32,412)	22,262 (15,938–28,909)	.28
Hospital margin	5.151 (−2.070–20353)	5.000 (−3.214–19,718)	.99
90-d readmission ($)			
Hospital cost	9.598 (5.307–15,785)	10,931 (6.753–19,105)	.16
Hospital margin	3.231 (−294–9.870)	2.427 (−731–10,403)	.77
Aggregate admissions ($)			
Hospital cost	34,815 (26,487–44,706)	34,922(25,690–50,378)	.87
Hospital margin	9.580 (−4.261–31,245)	8.300 (−4.307–35,162)	.96

Continuous variable reported as median (Q1–Q3) with *P* value and categorical variables reported as count (percentage) with *P* value. Fiscal data are reported in United States Dollar. “Aggregate admissions” refers to the sum of the cost or margin of the index admission and 90-day readmission period.

transitional care programs, as they remain financially feasible at a hospital level even during the period shortly after program inception.

Response rates to the Press Ganey surveys were 37% for controls and 35% for sC-TraC. This is considerably higher than the current national average, which is estimated to be a 16.5%.[21] Currently, Press Ganey scores are used by hospital administration to assess various programs within their institution despite the existing average response rate. As such, we believe these survey results to be an adequate measure of patient satisfaction and generalizable across institutions. Press Ganey scores were greater for sC-TraC patients, primarily in the area of patient education, compared to the control. This included sC-TraC patients rating their educational materials and understanding of their health responsibilities higher than controls. As patient education is a main pillar of this transitional care program and is given additional emphasis during telephone follow-ups; counseling on warning signs (so-called red-flag symptoms), caring for wounds or drains, diet or nutrition, activity restrictions, etc may help explain our results. Additionally, sC-TraC program may minimize the time a patient would languish if a complication did arise due to the frequent follow-up. This may help explain the increased global hospital rating as patients’ problems were promptly addressed and remedied. Although it is worth acknowledging that these results could reflect the Hawthorne effect, we are more inclined to believe that the increase patient satisfaction is due to additional teaching and individualized attention offered by the transitional care program. These aspects likely bolster patient competence and confidence in caring for themselves, which would explain the observed results.

Table IV
After multivariable adjustment, there remained no difference in hospital cost or margin during the 90-day readmission period between sC-TraC and control groups

	Hospital cost ($n = 306$)		Hospital margin ($n = 306$)	
	Effect estimate (95% CI)	*P* value	Effect estimate (95% CI)	*P* value
Program enrollment				
Control	ref	–	ref	–
sC-TraC	1.761 (−1.128–4.650)	.23	443 (−1.786–2.672)	.70
Age at surgery	170 (81–258)	<.01	–	.26
BMI	–	.71	–	.83
Index DRG payment weight				
All-patients refined	1.772 (589–2.955)	<.01	−1.588 (−2.880 to −298)	.02
Medicare severity	–	.99	1.096 (−207–2.398)	.10
Sex		.83		.37
Female	–		–	
Male	–		–	
Insurance model		.61		
Private capitated	–		ref	–
Fee-for-service	–		11,328 (7.618–15,037)	<.01
Public	–		−234 (−4.078–3.611)	.91
Smoking status		.96		
Never smoker	–		ref	–
Ever smoker	–		2.151 (−167–4.469)	.07
Charlson-Deyo score		.21		.94
Score 0–1	–		–	
Score 2–3	–		–	
Score >4	–		–	
Procedure				
Ileostomy	–	.43	–	.62
Multivisceral	–	.44	–	.32

Reported with effect estimate in United States Dollar, 95% confidence interval, and *P* value significantly different than zero. "Ref" denotes which variable was the reference during analysis. If input was removed on backward selection, it is denoted by a dashed line (–); the *P* value for the last step of inclusion in the model is reported (ie, if a variable was removed on step 3 of backwards selection, that *P* value is reported).

Table V
Patient responses to Press Ganey patient satisfaction survey

	Control ($n = 607$)	sC-TraC ($n = 608$)	*P* value
Response to Press Ganey survey, *n* (%)	224 (37)	213 (35)	.49
The patient understood the purpose of taking each medication after leaving the hospital, *n* (%)	155 (69)	134 (63)	.09
Extent to which the patient felt ready to be discharge, *n* (%)	137 (61)	138 (65)	.12
Overall satisfaction with discharge process, *n* (%)	130 (58)	136 (64)	.10
Patient instruction about how to care for self at home after leaving the hospital, *n* (%)	150 (67)	145 (68)	.33
Did the patient get information in writing about what symptoms/problems to look out for after leaving the hospital, *n* (%)	217 (97)	204 (96)	.66
The patient understood the responsibilities in managing their health after leaving the hospital, *n* (%)	132 (59)	147 (69)	.02
Patient instructions about whom to call with questions after discharge, *n* (%)	155 (69)	162 (76)	.04
Did hospital staff ask about whether the patient would have help they needed after discharge, *n* (%)	208 (93)	213 (100)	<.01
The quality of educational material provided to the patient about their condition/treatment, *n* (%)	123 (55)	145 (68)	<.01
Global rating of hospital experience, *n* (%)	103 (46)	121 (57)	.02

Reported as the number (percentage) of patients that responded with the highest number on the Likert scale (eg, if a survey question is scaled from 1–5, this is reported as the number and percentage of patients that responded with a 5) along with *P* values.

Additionally, sC-TraC patients rated their overall global hospital experience better than their control counterparts. This may reflect the personal and individualized attention that is offered to each patient through this program, which encourages a more patient-centered care model. A patient-centered care model facilitates better communication and mutual understanding between the patient and providers, which in turn may increase patient satisfaction.[11–13] With better education, greater access to patient services, and higher overall satisfaction, patients enrolled in sC-TraC are not only more likely to understand the personal responsibilities in their care but are empowered to engage in it as well. For these reasons, sC-TraC may have better adherence to surgical follow-up care and subsequently, a positive impact on the long-term health outcomes of these patients.

There is an extensive literature body covering transitional care programs for patients with chronic medical conditions (eg, heart failure, chronic obstructive pulmonary disease, etc). Of the programs studied, several have demonstrated great success in reducing all-cause readmission and cost, with cost-saving estimates ranging from $1,200 to $5,600.[14,22–26] However, others were less fortunate with either demonstrating no difference or even increased rehospitalizations for these medical transitional care programs.[27–29] In contrast, there is minimal literature on the effects of a dedicated surgical transitional care program on the hospital's fiscal position. Liu et al[30] described a dedicated neurosurgical transitional care program that was initiated preoperatively and followed patients through the 30-day postoperative window. They demonstrated the transitional care program had significant cost reductions of 17.2% in the initial admission (during which the principle operation was performed). This study also found substantial cost savings of 71.3% for readmissions within the 30-day period.[30] Yet, there are no studies evaluating dedicated abdominal surgical transitional care programs.

There is also a sparse amount of literature discussing the influence of surgical transitional care programs on patient satisfaction, let alone Press Ganey scores. One of the few previous reports that investigated this was by Fisher et al,[31] who demonstrated that a sC-TraC can positively impact patient satisfaction. Fisher et al found that greater than 80% of respondents felt they received high levels of support from the staff and had a better understanding of their care. Additionally, 100% of respondents reported overall satisfaction with the program.[31] Although the work by Fisher et al has highlighted the impact of a transitional care program on patient satisfaction, it has limited generalizability as the patient surveys were specific to the authors' institutions. Our study used validated and standardized patient surveys that are widely implemented across institutions in the United States to assess patient satisfaction. With greater standardization of surveys, these results may be more applicable to other US institutions and overall be more generalizable.

Limitations

This study was retrospective in nature and controlled by nearest neighbor matching. Although the cohorts were matched and multivariable models were used, it is likely that we are not accounting for all confounding factors. Possibly chief among these, is the inability to match the sC-TraC inclusion criteria of "clinician discretion." Acuity measures (which were used to match cohorts) cannot fully capture the frailty or social circumstances of patients. Similarly, due the retrospective nature of the study, we were unable to obtain certain granular data including readmission indications and number of averted readmissions. As such, we were unable to calculate cost savings for those patients that were not readmitted. From a generalizability standpoint, this study may be limited by only using financial data from the University of Wisconsin Hospital System and by excluding patients discharged to skilled nursing facilities. Lastly, despite Press Ganey response rates being considerably higher than the national average, it is worth acknowledging that the overall response rate is relatively low and may skew results due to nonresponse bias.

In conclusion, to the best of our knowledge, this is the first study to characterize the impact of a dedicated abdominal surgery transitional care program on the fiscal position of the hospital, as well as describing the influence of such programs on national, standardized patient satisfaction surveys. Our sC-TraC program is associated with improvements in global hospital rating and patient-reported education scores; although it is associated with greater aggregate hospital costs, there is no detriment to the hospital margin. These data support broader investments in similar patient-centered transitional care initiatives (including randomized clinical trials) that may significantly enhance patient experience.

Conflict of interest/Disclosure

The authors of this work have no related conflicts of interest to declare.

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