Effect of an Evidence-based Inpatient Tobacco Dependence Treatment Service on 30-, 90-, and 180-Day Hospital Readmission Rates

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Introduction: Smoking is a risk factor for hospitalization and interferes with patient care due to its effects on pulmonary function, wound healing, and interference with treatments and medications. Although benefits of stopping smoking are well-established, few hospitals provide tobacco dependence treatment services (TDTS) due to cost, lack of mandatory tobacco cessation standards and lack of evidence demonstrating clinical and financial benefits to hospitals and insurers for providing services.

Methods: This study explored the effect of an inpatient TDTS on 30-, 90-, and 180-day hospital readmissions. To carry out this work, 3 secondary datasets were linked, which included clinical electronic health record data, tobacco cessation program data, and statewide health care utilization data. Odds ratios (ORs) were calculated using inverse propensity score–weighted logistic regression models, with program exposure as the primary independent variable and 30 (90 and 180)-day readmission rates as the dependent variable, and adjustment for putative covariates.

Results: Odds of readmission were compared for patients who did and did not receive TDTS. At 30 days postdischarge, smokers exposed to the TDTS had a lower odds of readmission (OR = 0.77, $P = 0.031$). At 90 and 180 days, odds of readmission remained lower in the TDTS group (ORs = 0.87 and 0.86, respectively), but were not statistically significant.

Discussion: Findings from the current study, which are supported by prior studies, provide evidence that delivery of TDTS is a strategy that may help to reduce hospital readmissions.

Key Words: Tobacco cessation, tobacco dependence treatment services, cost, cost-benefit, hospital readmission, healthcare utilization

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Tobacco use causes ~480,000 deaths each year in the United States,[1] taking an economic toll of nearly $300 billion per year.[1,2] It is also a risk factor for hospitalization, and hospital readmission due to cardiac,[3–8] pulmonary,[9] surgical, and wound healing-related conditions.[10–15] The benefits of smoking cessation are well-documented. For individuals who have had a heart attack, stopping smoking can decrease the risk of subsequent heart attacks, sudden cardiac death, and total mortality by 50%.[16] Stopping smoking can slow the decline in lung function and improve prognosis in patients with coronary obstructive pulmonary disease (COPD).[17] Stopping smoking can also reduce the risk of cancer and stroke and improve prognosis for those with these diseases.[18]

Prior studies have demonstrated the benefit of providing inpatient tobacco cessation support combined with follow-up calls after hospitalization for smoking cessation.[19–27] In 2012 the Joint Commission (JC) recommended that all current smokers identified upon hospitalization receive tobacco cessation services as an inpatient and be followed up within 1 month after hospital discharge to increase long-term cessation rates.[28] Still, few hospitals have so far fully implemented the JC tobacco measures due to extra costs, the voluntary nature of the standard, and the lack of evidence demonstrating clinical and financial benefits to the hospital and insurers.[29,30] However, recent changes in national health policy have incentivized health care providers to improve the delivery of tobacco cessation efforts. For example, in 2011 the Centers for Medicare and Medicaid Services (CMS) began incentivizing health care providers to meet the requirements for meaningful use assessment of tobacco use.[31] CMS established penalties for readmissions starting in October 2012 to encourage hospitals to reduce hospital readmissions among patients with high volume, high cost chronic conditions and procedures, many of which are related to cigarette smoking.[32] In 2017, these penalty conditions now include

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acute myocardial infarction (MI), heart failure, stroke, pneumonia, COPD, hip and knee replacements and coronary artery bypass grafting.[32]

To date, 3 published studies have assessed the impact of offering smoking cessation to hospitalized patients on postdischarge hospital readmission, and all reported positive results favoring better outcomes in patients receiving smoking cessation services while hospitalized.[23,33,34] The first study, a randomized-controlled trial (RCT) conducted among patients hospitalized for mental health conditions, evaluated the efficacy of an inpatient tobacco dependence treatment service (TDTS) intervention that included counseling, medication support, and postdischarge follow-up support. This study found that patients who received TDTS while hospitalized were less likely than control patients to be readmitted within 18 months for psychiatric conditions [Odds ratio (OR), 1.92; $P=0.031$].[33] The second study, a RCT conducted among high-risk smokers with acute cardiovascular disease, evaluated the effect of an intensive TDTS consisting of 12+ weeks of behavior modification counseling plus free pharmacotherapy on hospital readmission rates, compared to usual care controls who received a single counseling session plus self-help materials. This study found a 44% relative risk reduction for the high-intensity intervention group, compared with controls ($P=0.007$).[23] In the third study, conducted in Ontario, Canada, readmission rates were compared for hospitalized patients who received a TDTS intervention and a usual care control group. The intervention consisted of screening for tobacco use and providing counseling, pharmacotherapy, and interactive voice recognition (IVR)-facilitated postdischarge support. At 30-day, 1-year, and 2-year intervals, the hazard ratios for hospital readmission among intervention group patients were lower, compared with the usual care group (0.50, 0.72, and 0.79, respectively; all P values <0.001).[34] Therefore, no study to date that we are aware of has examined the impact of an inpatient TDTS on hospital readmissions in the United States among a diverse group of hospitalized patients.

Beginning in early 2014, the Medical University of South Carolina (MUSC) implemented an automated TDTS using IVR technology and a TDTS Registry (TelASK Technologies Inc.) to meet the JC tobacco treatment standards. This innovative TDTS Registry interfaces with the hospital's admission and discharge records to identify tobacco users, automatically refers these patients into hospital tobacco cessation services, and then uses IVR technology to follow-up with patients 3, 14, and 30 days after discharge to assess tobacco use and transfer patients to additional community resources for cessation support if needed. A previous study which describes the TDTS in greater detail found that those exposed to the full service (bedside counselor + IVR follow-up calls) had 2-fold higher quit rate 1 month after discharge compared with those who received only IVR follow-up calls.[20] This project extends prior evaluations of the automated tobacco cessation service using IVR technology by examining the effect of the TDTS on unplanned hospital readmission assessed at 30, 90, and 180 days after hospitalization. The current study tests the hypothesis that among current smokers, hospital readmission rates will be lower among those exposed to the TDTS compared with those not exposed to the TDTS.

METHODS

Study Population and Design

The study population included current smoking acute care patients admitted and discharged from the MUSC hospital between November 1, 2014 and June 31, 2015. The MUSC hospital is a major tertiary care hospital located in Charleston, SC with over 30,000 adult hospital admissions annually. All current smokers admitted to the hospital were eligible for the TDTS, but not all patients received the service. Reasons for not receiving the service included being discharged before the bedside consult was provided and failure to answer any of the 18 IVR follow-up calls made within 30 days after discharge from the hospital.

This study compared unplanned readmissions at 30, 90, and 180 days after discharge among adult current smokers who were exposed to the TDTS and those who did not receive the service. Exposure to the TDTS was defined in 2 ways as follows: (1) the exposed group received either a bedside consult and/or responded to at least 1 IVR follow-up call versus the unexposed group who received neither a bedside consult nor responded to any of the IVR follow-up calls; and (2) level of exposure to the TDTS was further defined as high, low, and unexposed, with high exposure defined as receiving the bedside consult (regardless of whether they responded to any postdischarge IVR follow-up calls), low exposure defined as responding *only* to the postdischarge IVR follow-up calls, and unexposed as defined above.

This exploratory study design was built upon in-place data capture mechanisms to allow us to efficiently link data across 3 datasets to test the hypotheses that hospitalized readmission rates will be lower among patients exposed to the TDTS compared with those not exposed to the service. These datasets included: (1) the MUSC electronic health record database, which provided information about tobacco use status for all hospitalized patients; (2) the TDTS Registry, which provided information about which hospitalized patients participated in the MUSC TDTS and level of service received; and (3) the Statewide Hospital Utilization Datasets, which provided information about subsequent readmission rates and demographic and clinical covariates. Demographic and clinical covariates included the patients age in years, race/ethnicity (white, black, hispanic, other), sex (male, female), insurance status (uninsured, Medicare, Medicaid, private, other), length of stay during hospitalization, Charlson Score categories (none, mild, moderate, severe), and number of comorbidities[35] as assessed during the patients' index hospitalization at MUSC. Data linkage was accomplished in 2 steps. First, data from the TDTS database were linked with MUSC electronic health record data using patient medical record number (MRN) as the linking variable or name and date of birth to confirm linkage of 2 diverging MRN's for the same dataset. Once these MUSC internal datasets were linked, the merged dataset was sent to the SC Office of Research and Statistics (SC ORS) via file transfer protocol to carry out linkage with the SC health care utilization hospital discharge dataset. Data linkage at the SC ORS was performed using probabilistic matching on key patient identifiers (first, last, and middle name; date of birth; address; sex; race; and admit/discharge dates); patient identifiers such as MRN, name, data of birth, and address were subsequently omitted from the final dataset.

The dependent variables in this study were unplanned hospital readmissions measured at 30, 90, and 180 days after the discharge date of the index hospital admission at the MUSC hospital. An index admission was defined as the initial event for which the patient sought care (such as an initial heart attack or hip/knee replacement procedure) and had been discharged.[36] Index admissions that resulted in the admission to psychiatric care, had lengths of stay longer than 30 days, the patient was discharged against medical advice, or had died were excluded from analysis. To be consistent with how CMS calculates readmission rates, we excluded readmissions due to planned care components such as cardiac rehabilitation or staged myocardial infarction surgical procedures, but included readmissions due to unplanned problems such as septicemia, dehydration, or stroke.[36] The rationale for excluding planned readmissions was that these readmissions often represent components of quality care.[36] The CMS nationally standardized algorithm was used to assess both procedure codes and discharge diagnoses for each readmission to record if hospital admissions were planned or unplanned. Consistent with CMS methodology, readmissions within 1 day of discharge from the index visit were excluded.

Statistical Analyses

To test the hypothesis that exposure to the TDTS would reduce unplanned readmission rates, we first compared unplanned 30-day hospital readmission rates for patients who did and did not receive the TDTS. Next, we compared 30-day readmission rates for patients who received varying levels of TDTS intensity (no exposure vs. low exposure, no exposure vs. high exposure, and low exposure vs. high exposure). We repeated these same analyses at 90 and 180 days postdischarge to examine if this altered the assessment of the impact of the TDTS program. These secondary data analyses were carried out by linking inpatient TDTS program data with MUSC clinical data and the SC health care utilization dataset of all statewide hospital discharges.

Continuous and categorical variables were assessed using t tests and χ^2 tests respectively. To reduce potential program exposure selection bias from nonrandomized data, propensity scores were calculated balancing on age, sex, race, insurance status, Charlson score, indicator variable for length of stay (dichotomized as lower or higher than median), and comorbidities (ie, congestive heart failure, stroke, COPD, asthma, diabetes, hepatitis, multiple sclerosis, hypertention, etc.). As the study population consisted of only smokers, thus, all patients were eligible for all levels of the program exposure, the sample of those with no exposure was smaller than the sample of those exposed. Therefore, propensity score matching would have resulted in the loss of exposure cases that did not have a matching control. Therefore, the inverse probability treatment–weighted propensity score method was used for analysis.[37] Continuous and categorical variables were then reassessed using inverse probability treatment (propensity) weights to ensure similar distribution across baseline characteristics. We used inverse propensity score–weighted logistic regression models, with program exposure as the primary independent variable and 30 (90 and 180)-day readmission rates as the dependent variable.[38] In a first step, the relationship of TDTS participation with unplanned readmission was examined. We then adjusted for putative covariates that included age, race, sex, insurance status, and number of comorbidities. Covariates were added to the model to examine whether program exposure remained statistically significantly associated with 30 (90 and 180)-day readmission rates after controlling for potential covariates. Each covariate considered for inclusion was examined individually for a relationship with 30 (90 and 180)-day readmission. In the second step, those variables with a P-value <0.25 were included in an initial model. Next, the potential confounder variable in the initial model with highest P-value was removed and the model was refit. If the removal of the potential confounder variable did not result in a significant improvement in model fit (as indicated by a change in the model-2 log likelihood), then the variable was retained for later steps. The removal and subsequent testing of change in model fit was repeated until all nonsignificant potential confounders were tested. For subgroup analysis, only study subjects diagnosed with ≥ 1 CMS conditions, propensity score models, and logistic models were conducted analogous to the main analysis. However, due to the small sample size of this subpopulation, categories that had small sample sizes such as "other" insurance status (2 cases) and hispanic race (4 cases) were excluded from analysis and comorbidities with small sample sizes (eg, multiple sclerosis had only 1 case in this subpopulation) were excluded from propensity score analysis. Statistical significance was assessed at the 0.05 α level. All analyses were conducted using SAS 9.4 (Cary, NC).

RESULTS

A total of 3081 smokers with eligible index admissions were assessed; 1441 were not exposed to TDTS and 1640 received some level of exposure ($n=764$ and 876 for low and high exposure, respectively). More than half of the smokers were male (59.1% and 52.5% for nonexposed and exposed, respectively) with an overall mean age of 48.6 years. Mean length of stay was 5.1 days (median = 3.0 d). As shown in Table 1, statistically significant differences between the no exposure and any exposure groups were observed for several of the baseline characteristics including age, sex, insurance status, Charlson score, and total comorbidities; however, after balancing using inverse probability treatment weights, none of the differences remained statistically significant, therefore indicating successful balancing of baseline characteristics between the exposure groups using propensity score methods.

At 30 days postdischarge, unadjusted readmission rates were statistically significantly lower in TDTS exposed smokers compared with unexposed smokers ($\Delta=2.6\%$; $P=0.02$; Table 2). Similarly, unadjusted readmission rates were statistically significantly different between the high, low, and no TDTS exposure smokers (8.8%, 9.8%, 11.9% respectively; $P=0.05$).

When 30-day readmission was assessed and adjusted for covariates, smokers exposed to any level of TDTS maintained a statistically significant reduction with a decrease of 23% in the

TABLE 1. Characteristics of the Study Sample

	Unadjusted			Propensity Score Weighted		
	Control (N = 1441)	Intervention (N = 1640)	P	Control (N = 1439)	Intervention (N = 1640)	P
Demographics						
Age (y)	47.6 (16.3)	49.4 (14.9)	0.0020	48.6 (16.9)	48.6 (14.5)	0.9529
Male	851 (59.1%)	861 (52.5%)	0.0003	(55.5%)	(55.6%)	0.9597
Race			0.5141			0.9998
White	879 (61.0%)	978 (59.6%)		(60.1%)	(60.2%)	
Black	527 (36.6%)	608 (37.1%)		(37.0%)	(36.9%)	
Hispanic	15 (1.0%)	24 (1.5%)		(1.3%)	(1.3%)	
Other	20 (1.4%)	30 (1.8%)		(1.6%)	(1.6%)	
Insurance			0.0021			1.0000
Uninsured	399 (27.7%)	381 (23.2%)		(25.3%)	(25.3%)	
Medicare	378 (26.2%)	519 (31.6%)		(29.1%)	(29.1%)	
Medicaid	279 (19.4%)	308 (18.8%)		(19.2%)	(19.0%)	
Private	337 (23.4%)	394 (24.0%)		(23.6%)	(23.8%)	
Other	48 (3.3%)	38 (2.3%)		(2.8%)	(2.8%)	
Clinical characteristics						
Charlson score categories			0.0011			0.1539
None	863 (59.9%)	901 (54.9%)		(58.2%)	(56.3%)	
Mild	348 (24.1%)	502 (30.6%)		(25.8%)	(29.3%)	
Moderate	135 (9.4%)	142 (8.7%)		(9.5%)	(8.5%)	
Severe	95 (6.6%)	95 (5.8%)		(6.5%)	(5.9%)	
Total comorbidities	1.5 (1.5)	1.6 (1.5)	0.0214	1.6 (1.5)	1.6 (1.4)	0.9878
Body mass index*			0.0024			0.0461
Underweight	72 (5.0%)	66 (4.0%)		(4.9%)	(4.0%)	
Normal	451 (31.3%)	428 (26.1%)		(30.6%)	(26.9%)	
Overweight	334 (23.2%)	373 (22.7%)		(22.9%)	(22.6%)	
Obese	325 (22.6%)	432 (26.3%)		(23.4%)	(25.8%)	
Unknown	259 (18.0%)	341 (20.8%)		(18.1%)	(20.7%)	
Length of Stay	5.3 (5.3)	5.0 (4.6)	0.0869	5.3 (5.4)	5.0 (4.5)	0.1703

Data are represented as mean (SD) for continuous variables and number (%) for categorical or only (%) for propensity score–weighted categorical variables.
*Body mass index was not included in propensity score models due to large number of unknown/missing.

odds of readmission (OR = 0.77; $P = 0.031$; controlling for age, race, insurance status, and number of comorbidities) regardless of having a lower sample size of smokers (and consequently lower power). There was no statistically significant reduction in odds of readmission when low TDTS exposure was compared with no exposure (OR = 0.87, $P = 0.29$; controlling for insurance and comorbidities) but when high TDTS exposure was compared with no exposure the odds of readmission were reduced by 27% ($P = 0.02$, controlling for age and insurance). Although the comparison of high TDTS exposure to low exposure showed no statistically significant difference in the odds of readmission (OR = 0.86, $P = 0.36$; controlling for age and comorbidities), high exposure appeared to affect 30-day readmission rates positively (Table 3).

TABLE 2. Hospital Readmission Rates of Smokers by Level of Intervention (N = 3081)

	Unadjusted Proportions (%)		
	30 d	90 d	180 d
Control	11.9	18.6	24.3
Intervention	9.3	16.6	21.9
P	0.019	0.147	0.108
Control	11.9	18.6	24.3
Low	9.8	17.3	22.4
High	8.8	15.9	21.4
P	0.050	0.258	0.239

When these analyses were repeated for readmission at 90 and 180 days' postdischarge (using inverse probability of treatment weight and adjusted for covariates), no statistically significant effects of exposure on readmission rates were observed, although differences in readmission rates were in the expected direction consistent with the 30-day readmission results.

Exploratory subgroup analyses were performed on 369 smokers who had been diagnosed with at least 1 of the CMS conditions, of whom 40, 65, and 92 were readmitted at 30, 90 and 180 days postdischarge, respectively. Within this small subsample, there was a consistent trend towards lower readmissions among smokers exposed to any level of the TDTS intervention at each of the 30-, 90-, and 180-day intervals, after adjusting for covariates. When 30-day readmissions were assessed, smokers exposed to the TDTS had an 11% reduction in the odds of readmission (OR = 0.89; $P > 0.05$). At the 90-day interval, there was a similar 10% reduction in the odds of readmission (OR = 0.90; $P > 0.05$). At 180 days, smokers exposed to the TDTS had a more robust 43% reduction in the odds of readmission (OR = 0.57; $P = 0.005$).

DISCUSSION

The current study found that unplanned hospital readmission rates were 23% lower at 30 days postdischarge among hospitalized smokers who received a TDTS ($P = 0.031$), with results also favoring lower readmissions in the intervention group at 90 and 180 days. These findings mirror results from the 3 prior studies we

TABLE 3. Adjusted Propensity Score–weighted Hospital Readmission ORs of Smokers by Level of Intervention

	OR (95% CI)		
	30 d	**90 d**	**180 d**
N	3079	3079	3079
Control	1.00	1.00	1.00
Intervention	0.77 (0.61–0.98)	0.87 (0.72–1.05)	0.86 (0.73–1.02)
P	0.031*	0.145†	0.078†
Model fit‡	0.61/2022.9	0.60/2818.4	0.61/3265.8
N	2200	2200	2200
Control	1.00	1.00	1.00
Low	0.87 (0.66–1.09)	0.95 (0.76–1.19)	0.93 (0.76–1.14)
P	0.294§	0.657§	0.494§
Model fit‡	0.60/1482.8	0.60/2038.5	0.62/2330.1
N	2315	2270	2268
Control	1.00	1.00	1.00
High	0.73 (0.55–0.95)	0.82 (0.66–1.02)	0.82 (0.67–1.00)
P	0.021‖	0.079‖	0.048†
Model fit‡	0.62/1514.4	0.60/2062.2	0.61/2405.1
N	1635	1681	1682
Low	1.00	1.00	1.00
High	0.86 (0.61–1.19)	0.86 (0.66–1.11)	0.87 (0.69–1.10)
P	0.356¶	0.238#	0.250#
Model fit‡	0.59/1018.2	0.56/1515.9	0.57/1754.3

*Covariates: age, race, insurance status, and number of comorbidities.
†Covariates: age, insurance status, and number of comorbidities.
‡*c*- statistic/−2 log liklihood.
§Covariates: insurance status and number of comorbidities.
‖Covariates: age and insurance status.
¶Covariates: age and number of comorbidities.
#Covariates: number of comorbidities.
CI indicates confidence interval; OR, odds ratio.

have identified that have published on this topic.[23,33,34] In our study, there was also a stronger association observed between program exposure and readmission rates for the high-intensity group than for the low-intensity group. For example, when compared with the control group, the OR for readmission in the high-intensity and low-intensity groups were 0.73 ($P=0.021$) and 0.87 ($P=0.243$), respectively. Across these comparison studies conducted in patients hospitalized for mental health,[33] cardiac care,[23] and overall hospital conditions,[34] respectively, exposure to a TDTS was associated with robust reduction in hospital readmissions within 1–2 years postdischarge. Only 1 of these studies, which was conducted in Ontario Canada among a group of overall hospitalized patients, evaluated the effect of a TDTS on 30-day readmissions.[34] Therefore, the current study is the first US-based study to examine the effect of a TDTS on 30-day readmissions, adding to the evidence base that delivery of TDTS interventions may have a clinically meaningful effect on short-term hospital readmission rates.

Although quitting smoking has been shown to reduce long-term hospitalization rates,[38,16,17] less is known about the effect of quitting smoking on 30-day hospital readmission rates. The finding of a 20% reduction in 30 day unplanned readmission rates among TDTS participants in the current study is especially promising, as this research was conducted within the context of a "real world" TDTS designed to reach all patients to the extent possible with some level of TDTS. The reduction in unplanned hospital readmissions was more strongly positive for those who received bedside counseling combined with IVR follow-up calls. This result is consistent with the influence of smoking cessation, as our prior study of the TDTS patients who received the bedside consult were twice as likely to report not smoking compared with those who received just the IVR follow-up calls.[20] Although tobacco cessation has not been a focus of evaluation as a strategy for prevention of 30-day readmissions, there is strong biological plausibility for how a TDTS may reduce 30-day readmissions.[18] Specifically, quitting smoking lowers a person's heart rate, blood pressure, and blood sugar, improves pulmonary function, circulation, and wound healing, and enables cancer treatments to work more effectively.[42] As most of these health gains are achieved shortly after quitting smoking, it is plausible that quitting smoking has great potential as a strategy to reduce 30-day readmission rates.

In exploratory analyses that examined the association between TDTS intervention exposure and 30, 90, and 180 readmissions for overall CMS penalty conditions, a consistent trend was observed in the direction of lower readmissions in the TDTS exposure group. These findings provide additional evidence supporting the potential role of TDTS interventions on reduction of 30-day readmissions for CMS readmission penalty conditions specifically.

Further insight for understanding the association between smoking and hospital readmission can be gained by review of readmission rates within the MUSC hospital system. The overall readmission rate at MUSC is 10.8% for 30-day readmission and 17.5% for 90-day readmission. These rates vary by smoking status, with readmission rates of 9.6% for never smokers, 13.4% for former smokers, and 10.5% for current smokers. At 90 days, these readmission rates are 15.7%, 21.2%, and 17.5%, respectively. Never smokers have the lowest readmission rates. Former smokers, who tend to be older and have the greatest underlying morbidity, have the highest readmission rates, when compared with never and current smokers. The lower readmission rates for never smokers, coupled with the substantially higher readmission rates for former smokers, provides valuable information for understanding the broader context of tobacco use and hospital readmission.

Several limitations should be considered in interpreting the results from this study. First, the study was conducted using secondary data to evaluate the effects of an evidence-based TDTS on hospital readmission outcomes. Although an RCT study design would provide a more controlled and robust test of the impact of the TDTS service on hospital readmissions by creating study groups likely to have a similar distribution of characteristics that might influence the risk of hospital readmission, such a study would require a large sample of patients and would be expensive to carry out. In this study real world evaluation of an existing TDTS we attempted to control for suspected confounders of hospital readmissions using both propensity weighting and statistical control of key covariates to minimize bias between the group of smokers exposed to the TDTS service and those not exposed. Second, the study did not have optimal statistical power to be able to detect a statistically significant difference between groups, particularly when comparing subgroups of participants with low, high, and no program exposure. Despite this limited sample size, the intervention was associated with a 20% statistically significant lower rate of 30-day hospital readmissions, as well as trends towards lower readmissions at 90 and 180 days. Given that many well-documented factors influence 30-day readmission rates besides tobacco use, these findings provide promising evidence that delivery of evidence-based TDTS may be a tangible strategy that health care administrators can use to help reduce short-term hospital readmissions.

In summary, the current study provides exploratory evidence that an evidence-based TDTS may help to reduce short-term hospital readmission rates among smokers. To date, tobacco cessation has not yet been established as an influential driver of reduction in short-term hospital readmissions. Although our findings are promising, evidence will be needed from rigorous RCTs to further confirm these findings. For health care administrators who have to make difficult decisions about what clinical and preventive services to provide for patients, this evidence will be a crucial next step for encouraging health system investments in TDTS program delivery as a routine and sustainable clinical practice.

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