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Effectiveness of an Opt-Out Electronic-Heath Record-based Tobacco Treatment Consult Service at an Urban Safety-Net Hospital

Running Head: Effect of an opt-out tobacco treatment service

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Abstract

Background: To address the burden of tobacco use in underserved populations, our safety-net hospital developed a tobacco treatment intervention consisting of an "opt-out" Electronic Health Record (EHR)-based Best Practice Alert (BPA)+order-set, which triggers consultation to an inpatient Tobacco Treatment Consult (TTC) service for all hospitalized smokers.

Research Question: We sought to understand if the intervention would increase patient-level outcomes (receipt of tobacco treatment during hospitalization and at discharge; 6-month smoking abstinence), and improve hospital-wide performance on tobacco treatment metrics.

Study Design and Methods: We conducted two retrospective quasi-experimental analyses to examine effectiveness of the TTC service. Using a pragmatic design and multivariable logistic regression, we compared patient-level outcomes of receipt of nicotine replacement therapy and 6-month quit rates between smokers seen by the service (n=505) and eligible smokers not seen due to time constraints (n=680) between July 2016-December 2016. In addition, we conducted an interrupted time series analysis to examine the effect of the TTC service on hospital-level performance measures, comparing reported Joint Commission measure rates for inpatient (Tob-2) and post-discharge (Tob-3) tobacco treatment pre- (January 2015-June 2016) versus post- (July 2016-December 2017) implementation of the intervention.

Results: Compared to inpatient smokers not seen by the TTC service, smokers seen by the TTC service had higher odds of receiving nicotine replacement during hospitalization (51.5% [260/505] vs 35.9% [244/680], adjusted odds ratios (AOR)=1.93 [95% CI 1.5-2.45]) and at discharge (32.5% [164/505] vs 12.4% [84/680], AOR=3.41 [2.54-4.61]), as well as higher odds of

6-month smoking abstinence (14.9% (75/505) vs 10% (68/680), AOR=1.48 [1.03-2.12]). Hospital-wide, the intervention was associated with a change in slope trends for Tob-3 (p<.01), but not for Tob-2.

Interpretation: The "opt-out" EHR-based TTC service at our large safety-net hospital was effective at improving both patient-level outcomes and hospital-level performance metrics, and could be implemented at other safety net hospitals that care for hard-to-reach smokers.

Key words: inpatient tobacco treatment, hospitalized smokers, smoking cessation, electronic health record, MassHealth Pay-for-Performance, Joint Commission

Introduction

The prevalence of smoking in low socioeconomic status (SES) populations has declined at negligible rates in stark contrast to the general population.[1,2] Medicaid enrollees are more than twice as likely to be smokers (26.4%) than those with private insurance (11%).[1,2] Programs implementing coverage of FDA-approved medications and counseling have shown promise in decreasing smoking prevalence, including among Medicaid beneficiaries.[3,4] Yet utilization of these services remains low.[5,6]

Hospitalization is an opportunity to engage underserved smokers who may not otherwise have access to treatment.[7-9] Hospitalization may serve as a "teachable moment" for smoking cessation when smokers may be acutely aware of the consequences of smoking and more receptive to tobacco treatment.[7,8] Indeed, MassHealth (our state's Medicaid program) members identified health concerns as among the factors most helpful in successfully quitting or making quit attempts.[10] Historically, guideline-based treatment has only been offered to smokers who "opt-in" (agree to a quit attempt before providing treatment). Recently, trials have shown that an "opt-out" approach to offering tobacco treatment to all smokers regardless of motivation to quit are effective.[11-17] Despite evidence supporting "opt-out" approaches, due to hospital resource constraints many interventions exclude patients with substance use disorder (SUD) or psychiatric disease, those without phone numbers, or non-English speakers[12,13,18], thus potentially perpetuating inequities in tobacco use and smoking-related illness.

The Joint Commission (JC) recommends tobacco performance measures that apply to all hospitalized smokers, regardless of motivation to quit or admitting diagnosis.[19] In July 2016, we

responded to a state-level incentive program that measures and incentivizes hospital quality for MassHealth beneficiaries [MassHealth Pay-for-Performance][20] by developing and implementing a tobacco treatment intervention that addresses JC performance measures. The intervention consists of an "opt-out" Electronic Health Record (EHR)-based Best Practice Alert (BPA)+order-set, which triggers consultation to an inpatient Tobacco Treatment Consult (TTC) service for all hospitalized smokers. Based on the effectiveness of EHR-based referral tobacco treatment programs,[14,21-26] we hypothesized the intervention would improve patient-level receipt of nicotine replacement therapy (NRT) and 6-month smoking quit rates, as well as hospital-wide performance measures. This retrospective study reports the effect of the EHR-based TTC service on these outcomes.

Methods

Setting and participants

We conducted this study at Boston Medical Center (BMC), the largest safety-net hospital in New England. All patients admitted to BMC after July 2016, documented as current smokers in the EHR, are eligible to receive TTC services. Of note we previously established the accuracy of the "current smoker" designation in our EHR to be 96.2%.[27] The Boston University Medical Campus institutional review board approved this study (H-34929).

Intervention

In July 2016, we established the inpatient TTC service, and BMC's Chief Medical Officer sent a hospital-wide email setting the expectation that all clinicians take advantage of the EHR-based TTC service. The TTC service is staffed by tobacco treatment specialists certified by Association for the Treatment of Tobacco Use and Dependence standards. The team includes a 0.5 full-time employment (FTE) nurse practitioner, 0.5 FTE respiratory therapist, and a 0.1 FTE supervising pulmonologist. We created an Inpatient Smoking Cessation BPA+order set designed to trigger consultation to the TTC service when an adult (age>18 years) designated in the EHR as a current smoker is admitted to our safety-net hospital. The BPA consists of a defaulted choice to order a consultation to the TTC service.[27] If the clinician chooses to defer the BPA (not accept the TTC order), a reminder triggers every 8 hours until the clinician either accepts the TTC order or the patient is discharged from the hospital.

After receiving a consult from an accepted BPA+order set, the TTC service provides the following to all patients seen: (1) bedside counseling (15-20 minutes), (2) recommendations for NRT while hospitalized, and (3) linkage to outpatient treatment at discharge, which may include referral to the BMC tobacco treatment clinic and/or Massachusetts quitline. Patients can decline any of the offered services. Since the TTC team comprises consultants without prescribing authority, tailored recommendations based on patient preferences and other factors (e.g. nicotine dependency, prior quit attempts) are made to the primary inpatient team via text page and EHR documentation. We previously found the inpatient team follows through on ~80% of TTC recommendations for inpatient NRT, and ~50% of TTC recommendations for NRT at discharge.[27]

Study #1: Patient-level outcomes: Receipt of NRT and 6-month Smoking Abstinence Rates

We first sought to determine if the TTC intervention improved patient-level outcomes. For this analysis, hospitalized smokers between July-December 2016 were included if a consultation had been placed to the TTC service; 1185 of 2417 hospitalized smokers had consultations ordered (supplemental Figure 1). Due to limited resources, weekend admissions, and time constraints, the TTC team was only able to provide consultation to 42.6% (505/1185) of smokers for whom a consultation had been ordered from July-December 2016. We used the 57.4% (680/1185) of smokers who had a consult ordered, but were not seen, as a "real-world" control group to establish effectiveness of the intervention.

Receipt of NRT during hospitalization and NRT prescription at discharge

We summarized data on receipt of NRT during hospitalization (inpatient NRT) and NRT prescription at discharge (outpatient NRT), comparing patients seen and not seen by the TTC service between July 2016-December 2016 (n=1185). We collected these data by querying order status of inpatient NRT (NRT ordered during hospitalization: yes/no) and checking discharge prescriptions for presence of outpatient NRT (NRT prescribed at discharge: yes/no).

Secondary outcome: Self-reported 7-day smoking abstinence at 6 months

We compared 7-day smoking abstinence at 6 months between patients seen and not seen by the TTC service. Study staff called all patients who had a consult ordered from July-December 2016 to obtain smoking status (self-reported 7-day smoking abstinence at 6 months after hospital discharge: yes/no). We were able to reach and obtain self-reported abstinence data for

571/1185 smokers (48.2%). For patients not reached by phone, we performed chart review of clinician EHR notes 6 months post-hospital discharge to identify updated information on smoking status. Of 586 patients not reached by phone, we obtained smoking status for an additional 332 patients by chart review. Smoking status at 6 months post-hospital discharge was thus available for 903/1185 (76.2%) hospitalized smokers, representing 80.6% (407/505) of patients seen by the TTC service and 72.9% (496/680) of patients not seen by the TTC service (Supplemental Figure 1). If no data on smoking status was available by either phone or manual chart review, we conservatively classified patients as still smoking.

Co-variates: Baseline characteristics of patients seen and not seen by the TTC service

Demographics (age, sex, race, ethnicity, insurance plan type), and co-morbid illnesses (COPD, CHF, SUD [alcohol, opioids, cannabis, cocaine, sedatives, stimulants, hallucinogens, inhalants], mental health disorder [MHD, including mood disorders, schizophrenia, anxiety disorders, psychotic disorders]) of patients seen and not seen by the TTC service were extracted from the EHR. Patients were identified with co-morbid illness if the diagnosis was listed as a primary or secondary discharge diagnosis or was listed on their discharge problem list. Insurance plan type (primary and/or secondary) was categorized as Medicaid (including MassHealth) or non-Medicaid (Private and/or Medicare).

We also reviewed all TTC consultation notes and abstracted data on motivation to quit and smoking pack-year. The TTC team characterizes motivation to quit as low, moderate, or high, a measure shown to be accurate in predicting 6 and 12-month quit rates in hospitalized smokers.[28] Because motivation to quit and smoking-pack year was unavailable for patients not seen by the TTC service, a study team member performed bedside assessments to collect this

data for a subset of 75 randomly selected smokers for whom an order had been placed, but who had not been seen by the service.

Statistical analyses

Categorical variables were summarized using frequency with percentage. We performed chi-squared analyses for between group comparisons, with two-sided p-value strictly less than 0.05 considered significant. For both the primary (receipt of inpatient and outpatient NRT) and secondary (self-reported 7-day smoking abstinence at 6 months) outcomes, we first performed unadjusted analyses comparing outcomes between smokers seen and not seen by the TTC service using chi-squared analysis and then by multivariable logistic regression to control for potentially confounding variables. The four demographic (age, sex, race, insurance plan type) and 4 comorbid illness (COPD, CHF, SUD, MHD) variables shown in Table 1 were selected for inclusion in the multivariable models because they have been demonstrated in prior research to have an association with smoking cessation.[5,29-35] Adjusted odds ratios (AOR) with 95% confidence intervals (CI) are reported.

Study #2: Hospital-level Outcome: Performance measures

MassHealth collects data on JC performance measures Tob-2 (tobacco use treatment provided or offered during hospitalization to current smokers) and Tob-3 (tobacco use treatment provided or offered at discharge to current smokers). During the first year of required reporting (2015), the incentive payment was pay-for-reporting (i.e, complete submission of all data and passing of validation resulted in full payment regardless of performance). Beginning in 2016, incentive payment transitioned to pay for performance and was calculated based on

performance as compared to the attainment thresholds and benchmarks listed, as well as improvement over prior year performance.

BMC collected and reported on Tob-2 and Tob-3 beginning in January 2015 to the MassHealth program. Performance measure rates reflect the number of times a hospital treated a patient in a manner consistent with specific evidence-based clinical practice guidelines (numerator cases), divided by the number of patients who were eligible to receive such care (denominator cases). Trained abstractors collected tobacco measure elements from the EHR, using random sampling measures to ensure data was representative of the population of MassHealth-insured smokers. Sampling occurred quarterly from January 2015 to December 2017.

BMC efforts during pre-intervention period: January 2015 – June 2016

In 2015 (pay-for-reporting period), BMC efforts were focused on ensuring proper reporting of data. In January 2016 (beginning of pay-for-performance period), BMC introduced an effort to increase Tob-3 rates, which focused on optional EHR prompts to offer tobacco treatment during the nursing discharge process. Unfortunately these optional EHR prompts were seldom utilized, and led to design and deployment of the "opt-out" design of the BPA+order set of the TTC intervention in July 2016.

BMC efforts during post-intervention period: July 2016 – December 2017

During the initial portion of the post-intervention period (July-December 2016), TTC service focused on "meeting Tob-2 and Tob-3 metrics," which sometimes meant offering rudimentary tobacco treatment services to as many MassHealth smokers as possible, within resource constraints. During the first few months of implementation, the Clinical Analytics team

provided weekly feedback on the progress of meeting Tob-2 and Tob-3. The TTC team met monthly to review the TTC-referral workflow and suggestions for improvement. By late 2016, we learned that we were on track to improving Tob-2 and Tob-3 metrics. Accordingly, beginning in January 2017, TTC service efforts focused on providing more comprehensive treatment to particularly vulnerable populations with high smoking rates such as those with SUD,[36,37] improving patient acceptance of NRT which was approximately 50%, and improving communication with primary inpatient teams so as to increase follow-through of TTC recommendations.[27] The trade-off of these more comprehensive visits was seeing fewer consultations, which was later addressed by the hospital investing in an additional tobacco treatment specialist in 2018.

Statistical analysis

The pre-intervention period encompassed quarter (Q)1 2015-Q2 2016; the post-intervention period encompassed Q3 2016-Q4 2017. We subdivided the post-intervention period to reflect the two phases of TTC service efforts described above: (1) Q3-Q4 2016, and (2) Q1-Q4 2017. We compared our hospital's rates for Tob-2 and Tob-3 among MassHealth-insured smokers pre- and post-implementation of the EHR-based TTC service using standard methods for interrupted time-series (ITS), following a segmented regression model. ITS, considered one of the strongest quasi-experimental designs, examines whether the data pattern observed pre-intervention is different to that observed post-intervention.[38,39] In an ITS design, data are collected at multiple and equally spaced time points (quarterly for our study) before and after interventions to determine a range of effect estimates that describe the impact of the intervention.

For the ITS analysis, we obtained estimates for regression coefficients corresponding to two standardized effect sizes: change in level (which corresponds to the difference in the time point of interest to the predicted pre-intervention trend) and change in trend (which is the difference between the post-and pre-intervention slopes) before and after the intervention. We used residual vs. fitted values scatterplot and normal Q-Q plot to confirm validity of this model. Analyses were conducted using the software R, with two-sided p-value strictly less than 0.05 considered significant.

Results

Study #1: Patient-level outcomes

Baseline characteristics of patients seen and not seen by the TTC service

Baseline characteristics of patients seen and not seen are shown in Table 1. 85.8% (1017/1185) of smokers were Medicaid-insured and 46.5% (551/1185) had a SUD. Compared to smokers not seen by the TTC service, smokers seen by the service were younger (mean age 51.2 vs 53.0 years, p<0.01), more likely to have CHF (16.4% vs 10.7%, p<0.01), and less likely to be Hispanic/Latino (9.3% vs 15.3%, p<0.01). We compared motivation to quit and smoking pack-years between patients seen by the TTC service (n=505) and a subset of randomly selected smokers not seen by the service (n=75). Both patients seen and not seen by the TTC service showed similar levels of "high" motivation to quit (46.9% vs 45.3%, p=0.80) and similar proportions of smokers with >30-pack year smoking history (51.7% vs 41.1%, p=0.09).

Receipt of NRT during hospitalization and NRT prescription at discharge

Compared to patients not seen by the TTC service, smokers seen by the TTC service had higher receipt of inpatient NRT (51.5% [260/505] vs 35.9% [244/680], p<0.01) and NRT prescription at discharge (32.5% [164/505] vs 12.4% [84/680], p<0.01) (Figure 1). In multivariable analysis, smokers seen by the TTC service had significantly higher rates of receiving inpatient NRT (AOR 1.93, 95% CI 1.5-2.45); p<0.01) (Table 2). The odds of receiving a prescription for NRT at discharge increased by a factor of 3.41 if seen by the TTC team (AOR 3.41, 95% CI 2.54-4.61); p< 0.01).

Secondary outcome: Self-reported 7-day smoking abstinence at 6 months

Patients seen by the TTC service had significantly higher self-reported 7-day smoking abstinence at 6 months compared to smokers not seen by the service: 14.9% (75/505) vs 10% (68/680), p<0.01 (Figure 1). After adjusting for potential confounders, smokers seen by the TTC service had significantly higher rates of smoking abstinence at 6 months (AOR 1.48, 95% CI 1.03-2.12) (Table 2).

Study #2: Hospital-level outcomes: Performance measures

MassHealth Tob-2 measure rates improved from 0% at baseline (pre-intervention period mean 26.2% [27/103]) to 62.6% at study end (post-intervention mean 56.8% [184/324]); while MassHealth Tob-3 measure rates improved from 0% at baseline (pre-intervention mean 0% [0/98]) to 24% at study end (post-intervention mean 21.7% [52/240]). Based on ITS analyses, the intervention was associated with a significant positive change in slope trends for Tob-3 (p<.01) but not Tob-2 from the pre-implementation period to the first post-implementation period (Figure 2). In post-intervention period 2, both Tob-2 and Tob-3 demonstrated a negative

slope as TTC efforts shifted to more comprehensive interventions for a smaller number of patients. There was no significant level change in Tob-2 or Tob-3 performance across the study period.

Discussion

The findings of our study demonstrate real world effectiveness of an "opt-out" EHR-based TTC service at a large urban safety-net hospital where the vast majority of patients are Medicaid-insured. We show the intervention is effective at causing an immediate improvement in post-discharge (JC Tob-3) tobacco performance measures among MassHealth-insured patients, an outcome particularly important since hospital-based interventions are most effective when tobacco treatment is continued post-hospital discharge.[40] By contrast, our intervention did not achieve a significant increase in JC Tob-2 (tobacco use treatment during hospitalization) which had already been the focus of other quality improvement efforts among MassHealth-insured patients and was rising as a result in the months prior to introduction of the TTC service. We observed a downturn in performance on Tob-2 and Tob-3 measures beginning early in 2017, when the TTC service shifted efforts to more comprehensive interventions for a small number of patients. When we examined the effectiveness of our intervention for all hospitalized smokers (not just MassHealth-insured patients for whom performance metrics were incentivized), we found the TTC service improved important patient-level outcomes of receipt of NRT during hospitalization and post-discharge, as well as self-reported 7-day smoking abstinence at 6 months. Our study adds to the growing body of evidence that opt-out approaches are effective at providing evidence-based tobacco treatment to all smokers,[3,5,41]

regardless of motivation to quit. While other studies have been conducted in settings serving predominantly non-Medicaid-insured smokers [40], our study demonstrates that inpatient programs can increase 6-month quit rates even among low-income, underserved populations.

Despite NRT increasing the likelihood of smoking cessation,[42,43] Medicaid benefits such as coverage of tobacco cessation medications are often underutilized due to patient and clinician barriers.[5,44] We found our intervention to be effective at overcoming these barriers, increasing both patient receipt of NRT during hospitalization and discharge prescriptions. Our findings are consistent with a systematic review demonstrating that integrating system-change interventions (e.g. identification of smokers and the subsequent offering of evidence-based tobacco treatment into usual care) improve process outcomes such as provision of cessation counseling and referral to smoking cessation services.[45] In support of our findings, a recent study showed that inpatient receipt of smoking cessation medications and being discharged with a prescription increased use of smoking cessation medications after hospital discharge.[46]

There are both strengths and limitations to our study. A strength is our quasi-experimental design, taking advantage of the "natural experiment" of the TTC intervention to examine the effect of an "opt-out" EHR-based TTC service on both hospital-level performance measures incentivized by MassHealth, as well as patient-level outcomes for all hospitalized smokers. The interrupted time series design is well-suited to analyzing real-world responses to policy changes[38] – in this case the introduction of an EHR-based TTC service in response to incentivization of tobacco performance metrics. To assess patient-level outcomes, we did not rely on randomization; rather we leveraged data from a comparison group of adult smokers who had a TTC consult order placed but were not seen due to time and resource constraints.

This deliberately selected comparison group minimizes potential bias in provider factors that influence decisions to consult the TTC team, such as perception of patient's interest in quitting cigarettes and/or overall perceived utility of inpatient tobacco treatment, as well as accounting for secular trends in quality improvement. We did identify differences in some baseline characteristics among intervention versus comparison patients; however, these were adjusted for in our multivariable regression analysis. Of note, important characteristics predictive of successful quit attempts like total pack-years and motivation to quit were similar across groups. Our data on smoking abstinence is based on self-report, which falls short of gold standard biochemical confirmation, though there is expert consensus that self-reported 7-day smoking abstinence is acceptable in real-world studies and yields similar conclusions as 30-day prolonged abstinence.[47-51] While our underserved, understudied patient population is a strength of this study, it created a limitation for assessment of smoking abstinence: we were unable to reach half of participants by phone at the 6-month follow-up time due to issues such as non-working phone numbers and homelessness. While we attributed a status of "current smoking" to all participants for whom smoking status could not be assessed by either telephone or chart review, this may have led to an underestimate of the effect of the intervention. Because of these limitations, we considered smoking quit rates to be a secondary outcome.

Interpretation

In summary, we show that an "opt-out" EHR-based TTC service in a large safety net hospital led to improved patient-level outcomes (receipt of NRT and 6-month quit rates) for all hospitalized smokers, regardless of payer type, and as well as an immediate increase in hospital-level

performance on the post-discharge tobacco treatment measure for MassHealth-insured patients. Of note, due to limited resources, not all hospitalized smokers received TTC services – a missed opportunity to extend this effective intervention to underserved smokers admitted to our safety net hospital. Several studies have demonstrated that resources allocated to tobacco treatment can be cost-saving.[16,42,52-54] It is critical to recognize how providing resources for hospital-based tobacco treatment programs, particularly those that serve vulnerable patient populations, can reduce disparities in tobacco-related disease.

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Figure Legends

Figure 1. Comparison of receipt of NRT during hospitalization (Inpatient NRT) and NRT prescription at discharge (Outpatient NRT) and self-reported 7-day smoking abstinence at 6 months

Figure 2. Interrupted time series with level change regression model. A. MassHealth Tob-2 performance rates over time. B. MassHealth Tob-3 performance rates over time. *Black circle: pre-implementation rates; Red circle: post-implementation rates.*

Supplemental Figure 1. Study flow diagram, including detailed information on smoking status determination

**Patients classified as still smoking if declined to answer or smoking status not available*

Table 1. Comparison of demographics and patient factors between patients seen and not seen by TTC service from July 2016 to Dec 2016				
	Total	**Seen by TTC**	**Not Seen by TTC**	**p-value**
All Smokers with Consult Order	1185	505	680	
Age in years, n (SD)*	51.7 (13.5)	51.2 (13.4)	53 (13.5)	**p<0.01**
18-54 years	669 (56.5%)	258 (51.1%)	411 (60.4%)	
55-80 years	507 (42.8%)	244 (48.3%)	263 (38.7%)	
>80	9 (0.8%)	3 (0.6%)	6 (0.9%)	
Male Sex n (%)	738 (62.3%)	311 (61.6%)	427 (62.8%)	p=.67
Race n (%)				p=.27
Black	503 (42.4%)	229 (45.3%)	274 (40.3%)	
White	516 (43.5%)	214 (42.4%)	302 (44.4%)	
Other	20 (1.7%)	7 (1.4%)	13 (1.9%)	
Unknown	146 (12.3%)	55 (10.9%)	91 (13.4%)	
Hispanic/Latino Ethnicity n (%)	151 (12.7%)	47 (9.3%)	104 (15.3%)	**p<0.01**
Insurance				p=.57
Medicaid	1017 (85.8%)	430 (85.1%)	587 (86.3%)	
COPD	173 (14.6%)	82 (16.2%)	91 (13.4%)	p=.17
CHF	156 (13.2%)	83 (16.4%)	73 (10.7%)	**p<0.01**
Substance Use Disorder (SUD)**	551 (46.5%)	242 (47.9%)	309 (45.4%)	p=.39
Mental Health Disease (MHD)***	459 (38.7%)	198 (39.2%)	261 (38.4%)	p=.78
	Total	**Seen by TTC**	**Not Seen by TTC**	**p-value**
Subset of Smokers with Consult Order	580	505	75	
High Motivation to quit		237 (46.9%)	34 (45.3%)	p=.80
Pack-year >30		261 (51.7%)	31 (41.1%)	p=.09

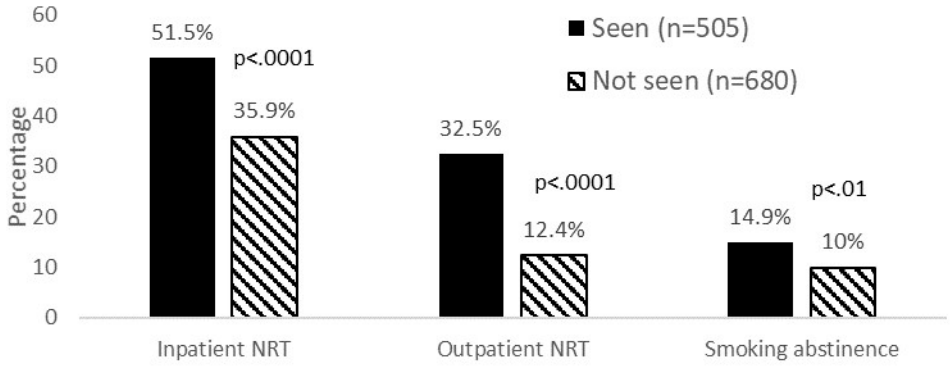
Statistically significant values at the 0.05 level are marked as bold

**SD is standard deviation*

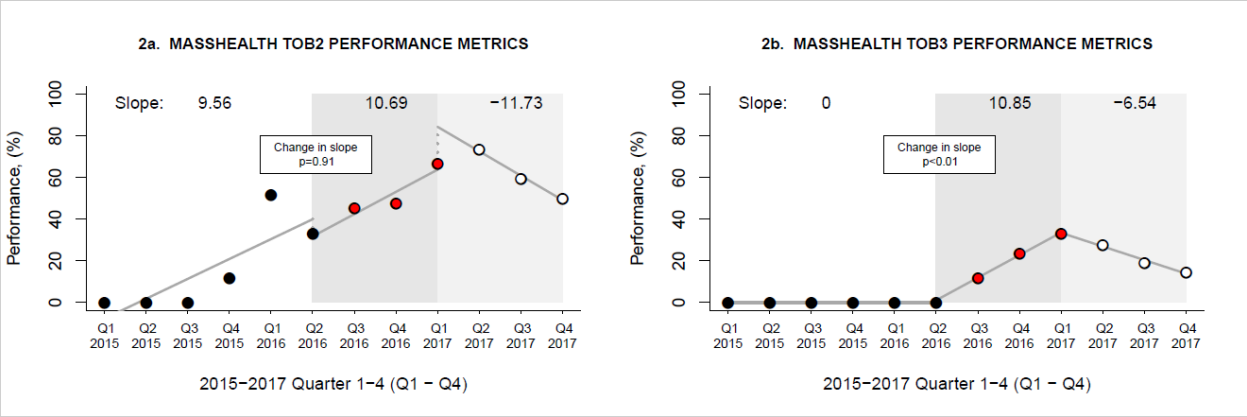
***Includes use disorders for the following substances: alcohol, opioids, cannabis, cocaine, sedatives, stimulants, hallucinogens, inhalants*

**** Includes mood disorders, schizophrenia, anxiety disorders, psychotic disorders*

Table 2. Multivariable regression analysis for receipt of NRT during hospitalization (Inpatient NRT) and NRT prescription at discharge (Outpatient NRT) and self-reported 7-day smoking abstinence at 6 months			
	Inpatient NRT (AOR, 95% CI)	Outpatient NRT (AOR, 95% CI)	6 month Smoking abstinence (AOR, 95% CI)
Patient seen by TTC	**1.93 (1.5,2 2.45)**	**3.41 (2.54, 4.61)**	**1.48 (1.03, 2.12)**



Smoking outcomes among patients seen and not seen by TTC



Abbreviation List

BMC	Boston Medical Center, the largest safety-net hospital in New England
BPA	Best Practice Alert
EHR	Electronic Health Record
JC	Joint Commission
MassHealth	Massachusetts's Medicaid program
MassHealth P4P	MassHealth Pay-for-Performance
NRT	Nicotine replacement therapy
SUD	Substance use disorder
Tob-2	Tobacco use treatment provided or offered during hospitalization
Tob-3	Tobacco use treatment provided or offered at discharge
TTC	Tobacco Treatment Consult