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CANCER PATIENTS' TOBACCO USE AND TOBACCO TREATMENT REFERRAL RESPONSE: IMPLEMENTATION OUTCOMES AT A NATIONAL CANCER INSTITUTE- DESIGNATED CANCER CENTER

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THESIS

A thesis submitted in partial fulfillment of the
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By

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ABSTRACT OF THESIS

CANCER PATIENTS' TOBACCO USE AND TOBACCO TREATMENT REFERRAL RESPONSE: IMPLEMENTATION OUTCOMES AT A NATIONAL CANCER INSTITUTE-DESIGNATED CANCER CENTER

Smoking after cancer diagnosis is linked to cancer-specific and all-cause mortality among other adverse outcomes. Yet, 10-20% of U.S. cancer survivors are current smokers. Implementation of evidence-based tobacco treatment in cancer care facilities is widely recommended, yet rarely accomplished. This study focuses on the early outcomes of a tobacco treatment program integrated within an NCI-designated cancer center. Participants consist of 26,365 patients seen at the cancer center during the first 18 months of implementation. The study is a retrospective chart review of patients' tobacco use, and among current users, patients' treatment referral response. Over 99% of patients were screened for tobacco use. Current use occurred in 21.05% of patients; cigarettes were the most popular product. Only 17.22% of current users accepted a referral for tobacco treatment; among the 76.59% of current users who declined, the majority were "not ready to quit" or wanted to quit "on their own". Multiple demographic and clinical variables were associated with tobacco use and treatment referral response outcomes. Despite cancer diagnosis presenting a "teachable moment" for tobacco cessation, many cancer patients may not be ready to quit. Clinically proven strategies to increase motivation, prompt quit attempts and encourage treatment use are warranted in cancer settings.

KEYWORDS: Cancer Patients, Program Evaluation, Smoking, Tobacco Use, Tobacco Treatment

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11/13/2020

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1. INTRODUCTION

The 2014 U.S. Surgeon General's Report on Smoking (US Department of Health and Human Services, 2014) clearly articulates that cancer survivors' cigarette smoking plays a causal role in numerous adverse outcomes. This report demonstrated that smoking after cancer diagnosis is causally associated with higher rates of all-cause mortality, cancer-specific mortality, and second primary plus increased risk of recurrence, poor treatment response, and severe treatment-related toxicity. Additionally, smokers are significantly more likely than non-smokers to have post-surgical complications (e.g., infection, reintubation), longer hospital stays, and a requisite return to the operating room (Gajdos et al., 2012; Hatcher et al., 2017). Cancer survivors who smoke also report worse quality of life (e.g., greater psychological distress, less physical function) than former and never smokers (Aigner et al., 2016; Mesquita et al., 2015). It is now undeniable that smoking undermines the health of cancer survivors.

Many U.S. cancer survivors continue to smoke after their cancer diagnosis. In one recent study with Health Information National Trends Survey data (n = 33,525), 16% of cancer survivors reported smoking some days or everyday (Swoboda, Walker, & Huerta, 2019). Similarly, other population-based surveys (n = 2,060-2,527) find that 9-19% of cancer survivors are current smokers (Gallaway et al., 2019; Mayer & Carlson, 2011; Westmaas, Alcaraz, Berg, & Stein, 2014). Prevalence estimates are even higher if one focuses on individuals who were smoking at cancer diagnosis. For instance, data from a National Health and Nutrition Examination Survey (n = 2,374) showed 64% of cancer survivors who smoked at diagnosis continue to smoke (Tseng, Lin, Moody-Thomas, Martin, & Chen, 2012), a finding that closely mirrors the results of a systematic literature

review on lung and head/neck cancer survivors (Burris, Studts, DeRosa, & Ostroff, 2015). Aggregating data across studies, it seems 10-20% of all cancer survivors smoke, with higher prevalence rates in subgroups of the patient population.

Due to the profound risks of smoking after cancer diagnosis, most guidelines for cancer survivors' health promotion recommend tobacco abstinence (Centers for Disease Control and Prevention, 2004; Doyle et al., 2009; R. Smith et al., 2017). Guidelines also exist for hospitals and clinics to follow in their care of cancer survivors (Hanna, 2013; International Society of Nurses in Cancer Care, 2014; Toll, Brandon, Gritz, Warren, & Herbst, 2013). For example, the National Comprehensive Cancer Network (NCCN) Clinical Practice Guidelines for Smoking Cessation state tobacco treatment should be standard of care, integrated throughout the cancer care process from work-up and diagnosis to curative treatment and end-of-life care (Shields et al., 2018). To facilitate this, the NCCN (Shields et al., 2018) recommends that smoking status should be asked of every cancer patient at every visit, and responses should be documented in the electronic medical record (EMR). Similarly, the American Association for Cancer Research (AACR) has a policy statement that includes universal assessment and documentation of tobacco use as standard of cancer care (Toll et al., 2013). Furthermore, the AACR policy statement says cancer care providers should receive proper training in tobacco treatment and be incentivized at the system level for referral to and delivery of said treatment. Compliance with the NCCN, AACR and similar widely espoused guidelines would facilitate health promotion among cancer survivors, but these mandates are not being met. Indeed, the results of U.S. cancer care provider surveys (n = 1,197-1,507) found that while 90% ask about tobacco use and 80% advise tobacco cessation, only 40-45% discuss

treatment options and provide assistance (Warren, Kasza, Reid, Cummings, & Marshall, 2013; Warren, Marshall, et al., 2013). Similarly, a recent literature review revealed that fewer than 75% of cancer care providers assess tobacco use, less than 60% advise tobacco cessation, and less than 50% provide assistance with or make referrals for treatment (Price, Studts, & Hamann, 2018). Overall, it is clear that cancer survivors who are engaged in the cancer care system typically do not receive the high-quality, population-based tobacco treatment recommended by the foremost cancer care organizations.

To address the problem of cancer survivors' smoking via improvements in the capacity of cancer care facilities to provide evidence-based tobacco treatment, the National Cancer Institute (NCI) drew upon the Cancer Moonshot ^{SM} Program and launched the Cancer Center Cessation Initiative (National Cancer Institute, 2020). Beginning in 2017, 52 NCI-designated cancer centers received NCI funding to create or build upon existing tobacco treatment programs (Croyle, Morgan, & Fiore, 2019). Markey Cancer Center in Lexington, Kentucky used these funds to design, implement, and evaluate a multi-level intervention called the "Markey Cancer-specific Assessment, Referral, Engagement, and Support (CARES) Tobacco Treatment Program". In the context of this program, this study has two objectives: 1) describe early implementation outcomes at the provider and patient level, specifically, rates of a) providers' screening for tobacco use, b) patients' using tobacco, and c) patients' declining tobacco treatment referral, and 2) identify correlates of patients' tobacco use and referral response.

CHAPTER 2. METHOD

2.1 Participants

The sample consist of patients age 18 and older seen at Markey Cancer Center for an outpatient visit between July 1, 2018 and December 30, 2019, as this reflects the first 1½ years of implementation. A total of 26,365 unique patients comprise the sample, and they are drawn from each of the cancer center's outpatient clinics (breast; gynecology; hematology; and multi-disciplinary (i.e., other tumor sites)).

2.2 Procedures

This study is a retrospective review of patients' de-identified EMR. Implemented as standard of care for outpatient visits, the intake procedures require that all adults are questioned about their tobacco use and all responses are documented in the EMR. Questions allowed patients to be classified as never, former, or current (past month) tobacco users. Information about type of tobacco product was obtained if applicable. Any patient identified as a current tobacco user received an offer of assistance with tobacco cessation. Patients who accepted the offer were automatically e-referred to the cancer center's Psych-Oncology Service where tobacco treatment specialists were charged with arranging treatment and following up. Patients who declined the offer were asked to provide a rationale (within a fixed set of response options) and advised to consider tobacco treatment in the future. All research procedures were approved by the University of Kentucky Institutional Review Board (Protocol 52059).

2.3 Measures

Data extracted from patients' EMR includes: 1) demographic characteristics (age, sex, race, ethnicity, relationship status, and insurance type); 2) clinical parameters (clinic

setting and distress rating, as indicated on a scale from 0 = no distress to 10 = extreme distress (Roth et al., 1997)); and 3) tobacco use outcomes (Land et al., 2016). Tobacco use outcomes include: 1) rates of lifetime, former, and current tobacco use, 2) rates of tobacco use by product type, 3) rates of tobacco treatment referral acceptance and decline among current tobacco users, and 4) reasons for decline (i.e., reportedly already in treatment, wants to quit on his/her own, or not ready to quit) among the relevant subsample of current tobacco users. Implementation outcomes are current tobacco use, referral response, and reason for decline.

2.4 Data Analysis

Descriptive statistics were used to describe the sample characteristics and implementation outcomes. As appropriate, binomial (current tobacco use and referral response) and ordinal (reason for decline) logistic regression models were fit to examine the relationship between the implementation outcomes and relevant covariates (demographic and clinical characteristics). All covariates considered were categorical in nature with the exception of age and distress. Initial logistic modeling made use of a Box-Tidwell transformation involving age and distress to assess linearity in the logit for these two covariates (Box & Tidwell, 1962); this linearity assumption was not tenable for any model. Therefore, tertile splits were used for age (< 55; 55-66; ≥ 67) and distress (0; 1-5; 6-10). All covariates were then entered simultaneously into the regression equations to assess their independent association with each implementation outcome. The deviance chi-square statistic assessed goodness of fit. The score test assessed the proportionality assumption for the ordinal model. The proportional odds assumption that is required for valid inference using the proportional odds model was violated given the significance of

the score test. Ultimately, reported results are based on the partial proportional odds model (Stokes, M. E., Davis, C. S., Koch, 2012) given that it was the most parsimonious and the proportional odds assumption appeared to be tenable for certain covariates. Model-adjusted odds ratios (OR) and 95% confidence intervals (CI) are reported. All statistical analyses were performed using SAS 9.4 (SAS Institute, Cary, NC).

CHAPTER 3. RESULTS

3.1 Sample Characteristics

Table 1 details the sample's (n = 26,365) demographic and clinical characteristics. Patients represent an array of disease sites/clinic settings (e.g., breast, hematology). About one-third of patients were male (36.43%, n = 9,604). Most patients were White non-Hispanic (93.11%, n = 24,150). Just over half of the sample was married or partnered (57.95%, n = 9,664). Medicare was the primary source of insurance coverage (44.24%, n = 7,631). The mean age was 59.32±14.34 years. The average level of distress was 3.28±3.12, with 24.7% (n = 6,504) reporting clinically significant distress using a cut-off of 4 or higher (Roth et al., 1997).

TABLE 1. Demographic and Clinical Characteristics of the Patient Population (n = 26,365) [a]

Characteristic	Value
Clinic [b]	
Gynecology	4267 (16.18%)
Breast	4458 (16.91%)
Hematology	4842 (18.37%)
Other	12798 (48.54%)
Sex	
Male	9604 (36.43%)
Female	16761 (63.57%)
Race [c]	
Native American	19 (0.07%)
Hawaiian/Pacific Islander	24 (0.09%)
Asian	182 (0.70%)
Black or African American	1579 (6.08%)
White	24150 (93.05%)
Ethnicity [c]	
Latinx	417 (1.58%)
Non-Latinx	25249 (95.77%)
Missing	699 (2.65%)
Relationship status [d]	
Separated	262 (1.58%)
Widowed	1575 (9.44%)
Divorced	2135 (12.80%)
Single	3041 (18.23%)
Married or partnered	9664 (57.95%)
Insurance status [d]	
Self-pay/Other	478 (2.78%)
Medicaid	3062 (17.75%)
Managed care organization	6077 (35.23%)
Medicare	7631 (44.24%)
Age, years [e]	59.32 ± 14.34, 61
Distress, 0-10 [d, e]	3.28 ± 3.12, 3

[a] Data are frequencies (percentages) unless otherwise noted.

[b] Clinic where patient was seen at the time of tobacco use screening. "Other" denotes a multi-disciplinary clinic that sees patients with tumors in sites not otherwise specified.

[c] Race and ethnicity were also combined such that there were White non-Latinx patients (n=23374) and racial/ethnic minority patients (n=2148). Missing data for this variable is n=843.

[d] Missing data for these variables: race and ethnicity (n=428), marital status (n =9688), insurance status (n =9117), and distress (n =11097).

[e] Data are means ± standard deviations, medians.

Table 2 presents the sample's tobacco use characteristics. Nearly all (99.3%, *n* = 26,183) patients were screened for tobacco use and had their response documented in the EMR. Lifetime tobacco use was reported by 43.82% (*n* = 11,551) of patients, and cigarettes were the most popular tobacco product among lifetime users (91.52%, *n* = 10,571). Current tobacco use occurred in 48.04% (*n* = 5,549) of lifetime users or 21.05% (*n* = 5,549) of the full sample. Seventy-six percent (*n* = 4,250) of current users declined the offer of tobacco treatment. Of those who declined, the majority (65.84%, *n* = 2,798) said they were not ready to quit.

TABLE 2. Tobacco Use Characteristics of the Patient Population (*n* = 26,365) [a]

Characteristic	Value
Lifetime history	
Current	5549 (21.05%)
Former	6002 (22.77%)
Never	14632 (55.50%)
Missing	182 (0.69%)
Last use among current and former users (*n* = 11,551)	
Today	4831 (41.82%)
1 – 7 days ago	486 (4.21%)
8 – 30 days ago	232 (2.01%)
More than 1 month – 1 year ago	583 (5.05%)
More than 1 year ago	5419 (46.91%)
Product type among current and former users (*n* = 11,551)	
Cigarettes	10571 (91.52%)
Cigars or pipes	178 (1.54%)
Electronic or vapes	138 (1.19%)
Smokeless	517 (4.48%)
Other, including multiple products	147 (1.27%)
Tobacco treatment referral response among current users (*n* = 5,549)	
Decline	4250 (76.59%)
Accept	956 (17.22%)
Missing	343 (6.18%)
Tobacco treatment referral response among current users who decline (*n* = 4,250)	
Already in treatment	269 (6.33%)
Desire to quit without assistance	1148 (27.01%)
Not ready to quit	2798 (65.84%)
Other	35 (0.82%)

[a] Data are frequencies (percentages) unless otherwise noted.

3.2 Associations with Implementation Outcomes

3.2.1 Current Tobacco Use

Patients from the gynecology (OR = 1.22; 95% CI, 1.04-1.43) and other site/multidisciplinary clinic (OR = 1.73; 95% CI, 1.53-1.95) were more likely to be tobacco users than patients from the hematology clinic. Males were almost twice as likely than females to be tobacco users (OR = 1.75; 95% CI, 1.58-1.94). Racial and ethnic minorities were less likely than Whites to be tobacco users (OR = 0.76; 95% CI, 0.65-0.90). Compared to patients in a relationship, those who were single (OR = 1.41; 95% CI, 1.26-1.58) and those who were divorced, separated, or widowed (OR = 1.67; 95% CI, 1.50-1.86) were about one-and-a-half times more likely to be tobacco users. Regarding insurance status, compared to self-pay patients, those with Medicaid were nearly twice as likely to be current tobacco users (OR = 1.94; 95% CI, 1.47-2.55) while those with insurance from managed care organizations were much less likely (OR = 0.65; 95% CI, 0.49-0.85). As age increased, patients were more likely to be tobacco users (OR = 0.79; 95% CI, 0.71-0.87; OR = 0.30; CI, 0.26-0.35). Finally, those with distress scores ≥ 6 were nearly twice as likely to be tobacco users than those with no distress (OR = 1.84; 95% CI, 1.66-2.05).

3.2.2 Referral Decline

Neither clinic, race and ethnicity, relationship status, insurance type, age nor distress level was associated with patients' decision to decline or accept a referral for tobacco treatment. However, males were more likely to decline than females (OR = 1.59;

95% CI, 1.26-2.00) and patients with distress scores ≥ 6 were less likely to decline treatment (OR = 0.61; 95% CI, 0.48-2.05).

3.2.3 Reason for Referral Decline

The cumulative logits model was fit for the ordinal reason for decline outcome. Given that this outcome contained three levels ('not ready to quit', wants to quit on her/his own', and 'already to treatment'), the logits formed include (1) the log odds of 'not ready to quit' versus 'quit without assistance' or 'already in treatment' and (2) the log odds of 'not ready to quit' or 'quit without assistances' versus already in treatment'. This model assesses associations across the two logits using odds ratios that can be interpreted as comparing 'least desirable' outcome relative to 'most desirable' outcome. Neither race/ethnicity, relationship status, insurance status, nor age were associated with reason for decline. Relative to hematology clinic patients, gynecologic and other site/multidisciplinary clinic patients were associated with more favorable odds of reason for treatment referral decline for one of both sets of logits (other site for the first logit: OR = 0.69; 95% CI, 0.54-0.89 and gynecologic for the second logit: OR = 0.57; 95% CI, 0.32-0.99). Male gender was associated with less favorable outcomes than females with regard to the second logit (OR = 1.96; 95% CI, 1.28-2.99). Relative to those with lower levels of distress, patients with higher levels were associated with more favorable odds of reason for treatment referral decline for the second logit (distress scores 1-5: OR = 0.48; 95% CI, 0.30-0.79; distress scores 6-10: OR = 0.59; 95% CI, 0.37-0.93).

TABLE 3. Association of Cancer Patients' Tobacco Use and Tobacco Treatment Referral Response

	Current Tobacco Use	**Treatment Referral Decline**	**Reason for Treatment Referral Decline**	
			Logit 1	Logit 2
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Clinic/Disease site				
Hematology	REF	REF	REF	REF
Breast	0.92 (0.78–1.09)	1.11 (0.75-1.64)	0.85 (0.60-1.22)	0.81 (0.42-1.59)
Gynecology	1.22 (1.04–1.43)*	1.26 (0.88-1.79)	1.36 (0.97-1.88)	0.57 (0.32-0.99)*
Other	1.73 (1.53–1.95)*	0.84 (0.64-1.11)	0.69 (0.54-0.89)*	0.80 (0.48-1.35)
Sex				
Female	REF	REF	REF	REF
Male	1.75 (1.58–1.94)*	1.59 (1.26-2.00)*	1.23 (0.99-1.52)	1.96 (1.28-2.99)*
Race and ethnicity				
White, non-Hispanic	REF	REF	REF	--
Minority	0.76 (0.65–0.90)*	0.74 (0.53-1.05)	1.03 (0.74-1.43)	
Relationship Status				
Married or partnered	REF	REF	REF	--
Divorced, separated, widowed	1.67 (1.50–1.86)*	1.08 (0.85-1.36)	0.91 (0.73-1.12)	
Single	1.41 (1.26–1.58)*	1.10 (0.86-1.42)	0.87 (0.70-1.09)	
Insurance status				
Self-pay/Other	REF	REF	REF	REF
Managed care organization	0.65 (0.49–0.85)*	1.02 (0.54-1.93)	0.79 (0.45-1.39)	0.42 (0.10-1.74)
Medicare	1.25 (0.95–1.65)	0.98 (0.52-1.85)	0.92 (0.53-1.61)	0.56 (0.14-2.31)
Medicaid	1.94 (1.47-2.55)*	0.87 (0.46-1.63)	1.09 (0.62-1.91)	0.37 (0.09-1.49)
Age tertiles				
< 55 years	REF	REF	REF	REF
55-66 years	0.79 (0.71–0.87*	0.87 (0.70-1.09)	1.12 (0.91-1.37)	0.71 (0.49-1.02)
≥ 67 years	0.30 (0.26-0.35)*	0.82 (0.59-1.14)	1.35 (0.99-1.83)	1.10 (0.58-2.07)
Distress tertiles				
0	REF	REF	REF	REF

[a] Asterisk (*) denotes statistical significance.
[b] The two logits are formed by fitting a cumulative logits model where the first logit corresponds to the 'log odds' of not yet ready to quit versus quit on my own or already in treatment and the second logit corresponds to the 'log odds' of not yet ready to quit or quit on my own versus already in treatment. These log odds 'accumulate' probability of 'least desired to most desired outcome'. The model reported is the partial proportional odds/cumulative logits model. When odds ratio estimates appear in the logit1 column only, this implies that the proportional odds assumption was tenable and only one odds ratio is needed to quantify the effect of this covariate on the ordinal outcome of 'reason for refusal' of treatment. When the proportional odds assumption is not tenable, two sets of odds ratios are needed for the covariate and are reported separately for the two logits. Therefore, the last 2 columns provide results from a 'partial' proportional odds model where the proportional odds assumptions held for race/ethnicity and relationship status, but not for clinic, sex, insurance status, age tertiles, and distress tertiles.
CI = confidence interval; OR = odds ratio; REF = reference category

CHAPTER 4. DISCUSSION

Recommendations by the foremost cancer care organizations to conduct population-based tobacco use assessment and provide evidence-based tobacco treatment are inadequately met by cancer care facilities, and smoking rates among cancer patients remain high (Shields et al., 2018; Toll et al., 2013). In the context of a new tobacco treatment program at a NCI-designated cancer center, this study aimed to determine rates and correlates of tobacco use, tobacco treatment referral decline, and reasons for decline, all with the goal of better understanding of how to optimize the reach of tobacco treatment in cancer settings. This study is the first to systematically examine reasons for declining enrollment into a cancer center's integrated tobacco treatment program. Additionally, this study is one of the first to examine correlates of not only cancer patients' tobacco use but also their treatment referral response and reasons for referral refusal. Finally, by measuring time since last use and non-cigarette tobacco use in addition to cigarette smoking among every cancer patient at every visit, the breadth and precision in the description of cancer patients' tobacco use history is high.

Three major study findings emerge. First, approximately 20% of adult cancer patients reported tobacco use. This converges with the upper-limits of both U.S. population-based survey data, which shows 9-19% of cancer patients are current smokers (Gallaway et al., 2019; Mayer & Carlson, 2011; Swoboda et al., 2019; Westmaas et al., 2014), and data from 13 NCI-designated cancer centers, where current smoking rates range from 4 to 22% (Angelo et al., 2019; Davis, Thomas, Dirkes, & Swartzwelder,

2020; Gali et al., 2020; May et al., 2020; Ramsey et al., 2020). In addition to reinforcing concerns about cancer patients' persistent cigarette smoking, this study also highlights the problem of non-cigarette tobacco use. Although only 1% of cancer patients in this study engaged in this behavior, other recent studies have found 3-25% of cancer patients are current users of electronic cigarettes (Akinboro et al., 2019; Borderud, Li, Burkhalter, Sheffer, & Ostroff, 2014) and in the general population these rates are on the rise (Creamer, Wang, & Babb, 2019), in part because smokers view these products as a means to smoking cessation (James, Cheney, Smith, & Beebe, 2019). Smoking and other tobacco use is clearly a deeply entrenched problem–even after the potential "teachable moment" of cancer diagnosis (McBride, Emmons, & Lipkus, 2003; McBride & Ostroff, 2003)–a problem that cannot be ignored by cancer care providers due to fears of upsetting patients or perceptions of inadequate training on the matter (Nath Simmons et al., 2013; Warren, Marshall, et al., 2013). As a whole, the aforementioned tobacco use rates among cancer patients underscore the need for cancer care providers to ask every patient at every visit about their tobacco use and advise tobacco users to quit consistent with indicators of quality healthcare delivery (Patnode et al., n.d.) and current best practices for cancer care (Shields et al., 2018; Toll et al., 2013). There might even be sufficient reason to extend core items of the Cancer Patient Tobacco Use Questionnaire to include questions about non-cigarette tobacco use (Doyle et al., 2009; Toll et al., 2013) and to consider extending eligibility for clinical trials and treatment programs to all tobacco users, as opposed to a singular focus on cigarettes/smokers as is normative (Dahm et al., 2019; Japuntich et al., 2016; Ostroff et al., 2014). In trying to reach the target audience for tobacco treatment, the results of this study would point toward a focus on cancer patients who were treated

in gynecology and multi-disciplinary clinics; are male; are not in a relationship; have Medicaid insurance; and report high distress – all of which is consistent with past studies on correlates of smoking status in cancer patients (Gallaway et al., 2019; Kanera et al., 2019; Little et al., 2018).

The second key study finding is that over three-quarters of tobacco users declined a referral for tobacco treatment that was integrated into the cancer care system. The rate of treatment acceptance in this study (17%) is much lower than that found in clinical trials for smoking cessation in cancer patients, which range from 17% to 84% (Dahm et al., 2019; Duffy, Scheumann, Fowler, Darling-Fisher, & Terrell, 2010; Gritz et al., 1991; Martinez et al., 2019; Ostroff et al., 2014). This rate is also in the lower limit of enrollment rates found for other cancer centers' tobacco treatment programs, which range from 17% to 83% (Amato et al., 2018; Davis et al., 2020; Gali et al., 2020; Japuntich et al., 2016; Schnoll, Rothman, Lerman, et al., 2004; Schnoll, Rothman, Newman, et al., 2004). The discrepancy between this study and prior ones could be due to the population-based, proactive approach of this tobacco treatment program (i.e., an offer of assistance is made to every current tobacco user) compared with only offering treatment to tobacco users who ask for help or who report readiness to quit, as is customary in smoking cessation research (Westmaas, Berg, Alcaraz, & Stein, 2015) and some clinical implementation (Gritz et al., 1991). By offering treatment to "all comers," one would likely expect a high rate of decline/low rate of acceptance, as most tobacco users–while interested in quitting at some point–are not ready to quit in the near future (Babb, Malarcher, Schauer, Asman, & Jamal, 2017; Burris, Wahlquist, & Carpenter, 2013). Indeed, in terms of reasons for refusal, most patients in this study declined treatment

because they were not ready to quit. Cancer patients who continue to smoke post-diagnosis experience many barriers to quitting (e.g., stress of diagnosis, insufficient knowledge or appreciation of the impact of smoking on cancer outcomes, continued exposure to other tobacco users) (Borger et al., n.d.; Wells et al., 2017; Westmaas et al., 2015), and it may be advantageous to offer assistance with tobacco cessation alongside assistance with interventions for distress management, unmet information or practical needs, and difficulty with role changes or family disruption. Interestingly, for cancer patients who were ready to quit, tobacco treatment referral was often declined due to the desire to quit on one's own. Again, this is consistent with prior studies in that most tobacco users attempt to quit sans treatment, with many citing practical barriers to treatment use (e.g., financial cost, medication side-effects) (Morphett, Partridge, Gartner, Carter, & Hall, 2015; Smith, Carter, Dunlop, & Freeman, 2015) in addition to a prevailing preference to rely on one's internal strength to overcome nicotine dependence (Borger et al., n.d.; Morphett et al., 2015), both issues that cancer care facilities will need to address in efforts to fully engage cancer patients in tobacco cessation.

The final key finding concerns correlates of referral response. Patients were significantly more likely to decline tobacco treatment if they were male. This supports results from past studies that have found male gender to be a significant predictor of cancer patients' declining tobacco treatment (Schnoll, Rothman, Lerman, et al., 2004; Sheffer et al., 2020). This study also found patients with higher levels of distress were less likely to decline tobacco treatment, which is contrary to some prior research (Sheffer et al., 2020), but possibly consistent with the affective response component of the "teachable moment" heuristic (McBride & Ostroff, 2003; McBride et al., 2008). Notably,

no other variables were significantly associated with treatment referral decline, possibly a function of the difficulties in predicting a high overall rate of refusal. Upon examining covariate associations with reasons for refusal, cancer patients were less likely to report readiness to quit if they were male, and more likely to report readiness to quit if they were treated in gynecology or multi-disciplinary clinics or reported higher levels of distress. Past studies have not found demographic characteristics or clinical variables to be significant predictors of quit motivation, but have found tobacco use variables (e.g., nicotine dependence) to play a role (Schnoll, Rothman, Newman, et al., 2004). No past studies have studied cancer patients' distress level as a correlate of declining tobacco treatment in the context of a clinical trial or tobacco treatment program. Depressive symptoms and other markers of distress have been studied as a correlate of cancer survivors' confidence to quit (Duffy, Karvonen-Gutierrez, Ewing, & Smith, 2010; Martinez et al., 2019) and readiness to quit (Schnoll et al., 2003), with significant negative associations, which contrast the findings of this study. Because many cancer patients experience distress during the acute period of cancer diagnosis and treatment (Carlson et al., 2019), integrating psychological services into cancer care might help patients capitalize on any affect-related motivation to quit while also preventing any distress that might eventually become a barrier to successful engagement in tobacco treatment. As is, further elucidation of demographic and clinical variables tied to tobacco treatment acceptance and readiness to quit is important, as it could lead to more targeted offers and tailored interventions, which could prove more cost-effective than a one-size-fits-all approach to tobacco treatment.

The implementation outcomes of this study must be viewed in light of the study's methodology and limitations. First, clinical service technicians were responsible for screening for tobacco use and offering cessation assistance. On the one hand, because patients may feel more pressure to accept tobacco treatment when asked by an oncologist or nurse (Hoover et al., 2019), the referral acceptance rates observed here might be especially low due to the nature of who asked the important questions. On the other hand, patients in this study may have felt more at ease and perhaps were more honest about their tobacco use and treatment readiness due to less perceived stigma or blame since the person asking about their tobacco behavior was not the person providing their cancer care (Shen Johnson, Hamann, Thomas, & Ostroff, 2017). Second, none of the predictive models are comprehensive. Since the data were pulled from patients' EMR, data on some of the known predictors of current tobacco use and treatment acceptance (e.g., nicotine dependence, quit attempt history, risk perception, confidence to quit) were not available for analysis (Schnoll, Rothman, Newman, et al., 2004) while others (namely, disease site) were not detailed enough to provide definitive answers about their role in the implementation outcomes. That said, the correlates considered herein are largely consistent with those in similar studies (Burris et al., 2013; Schnoll, Rothman, Newman, et al., 2004; Sheffer et al., 2020). Third, and also related to the constraints of the study design, there was sizeable data missing for relationship status, insurance status, and distress level.

Even with its limitations, this population-based study of more than 25,000 adults provides new information about cancer patients' tobacco use, interest in tobacco treatment, and readiness to quit. Study findings underscore the need for cancer care

facilities to ask cancer patients about all forms of tobacco use and among those patients who report tobacco use, to stress the critical importance of tobacco cessation as an integral component of high-quality cancer treatment. Given limited resources in many cancer centers, the results of this and other studies should be used to guide cost-effective implementation of population-based tobacco use screening and proactive tobacco treatment that reaches wide swatches of the target patient population and engages people throughout the tobacco cessation process from making an initial quit attempt to achieving long-term abstinence. Ultimately, tobacco treatment is cancer treatment, and this study shows there is still room for improvement before the goals of the NCI Cancer Center Cessation Initiative are met.

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PUBLICATIONS

Borger, T. N., Puleo, G. P., Rivera Rivera, J. N., Montgomery, D., Bowling, W. R., & Burris, J. L. (2020). A descriptive study of cervical cancer survivor's persistent smoking behavior and perceived barriers to quitting. *In preparation for Psychology of Addictive Behaviors*.

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