Research Article

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# Comparison of referral methods into a smoking cessation program

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**Rational, aims & objectives:** The goal of this observational study was to compare three referral methods and determine which led to the highest utilization of the Duke Smoking Cessation Program (DSCP). **Materials & methods:** We conducted two assessments within the Duke health system: a 12-month assessment of Traditional Referral (a provider refers a patient during a patient visit) and Best Practice Advisory (BPA) (a provider refers a patient after responding to an alert within the electronic health record); and a 30-day assessment of Population Outreach (a list of smokers is generated through the electronic health record and patients are contacted directly). **Results:** Over the 12-month assessment, a total of 13,586 smokers were seen throughout health system clinics receiving services from the DSCP. During this period, the service utilization rate was significantly higher for Traditional Referral (3.8%) than for BPA (0.6%); $p < 0.005$. The 30-day pilot assessment of showed a service utilization rate for Population Outreach of 6.3%, significantly higher than Traditional Referral (3.8%); $p < 0.005$ and BPA (0.6%; $p < 0.005$). **Conclusion:** Population Outreach appears to be an effective referral method for increasing utilization of the DSCP.

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**Keywords:** nicotine • patient referral • referral methods • smoking cessation

## Cessation programs

Smoking is the leading preventable cause of morbidity and mortality in the USA [1,2] causing 480,000 deaths per year [3] and 28.6% of all cancer-related deaths [4]. People who smoke today have a success rate for unassisted quit attempts of only 3–5%, [5] and may require multiple attempts before successfully quitting [6]. To help smokers quit, dedicated smoking cessation programs have been developed within many health systems (i.e., Mayo Clinic, MD Anderson, Duke) and show smoking abstinence rates of 27–39%, roughly ten-times that of an unassisted quit attempt [7,8].

## Referral methods

The study we describe provides a comparison of Traditional Referral, Best Practice Advisory (BPA) and Population Outreach (Figure 1). 'Traditional Referral' is a term we use here to broadly describe what is historically the most commonly recognized form of referral – a provider sees a patient, identifies the need for additional services and requests a referral. Traditional referral has the advantage of being driven by the medical provider, in that patients may be prone to follow through on the referral if there is good patient–provider relationship [9]. Traditional Referral, however, has limitations; medical providers are often busy and may not have time to place a referral or they might not think about smoking cessation during a clinic visit [10]. In the DSCP, Traditional Referral is supported by information sessions in which DSCP staff tell providers about DSCP services, referral pathways and program outcomes. 'BPA' is a method of patient referral in which the electronic health record (EHR) displays an

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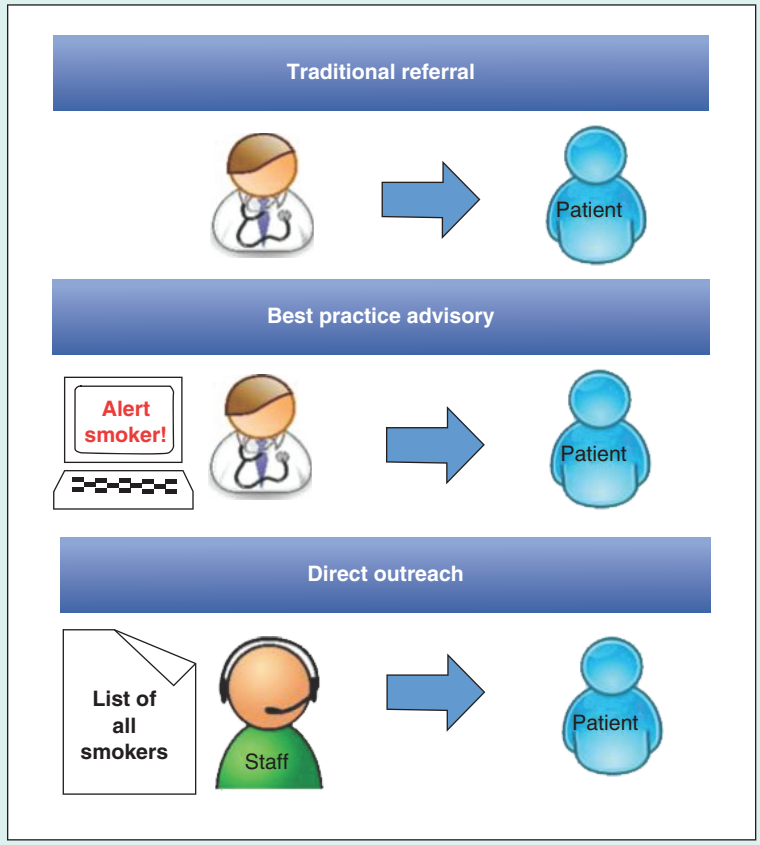


**Figure 1. Referral methods.**

'alert' during a clinical visit. At Duke Health, when the tobacco use BPA alert is opened, the provider is given the option to refer their patient to the Duke Smoking Cessation Program (DSCP). 'Population Outreach,' as used in the DSCP, is a referral method in which a pursuit list is generated that includes the names and phone numbers of all tobacco users with upcoming appointments at a specified clinic. A phone call is then made to each patient on the pursuit list to describe the DSCP and offer DSCP services. Population Outreach may be conducted through a variety of platforms, including phone calls, mailings, text, email, interactive voice response or EHR messaging. Warren *et al.* have shown that automated outreach can be effective for generating referrals to a cancer center smoking cessation program [11], for patients after discharge from the hospital [12], and has been used clinically in Canada where it is referred to as the 'Ottawa Model' [13].

## Materials & methods

### Duke smoking cessation program

This study was conducted within the DSCP. The DSCP operates within a research infrastructure such that there is uniform data collection on patients including carbon monoxide breath testing, smoking history, smoking related illness and mental illness, as well as data on current smoking cessation pharmacotherapy and behavioral treatment. DSCP providers are embedded within a variety of medical clinics at Duke. In this study, we used DSCP data from clinicians embedded within five types of clinics: primary care (2 clinics), disadvantaged care (2 clinics), infectious disease/HIV (1 clinic), cancer care (1 clinic) and pulmonology (1 clinic). Patients who were contacted but declined face-to-face treatment were offered remote treatment including the QuitlineNC, a telephonic tobacco quitline run by the state of North Carolina, and SmokeFreeTXT, a text-based smoking cessation program offered by the National Cancer Institute. Outcomes from these remote treatment options were not available for this study.

Table 1. Demographics of all smokers seen at Duke Smoking Cessation Program.

| Demographic | Oncology (n = 122) | Primary care (n = 157) | Disadvantaged (n = 227) | Pulmonology (n = 69) | Infectious disease (n = 52) |
|---|---|---|---|---|---|
| Age | 57.43 (9.76) | 57.13 (10.38) | 55.20 (12.38) | 54.10 (11.96) | 51.86 (10.56) |
| Females | 68 (55.7%) | 78 (49.7%) | 131 (57.7%) | 44 (63.8%) | 22 (42.3%) |
| Race | | | | | |
| – Blacks | 50 (41.0%) | 54 (34.4%) | 130 (57.3%) | 24 (34.8%) | 31 (59.6%) |
| – Whites | 65 (53.3%) | 102 (65.0%) | 86 (37.9%) | 44 (63.8%) | 16 (30.8%) |
| – Others | 5 (4.1%) | 0 (0.0%) | 7(3.1%) | 0 (0.0%) | 2 (3.9%) |
| – Unknown | 2 (1.6%) | 1 (0.6%) | 4 (1.8%) | 1 (1.5%) | 3 (5.8%) |
| Public (vs private) insurance | 81 (66.4%) | 91 (58.0%) | 148 (64.2%) | 44 (63.8%) | 25 (48.1%) |

Table 1 describes all patients at Duke Smoking Cessation Program over a 12-month period and includes data from all three referral methods – Traditional, Best Practice Advisory and Direct Outreach; n = 627.

### Data collection

Two referral methods, Traditional Referral and BPA, were used in all DSCP associated clinics over the 12-month assessment period (1 October 2017–30 September 2018). A third referral method, Population Outreach, was pilot tested within Duke Cancer Center over a 30-day assessment period (1–30 April 2018). The primary outcome for all referral methods was service utilization rate. Service utilization rate will be defined here as the number of smokers who receive services divided by the number of smokers in the population, or more precisely, the portion of smokers who complete a visit with a DSCP provider out of the total number of smokers who received any medical service within a DSCP-associated clinic. Data on patient referral and service utilization rate were obtained from referral logs and appointment logs within the EHR. Data on BPA outcomes were obtained from an EHR BPA report. To conduct Population Outreach, a pursuit list was generated from the EHR with contact information for all current smokers who had an appointment of any kind at Duke Cancer Center within the next 30 days. Patients on this list were called by phone and offered smoking cessation services. Data on Population Outreach were collected manually over a 30-day period.

### Analytic approach

Contingency table analysis and chi-square goodness-of-fit testing were used to examine contrasts in utilization rates by referral method and clinic type. Comparisons of utilization rates between independent groups (e.g., clinic types) were conducted using contingency table analysis. Analysis of variance (ANOVA) and t-tests were used to compare means between independent groups. Chi-square goodness-of-fit testing was used to compare rates between the differing referral methods. Traditional Referral utilization rate was used as the reference for equivalence testing of other referral methods. Analyses were also conducted to determine whether the addition of BPA to Traditional Referral led to an increase in utilization rates. Because Population Outreach was evaluated through pilot testing in a smaller set of smokers, only equivalence testing with Traditional Referral utilization rates was possible.

## Results

### A 12-month health system outcomes

The 12-month analysis of all DSCP associated clinics across the health system showed that 13,586 smokers were seen for a medical appointment and 627 (4.6%) were seen by a DSCP provider. Of the 627 seen, 523 were referred to DSCP from Traditional Referral, 77 from BPA and 27 from Population Outreach. Demographics of patients seen within each clinic type are provided in Table 1. Infectious disease patients were significantly younger than oncology and primary care patients; $p < 0.004$ and pulmonology patients were significantly younger than primary care patients; $p < 0.05$ Neither gender, $X^2(4) = 7.99$; $p = 0.092$, nor insurance type, $X^2(4) = 7.44$; $p = 0.11$, were significantly different across the five clinic types. The majority of patients seen in disadvantaged care and infectious disease clinics were black, while the majority of patients seen in oncology, primary care and pulmonary clinics were white, $X^2(4) = 35.46$; $p < 0.001$.

### Comparison of Traditional Referral & BPA

Table 2 shows a comparison of Traditional Referral and BPA over a 12-month period (30-day Population Outreach data were excluded). The service utilization rate for Traditional Referral was 3.8%, significantly higher than BPA,

Table 2. Service utilization rate comparing patients referred through Traditional Referral and Best Practice Advisory by clinic type.

| Clinic type | Total number of smokers | Received DSCP services | | | Traditional Referral > BPA | Traditional Referral < Traditional Referral + BPA |
|---|---|---|---|---|---|---|
| | | Total | Traditional Referral | BPA | | |
| Oncology | 6040 | 104 (1.7%) | 94 (1.5%) | 10 (0.2%) | $X^2(2) = 76.27$; $p < 0.001$ | $X^2(1) = 1.08$; $p = 0.30$ |
| Primary care | 2815 | 151 (5.4%) | 129 (4.6%) | 22 (0.8%) | $X^2(2) = 93.23$; $p < 0.001$ | $X^2(1) = 3.93$; $p = 0.047$ |
| Disadvantaged care | 2789 | 225 (8.1%) | 206 (7.4%) | 19 (0.7%) | $X^2(2) = 184.46$; $p < 0.001$ | $X^2(1) = 1.89$; $p = 0.17$ |
| Pulmonology | 1033 | 68 (6.6%) | 66 (6.4%) | 2 (0.2%) | $X^2(2) = 66.61$; $p < 0.001$ | $X^2(1) = 0.06$; $p = 0.80$ |
| Infectious disease (HIV) | 909 | 52 (5.7%) | 28 (3.1%) | 24 (2.6%)† | $X^2(2) = 0.59$; $p = 0.74$ | $X^2(1) = 21.23$; $p < 0.001$ |

†Table 2 describes patients seen at DSCP over a 12-month period and includes data from only two referral methods – Traditional Referral and BPA; n = 600.
BPA: Best practice advisory; DSCP: Duke smoking cessation program.

which was 0.6%, $X^2(1) = 21.23$; $p < 0.001$. The combination of BPA and Traditional Referral showed significantly higher service utilization rate than Traditional Referral alone, $X^2(1) = 11.79$; $p < 0.001$. Contingency table analysis indicated that service utilization rates differed significantly by clinic type, $X^2(4) = 211.97$; $p < 0.001$, with disadvantaged care clinics showing the highest service utilization rate (8.1%) and oncology showing the lowest service utilization rate (1.7%). Within all but the infectious disease clinics, services utilization rates resulting from Traditional Referral exceeded those from BPA, although it is noteworthy that 94.8% of BPA referrals within the infectious disease clinics were initiated by registered nurses or medical assistants as opposed to physicians.

### A total of 30-day assessment of population outreach

We conducted an assessment of Population Outreach within the Duke Cancer Center over a 30-day period. A total of 426 current smokers had a cancer-related medical appointment at Duke Cancer Center over the 30-day period. All 426 current smokers received at least one outreach phone call from DSCP; of those who received a phone call, 135 (31.7%) were contacted and of those contacted, 27 (20.0%) attended appointment with a DSCP provider. Within this pilot test, the service utilization rate for Population Outreach was 6.3%, significantly higher than Traditional Referral (3.8%), $X^2(1) = 7.13$; $p = 0.008$.

### Patient flow & attrition

Figure 2 shows each step of patient flow and attrition with the gradual decrease in patient numbers from patient referral to appointment scheduled to appointment attended. Attrition from referral to attending a clinic visit with a DSCP provider varied by referral method. For Traditional Referral, 2185 were referred and 523 (23.9%) attended an appointment; for BPA, 418 were referred and 77 (18.4%) attended an appointment; for Population Outreach 135 were contacted (no referral) and 27 (20.0%) attended an appointment.

## Discussion

### Main findings

Over the 12-month assessment period, Traditional Referral showed significantly higher service utilization rates (3.8%) than BPA (0.6%). Over the 30-day pilot assessment within Duke Cancer Center, Population Outreach showed a significantly higher service utilization rate (6.3%) than traditional referral (3.8%). Within this 30-day pilot study, all referral methods combined (Traditional Referral, BPA and Population Outreach) produced a service utilization rate of 10.7%.

### Population differences

This study showed significant differences in program utilization rates among clinical populations. Utilization of DSCP services was lowest for the cancer center and highest for disadvantaged care clinics. Patients receiving treatment from cancer centers are known to face a number treatment barriers; they often travel a long distance to the cancer center, face scheduling challenges while at the cancer center, and may be ill or fatigued due to cancer or treatment side effects [14]. Further research into the differences between clinic types may provide additional insight into how to best refer patients to smoking cessation services.

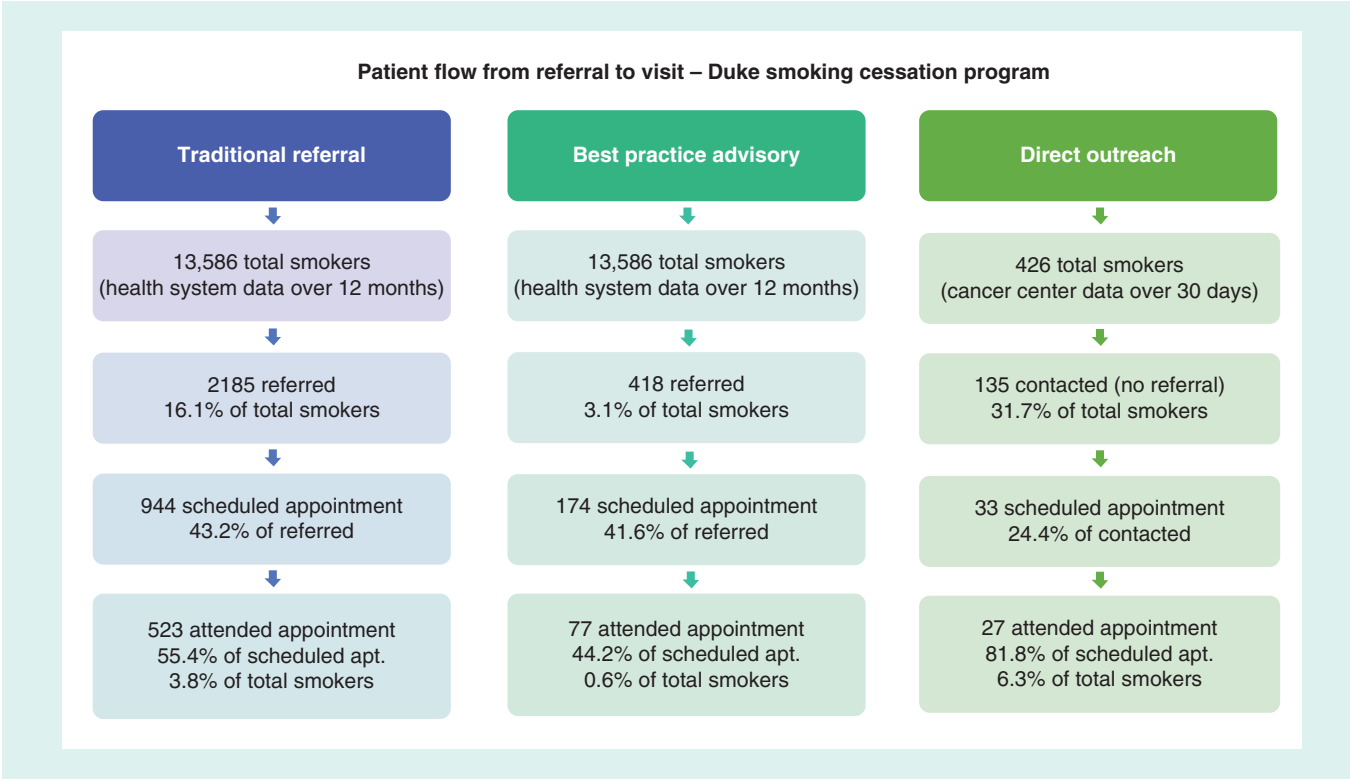


**Figure 2. Patient flow from referral to visit.**

## Traditional Referral

Disadvantaged care clinics showed relatively high service utilization rates through Traditional Referral compared with other clinics. Disadvantaged care clinics offer regular staff presentations describing the DSCP program to providers, which may help DSCP services to remain salient in the minds of referring providers. Additionally, disadvantaged care clinics at Duke are the 'clinical home' for a large number of African-American patients. Research shows that African-Americans show relatively high adherence to recommendations from providers they know well [15,16].

## Best Practice Advisory

An unexpected finding in this study was that BPA had a significant but relatively small effect on service utilization rates. An exploration into this showed that most providers do not commonly open BPA alerts. A major challenge for the use of BPA is 'alert fatigue', a problem that arises when a medical system utilizes multiple BPAs within the EHR and ultimately, providers begin to ignore them [17,18]. A recent study has described an inverse relationship between the number of BPA alerts presented and the chance that the provider will open a BPA alert [18]. An interesting finding was that BPA was used quite successfully in our infectious disease (HIV) clinic, where BPA generated as many referrals as Traditional Referral; in this case, 94.8% of BPA referrals were generated by nurses or medical assistants, not medical providers. This suggests that BPA may be more effective as a patient referral method if nurses or other supporting staff are trained to use it.

## Population outreach

In our 30-day cancer center pilot, Population Outreach led to significantly higher program utilization rate than Traditional Referral. One finding that was expected was that patients who were contacted through direct outreach phone calls were less likely to schedule a DSCP appointment than those referred by their own medical providers. An unexpected finding, however, was that once a patient did schedule an appointment through Population Outreach, that patient showed the highest rate of attending that appointment of all referral methods. A barrier to implementation of this form of manual patient outreach (DSCP staff making phone calls) is that it was labor

intensive and thus relatively expensive. Automated outreach has the potential to be more affordable; it was not tested in this study, but prior studies suggest that it has potential to generate robust recruitment [11,13].

### Approaches to increasing utilization of smoking cessation services

Major barriers to utilization of smoking cessation services include transportation, scheduling, mobility and financial challenges [19,20]. Many of these can be overcome through remote treatment platforms including telehealth [21], web-based treatment [22], telephonic quitline [23], text-based treatment [24], app-based treatment [25], the use of free smoking cessation medications [26] and contingency management [27]. For example, one patient who is ill or lives far away may find it difficult to attend face-to-face smoking cessation treatment; while another patient may face financial challenges with obtaining medications. Our program is currently developing remote treatment options, but data from these treatment options were not available at the time of this study.

### The portion of smokers willing to make a quit attempt

An important perspective in understanding these figures is that studies show that although many smokers would like to quit, the percentage of smokers who will be willing to make a quit attempt within the next 30 days is only 14–20% [28–30]. To put this in perspective, in our pilot study we were able to contact 135 smokers and 27 (20%) attended a DSCP appointment. A smoker's readiness to make a quit attempt may be related to age, various diseases, current stressors and multiple other life circumstances [31]. With this perspective, the relatively low service utilization rates observed in this study, though they have room for improvement, may in part be a reflection of readiness to quit and may change over time presenting new opportunities to engage services at a later date.

### Health benefits & health system cost savings

Important considerations for a program like this are potential health benefits to smokers and cost savings to a health system that occur when smokers are able to quit smoking; we describe these effects in a companion manuscript, 'Health Benefits and Economic Advantages Associated with Increased Utilization of Smoking Cessation Program'. In the companion manuscript, we use Markov modeling to estimate changes in health outcomes and health system costs with each referral method.

### Attrition

Attrition is often high for smoking cessation programs [7]. For example, QuitlineNC offers a program with 4 phone calls but shows that an average of 1.1 completed call per participant [32]. In our study, attrition from referral to appointment attended varied by referral method as follows: 23.9% for Traditional Referral, 18.4% for BPA and 20% (of contacted) for Population Outreach. Readiness to quit may be an important variable in understanding attrition. Nonetheless, significant attrition underscores the need for innovative approaches to improve clinic attendance and overcome treatment barriers, such as the use of telemedicine or other remote treatment modalities that do not require travel to a clinic to receive treatment.

### Limitations

This study had several limitations. The first is that all data were observational such that patients were not randomized to various conditions. Because the study was observational, the possibility of selection bias obscures our ability to demonstrate causation. Additionally, the study includes a wide range of patients with many different medical diagnoses (mental illness, financial challenges, cancer and HIV), making it difficult to generalize this data to other populations. Finally we were able to generate only pilot data on Population Outreach within a smaller sample of smokers of patients within the cancer center. If non-cancer patients were targeted, response rates may have been different.

## Conclusion

Results of the 12-month observational study suggest that the program utilization rate of the DSCP was higher for Traditional Referral than for BPA. Results of a 30-day pilot study showed that program utilization rate was higher for Population Outreach than for Traditional Referral.

## Summary points

- Quitting smoking without help is not an effective approach; the success rate for unassisted quit smoking attempts is under 5%.
- Health systems are now offering evidence-based smoking cessation programs with smoking abstinence rates that are roughly ten-times as effective as an unassisted quit attempt.
- In order for a health system smoking cessation program to impact smoking rates across large patient populations, they must use an effective patient program referral.
- We describe a study comparing three forms of referral to a health system smoking cessation program – Traditional Referral (provider places a referral order); Best Practice Advisory (provider receives an electronic alert and then places a referral order) and Population Outreach (the smoking cessation program contacts smokers directly).
- This study found that Population Outreach led to the highest program utilization rate, followed by Traditional Referral and then Best Practice Advisory.
- The health and economic impacts related to these referral approaches are discussed in a companion paper 'Health Benefits and Economic Advantages Associated with Increased Utilization of Smoking Cessation Program'.

### Author contributions

JM Davis oversaw clinical program, implemented data collection processes, researched background information, assisted in data review and analysis. JM Davis is the primary author of the manuscript. LC Thomas assisted in data review and analysis. JEH Dirkes managed clinical operations, implemented data collection processes, primary on EPIC-based data extraction and review. SK Datta researched background on population-based data. LC Thomas, JEH Dirkes and SK Datta are the contributing authors of the manuscript. PA Dennis contributed toward primary statistical analysis and is the senior author of the manuscript.

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J Greyber edited and formatted the manuscript for publication. K Pallin and J Brown assisted with copyediting and management of tables. A Pratt developed figures.

### Financial & competing interests disclosure

JM Davis, LC Thomas, JEH Dirkes, PA Dennis, J Greyber, K Pallin and J Brown are employees of Duke University, which received financial support from Pfizer, Inc., in connection with the development of this manuscript. S Datta was an employee of Duke University at the time the study was conducted. JM Davis, LC Thomas, JEH Dirkes, SK Datta and PA Dennis declare research funding from Pfizer Inc. and Axsome Therapeutics Inc. The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

No writing assistance was utilized in the production of this manuscript.

### Ethical conduct of research

The authors state that they have obtained appropriate institutional review board approval.

### Data sharing statement

Data collected for this study contain protected health information for patients seen at the Duke Smoking Cessation Program and as such cannot be made publicly available.



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