Barriers to helping patients quit smoking: Lack of knowledge about cessation methods, E-cigarettes, and why nurse practitioners and physician assistants can help

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ABSTRACT

Objectives: Health care settings are ideal for addressing patients' smoking and quitting, but barriers may limit providers' assistance with cessation, including lack of knowledge about newer devices being used by some smokers to quit (e.g., e-cigarettes). Cessation practices among nurse practitioners (NPs) and physician assistants (PAs) are also unknown.
Study design: Cross-sectional.
Methods: Participants (N = 459) were 151 oncologists, 150 primary care physicians (PCPs), 98 nurse practitioners (NPs), and 60 physician assistants (PAs) recruited from a national online panel who completed an online survey.
Results: Four barriers were common across specialties: "patient doesn't want to quit, and it is their decision," "smoking is not reason for patient's visit; must treat the immediate problem first," "patient wants to quit on their own," and "lack of effective methods available." While a majority of oncologists (58%) were aware of free telephone counseling for cessation, only 29% of NPs were aware. Perceived knowledge of e-cigarettes was low. Greater comfort treating patients' smoking predicted greater frequency of engagement in 4 of 5 general cessation practices (βs = 0.15-0.26, all $p \leq .001$). NPs and PAs more frequently asked patients about smoking and e-cigarette use compared to oncologists, but oncologists more frequently referred patients to effective quitting resources (e.g., quitlines).
Conclusions: NPs and PAs may be uniquely positioned to provide cessation assistance, but providers need more education on currently available, effective cessation methods, and about e-cigarettes. Addressing patient resistance to offers of cessation services and improving clinical workflows to enhance cessation service provision should be investigated in future research.

1. Introduction

Approximately 30.8 million American still smoke cigarettes, costing the U.S. economy over $5 billion dollars annually [1]. Most smokers want to quit [2], but despite the availability of effective treatments the majority of smokers do not use them [2]. Health problems from smoking increase the likelihood that smokers interact with the health care system [3]. This offers a unique opportunity for health care providers to educate patients about the dangers of smoking, motivate them to quit, and administer treatments and/or provide services, including follow-up

support for quitting [4,5], Although health care providers agree on the importance of cessation in clinical care and/or ask about smoking or advise quitting, barriers have been identified that limit their provision of cessation services in the health care setting [6–8]. These include clinicians' beliefs that they lack the expertise or knowledge to advise about quitting smoking, that patients do not want to quit, limited time and resources, and inadequate reimbursement [8–13]. Notably, these barriers have been reported primarily for oncologists [11] and/or PCPs [6, 14].

Contemporary data on health professionals' cessation practices

would indicate whether previous calls by cessation experts to increase cessation assistance in the clinic setting [3,4,15,16] have been heeded or what barriers remain. Moreover, the above studies did not ask about electronic cigarettes, a nicotine-delivery product that has shown increased sales in recent years [17,18] and which have also been advocated by some authorities as a method for quitting or reducing cigarette smoking [19–22].

There may be wide variability among health professionals in knowledge or attitudes about e-cigarettes [23]. This is likely due to the lack of a consensus by experts on whether it should be promoted for quitting [24], and concerns about potential long-term harms or uptake by youth [24,25]. Nonetheless, if health professionals are informed about current scientific findings regarding e-cigarettes for quitting, imparting this knowledge to adult patients who smoke has the potential to assist them in their quit attempts. This could include education that e-cigarette use is not completely risk free, is not FDA-approved for cessation, that long-term effects are not yet known, but that there is general consensus that (i) e-cigarettes contain substantially fewer toxicants compared to combustible cigarettes [26], and (ii) it is used by some smokers as a quitting method [27] and may be helpful for some smokers [19,28]. To date, however, it is unclear whether health care providers believe they are knowledgeable about e-cigarettes.

The potential contributions of NPs or PAs to providing cessation assistance have also yet to be recognized. NPs and PAs are likely to have more frequent or prolonged direct contact with patients compared to other health professionals and therefore more opportunities and/or time to provide cessation assistance. Increasingly, NPs or PAs undertake holistic and/or wellness-oriented training to motivate healthier behaviors in patients [29], and many have considerable experience in addressing health promotion and disease prevention [30]. To date, however, there have been no studies that we could find that reported the beliefs, barriers, and cessation practices of NPs or PAs.

In the current study, we wanted to investigate the extent to which the cessation practices of oncologists, PCPs, NPs, and PAs were associated with variables identified in previous research as being associated with (or hypothesized to be associated with) the provision of cessation treatment in clinical settings. These include beliefs, knowledge, and attitudes about the prevalence and/or harms of tobacco use [31–33], and barriers to the provision of evidence-based cessation treatments [8–13], controlling for sociodemographic and practice-related factors. Our study is the first to examine these constructs among NPs and PAs, and results will offer the opportunity to understand and further investigate steps that may be needed to maximize provision of cessation services in clinic settings.

2. Methods

2.1. Participants and procedure

The American Cancer Society (ACS) engaged Public Opinion Strategies™ (POS), a health survey and public opinion research firm, to administer a survey to oncologists, PCPs, NPs and PAs to guide program planning and volunteer outreach. Participants were recruited from a national U.S. online panel of more than 400,000 health care providers, themselves recruited to the panel through multiple channels that included MDLinx, referrals from existing panel members, medical conferences, and registration via the panel's global research website. The panel, which is proprietary to M3 Global Research (https://www.m3global.com/about-us.cfm), is used to support market research in the health care, pharmaceutical and medical device sectors.

To create a sample representative of the U.S. population of providers within each specialty, quotas for sampling were set based on age, gender, and geographic information obtained from publicly available reports by professional societies and medical institutions (e.g., Kaiser Family Foundation (KFF [34]). Eligibility criteria for all 4 specialties included spending at least 20 h per week in patient care activities, and

for PCPs, NPs, and PAs, practicing in family/general practice or internal medicine. Only oncologists treating patients with lung, bronchial, esophageal, mouth, or throat cancer (i.e., cancers for which smoking is established to be a significant contributing factor) were invited.

A total of 7881 invitation emails were sent with the goal of achieving a sample size of 450. A power analysis using G*Power [35,36] indicated that this sample size would provide the power (0.95) to detect (at alpha = .05) a relatively medium-size difference among our four groups of health professionals on measures of cessation practices.

Panelists who responded during the survey field dates and met the screening criteria were paid an honoraria of between $30 to $70 for participation (the compensation scale for each discipline was determined by years of education, training, and the U.S. population of the provider specialty). The final sample recruited consisted of 459 individuals who were surveyed between August 8 and August 28, 2018; 151 were oncologists, 150 PCPs, 98 NPs, and 60 PAs.

Ethical approval for this anonymous survey was handled by M3 Global Research (https://www.m3global.com/about-us.cfm). Data collection was compliant with regulatory bodies for the market research industry (e.g., HIPAA, Insights Association Code of Standards and Ethics for Marketing Research and Data Analytics, and CASRO Institute of Research Quality). POS provided unique survey links for each potential respondent which were used to send invitations and the survey. Potential respondents clicked on their survey link to take the survey anonymously and to receive compensation via online debit or Amazon gift cards (no identifying information was collected).

2.2. Measures

2.2.1. Dependent variables

Cessation Practices. Twenty-four questions asked about the frequency of providers' provision of cessation assistance that covered each component of the 5 A's (Ask, Advise, Assess, Assist, Arrange), including about e-cigarettes. Response options were "nearly always," "often," "sometimes," and "never." From this set of items, and after reverse scoring, we conducted a principal components analysis (PCA) with varimax rotation. Five factors emerged with eigenvalues greater than 1 that accounted for 63% of total variance. Low discriminability was observed for five items (factor loadings of ≤ 0.10 on two or more factors) which were removed before conducting the procedure again. A final PCA yielded five dimensions with eigenvalues >1 that accounted for 70% of total variance. The first factor, which accounted for 36% of total variance was labelled "*Provision of in-house cessation treatment, including follow-up*" and consisted of 5 items that formed a reliable subscale (Cronbach's $\alpha = 0.85$) (e.g., "Help the patient make a plan to quit smoking").

The second factor, which accounted for 13% of total variance, also consisted of 5 items that formed a reliable subscale (Cronbach $\alpha = 0.80$). We labelled this factor "*Referrals to external sources for smoking cessation services and tools*" (e.g., "Refer patients to Quitlines for phone counseling and support services").

The third factor, which accounted for 8% of total variance, consisted of 3 items that formed a reliable subscale (Cronbach $\alpha = 0.89$). We labelled this factor "*Discussion of patients' use of e-cigarettes*" (e.g., "Discuss health risks related to using e-cigarettes or other nicotine vaping products with patient").

A fourth factor, which accounted for 7% of total variance, consisted of 3 items that formed a reliable subscale (Cronbach $\alpha = 0.80$). We labelled this factor "*Discussion of patients' use of cigarettes*" (e.g., "Ask how often or how many cigarettes the patient smokes per day").

The final factor, which accounted for 6% of total variance, consisted of 2 items that formed a reliable subscale (Cronbach $\alpha = 0.87$). We labelled this factor "*Discussion of the risks of smoking or the benefits of quitting*" (e.g., "Discuss health benefits of stopping smoking with patient").

Standardized factor scores from these 5 orthogonal dimensions of

smoking cessation practice were used in bivariate and multivariate regression analyses.

2.2.2. Independent variables

Perceived barriers to providing cessation-related treatment. From a list of eleven barriers identified in previous research [10,11] participants were asked to choose their top three biggest barriers to providing cessation-related treatment. After stratifying by provider specialty, four barriers were found to be the top choices of at least 30% of respondents from each provider specialty. These were (i) "Patient does not want to quit smoking, it is patient's decision and personal choice on whether they want to quit smoking," (ii) "Competing priorities: smoking is not the primary reason for the patient's visit, need to address and treat their illness first," (iii) "Patient does not want to quit with assistance of health care provider, wants to do on their own," and (iv) "Lack of effective methods available to get patients to quit smoking." Four dichotomous variables were created to indicate whether each of these 4 barriers was a top choice for each respondent.

Comfort with treating patient smoking. Two questions, each using a 4-point scale (0 = "not at all comfortable" to 3 = "very comfortable") assessed respondents' comfort with (i) talking to patients about their need to quit smoking, and (ii) counseling or recommending methods on how to quit smoking (Cronbach's $\alpha = 0.68$). Items were reversed scored and then the average taken of the two items for a single measure of comfort with treating smoking. Higher scores indicated greater comfort.

Positivity of attitudes toward treating patients' smoking. Providers' attitudes about treating patients' smoking asked for respondents' level of agreement (on a 4-point scale from *"strongly agree," to "strongly disagree")* to four statements (i) "Having patients quit smoking is beneficial in treating patients' other health problems," (ii) "Quitting smoking should be a priority for my patients who smoke," (iii) "It is a (physician's, nurse practitioner's, physician assistant's) responsibility to help patients quit smoking," and (iv) "My current knowledge and skills are sufficient for giving advice to patients who wish to quit smoking." After reverse scoring (so that higher scores indicated greater attitudinal positivity), a principal components analysis (PCA) with varimax rotation of these items identified a single factor with an eigenvalue greater than 1 that accounted for 65% of the variance in total scores (confirming the unidimensionality of the items). Each item loaded 0.72 or higher on the factor and together the items had good internal consistency reliability (Cronbach $\alpha = 0.81$). Factor scores (standardized) were used to represent positivity of attitudes toward treating patients' smoking in analyses.

E-cigarette knowledge. Respondents were asked "If you were to rate your level of knowledge about e-cigarettes or other nicotine vaping products, as a health care provider would you say you are very knowledgeable, somewhat knowledgeable, not very knowledgeable, or not at all knowledgeable?" Scores were reversed so that higher scores indicated greater perceived knowledge about e-cigarettes (0 = not at all knowledgeable, 1 = not very knowledgeable, 2 = somewhat knowledgeable, 3 = very knowledgeable).

Free quitline awareness. Respondents were asked, "Before this survey, were you aware of a free telephone smoking cessation counseling service available for all smokers at 1-800-QUIT-NOW?" Response options were "yes" or "no" and coded 1, and 0 respectively.

Beliefs about the prevalence of patient smoking and e-cigarette use. Respondents were asked (i) "What percentage of your patients currently smoke cigarettes on a regular basis (not including e-cigarettes or other nicotine vaping products)," and (ii) "What percentage of your patients currently use e-cigarettes or other nicotine vaping products (such as JUUL) on a regular basis?" Mean percentages were calculated after excluding those who chose "do not know" for their responses.

Practice-related variables. Individual questions assessed: (i) number of years providers had been practicing; (ii) the setting of their main practice (e.g., clinic, hospital, etc.); (iii) the number of individuals in their practice who were physicians, NPs, and PAs; (iv) existence of an electronic health record system (EHR) (yes/no) and whether it identified

patients who smoke cigarettes or use e-cigarettes (yes/no); (v) their estimate of the percentage of their patients on Medicaid; (vi) geographical area of practice (e.g., northeast, south); (vii) and urbanicity (urban, suburban, rural).

Demographic variables. Respondents indicated their age, gender, and race-ethnicity (White vs. Non-White).

2.3. Statistical analysis

One-way analyses of variance investigated differences among provider specialties on continuous measures (omnibus *F*-test, $p \leq .05$), with follow-up pair-wise tests corrected for multiple comparisons (Bonferroni correction). For categorical measures chi-square analyses were performed. Five separate multivariate linear regression analyses were also conducted for each of the 5 cessation practices (dependent variables), with demographic variables as covariates. Backward stepwise elimination was used to retain variables with a *p*-level of .10 or lower in subsequent iterations.

3. Results

3.1. Sample characteristics

Table 1 provides detailed descriptive information for the sample as a whole, for each specialty, and results of comparisons across specialties. The age and sex of participants in each specialty were similar to those reported by the Association of American Medical Colleges' (AAMC) Physician Specialty Data Reports [37], or by the Kaiser Family Foundation (KFF [34]) (e.g., 70.2% of oncologists in the current sample were male, similar to 68.2% reported in the AAMC [37]). Respondents were distributed in approximately the same proportions over the 4 main U.S. geographic areas (Northeast, Midwest, South, West) (Table 1), commensurate with distributions based on national health care provider population statistics [38].

Forty-three percent of the overall sample reported practicing in a suburban area (Table 1). The main practice setting was a physician's office (48%), and 42% had been in practice for 10 or fewer years. Providers' self-rated knowledge of e-cigarettes was between "not very" and "somewhat" knowledgeable ($M = 1.6$ on scale from 0 to 3).

Seventy-seven percent of the sample endorsed, as one of their top 3 barriers, "the patient doesn't want to quit, and it is their decision," 50% endorsed "competing priorities: smoking is not reason for patient's visit; must treat immediate problem first," 43% endorsed "patient wants to quit on their own," and 32% endorsed "lack of effective methods available."

3.2. Results of multivariate regressions predicting cessation practices

The strongest predictor of providing *in-house cessation treatment including follow-up* was providers' greater comfort treating patient smoking ($\beta = .22, p \leq .0001$) (Table 2). In-house cessation treatment was engaged in more frequently by PCPs ($\beta = 0.14, p < .01$) and PAs ($\beta = 0.17, p < .001$) compared to oncologists.

Greater use of *referrals to external services & tools for quitting* was associated most strongly with greater perceived knowledge of e-cigarettes ($\beta = 0.28, p \leq .0001$). Oncologists engaged in this practice more frequently compared to PCPs ($\beta = -0.11, p \leq .04$), PAs ($\beta = -0.11, p \leq .03$) or NPs ($\beta = -0.18, p \leq .001$).

Greater frequency of discussing *patients' use of e-cigarettes* was associated with greater comfort treating patients' smoking ($\beta = 0.15, p \leq .001$), with greater perceived knowledge of e-cigarettes ($\beta = 0.32, p \leq .0001$), and was more frequently engaged in by NPs ($\beta = 0.16, p \leq .001$) and PAs ($\beta = 0.10, p \leq .03$) compared to oncologists.

Greater frequency of discussing *patients' use of cigarettes* was associated with greater comfort treating patients' smoking ($\beta = 0.26, p \leq .0001$), and was more frequently engaged in by NPs ($\beta = 0.14, p \leq .01$)

Table 1
Sociodemographic, practice-related variables, and cessation-related beliefs and behaviors by provider specialty.

	Total N = 459 N(%)/M(SD)		Oncologists n = 151 (32.9%) n(%)/M(SD)		PCPs n = 150 (32.7%) n(%)/M(SD)		NPs n = 98 (34.4%) n(%)/M(SD)		PAs n = 60 (13.2%) n(%)/M(SD)		P value
Cessation Practices (standardized variables)											
In-house treatment incl. follow-up	0.00	(1.0)	−0.34$_b$	(0.97)	0.16$_a$	(0.98)	0.10$_a$	(1.01)	0.28$_a$	(0.89)	p ≤ .0001
Referrals to external services, tools	0.00	(1.0)	0.13	(0.96)	−0.01	(1.04)	−0.10	(1.02)	−0.16	(0.95)	.176
Discusses patient use of e-cigarettes	0.00	(1.0)	−0.19$_a$	(1.03)	−0.07$_a$	(1.03)	0.30$_b$	(1.02)	0.17$_{a,b}$	(1.02)	p ≤ .001
Discusses patient use of cigarettes	0.00	(1.0)	−0.16$_a$	(0.95)	0.01$_{a,b}$	(0.98)	0.32$_b$	(0.81)	−0.16$_a$	(1.03)	p ≤ .001
Discusses risks/benefits	0.00	(1.0)	0.05	(0.97)	0.06	(0.99)	−0.10	(1.08)	−0.11	(0.98)	.472
Barriers to Providing Cessation Support											
Patient doesn't want to quit											
Yes	352	(76.5)	111	(73.5)	118	(78.7)	74	(75.5)	49	(80.3)	.638
No	108	(23.5)	40	(26.5)	32	(21.3)	24	(24.5)	12	(19.7)	
Competing priorities											
Yes	225	(49.5)	71	(47.0)	75	(51.4)	45	(45.9)	34	(56.7)	.510
No	230	(50.5)	80	(53.0)	71	(48.6)	53	(54.1)	26	(43.3)	
Patient wants to quit on their own											
Yes	195	(42.9)	65	(43.0)	65	(44.2)	42	(42.9)	23	(39.0)	.924
No	260	(57.1)	86	(57.0)	82	(55.8)	56	(57.1)	36	(61.0)	
Lack of effective methods available											
Yes	145	(31.9)	53	(35.1)	45	(30.6)	32	(32.7)	15	(25.4)	.575
No	310	(68.1)	98	(64.9)	102	(69.4)	66	(67.3)	44	(74.6)	
Comfort treating patient cigarette use	2.67	(0.47)	2.50$_b$	(0.55)	2.74$_a$	(0.41)	2.76$_a$	(0.39)	2.75$_a$	(0.39)	p ≤ .0001
Positivity of attitudes about treatment	0.00	(1.0)	−0.26$_b$	(0.94)	0.06$_a$	(0.89)	0.24$_a$	(0.99)	0.13$_{a,b}$	(1.27)	p ≤ .0001
Perceived knowledge about e-cigarettes	1.56	(0.72)	1.50	(0.77)	1.59	(0.72)	1.66	(0.65)	1.48	(0.70)	.280
Awareness of (1-800-QUIT-NOW)											
Yes	193	(42.0)	88	(58.3)	58	(38.7)	28	(28.6)	19	(31.7)	p ≤ .0001
No	266	(58.0)	63	(41.7)	92	(61.3)	70	(71.4)	41	(68.3)	
Beliefs about prevalence											
Patients smoke cigarettes (%)	29.8	(19.3)	29.0$_{a,b}$	(18.3)	26.4$_a$	(16.3)	35.1$_b$	(20.6)	31.1$_{a,b}$	(17.3)	p ≤ .004
Do not know (n)	35	(7.6)	15	(9.9)	9	(6.0)	5	(5.1)	6	(10.0)	[a]
Patients vape e-cigarettes (%)	11.3	(10.2)	12.4$_{a,b}$	(10.9)	9.3$_a$	(9.7)	13.9$_b$	(11.1)	9.5$_{a,b}$	(6.5)	p ≤ .005
Do not know (n)	104	(22.7)	46$_a$	(30.5)	28$_b$	(18.7)	16$_b$	(16.3)	14$_b$	(23.3)	p ≤ .031
Clinical Practice-related Variables											
Geographical area of practice											
Northeast	106	(23.0)	35	(23.2)	39	(26.0)	20	(20.4)	12	(19.7)	.835
Midwest	119	(25.9)	45	(29.8)	34	(22.7)	23	(23.5)	17	(27.9)	
South	139	(30.2)	42	(27.8)	45	(30.0)	35	(35.7)	17	(27.9)	
West	96	(20.9)	29	(19.2)	32	(21.3)	20	(20.4)	15	(24.6)	
Urbanicity											
City or urban area	189	(41.1)	69	(45.7)	57	(38.0)	45	(45.5)	18	(30.0)	p ≤ .0001
Suburban area	198	(43.0)	73	(48.3)	67	(44.7)	34	(34.3)	24	(40.0)	
Rural area	73	(15.9)	9	(6.0)	26	(17.3)	20	(20.2)	18	(30.0)	
Main practice setting											
Physician's office	217	(47.4)	65	(43.0)	80	(53.3)	41	(42.3)	31	(51.7)	p ≤ .0001
Multi-specialty grp practice/clinic	100	(21.8)	25	(16.6)	43	(28.7)	19	(19.6)	13	(21.7)	
Hospital	94	(20.5)	58	(38.4)	17	(11.3)	15	(15.5)	4	(6.7)	
Clinic or community health center	47	(10.3)	3	(2.0)	10	(6.7)	22	(22.7)	12	(20.0)	
Years practicing											
1-5	89	(19.3)	26	(17.2)	20	(13.3)	27	(27.8)	15	(25.0)	p ≤ .0001
6-10	107	(23.3)	39	(25.8)	25	(16.7)	23	(23.7)	20	(33.3)	
11-15	84	(18.3)	32	(21.2)	23	(15.3)	19	(19.6)	9	(15.0)	
16-20	65	(14.1)	16	(10.6)	27	(18.0)	16	(16.5)	6	(10.0)	
>20	115	(25.0)	38	(25.2)	55	(36.7)	12	(12.4)	10	(16.7)	
Estimated % of patients on Medicaid	23.6	(21.6)	19.4$_a$	(16.7)	19.4$_a$	(20.4)	32.8$_b$	(25.3)	29.2$_b$	(23.6)	p ≤ .0001
Num. physicians in practice	17.6	(54.0)	16.9	(33.6)	24.3	(72.8)	10.6	(34.1)	13.8	(65.0)	.234
Num. nurse practitioners in practice	6.5	(22.4)	7.4	(18.7)	7.1	(24.1)	3.6	(3.1)	7.0	(39.0)	.573
Num. physicians assistants in practice	4.5	(26.6)	2.9	(5.9)	5.3	(20.9)	1.3	(3.4)	12.1	(64.8)	.070
Practice has EHR system											
Yes	435	(94.8)	148	(98.0)	138	(92.0)	91	(92.9)	58	(96.7)	[a]
No	24	(5.2)	3	(2.0)	12	(8.0)	7	(7.1)	2	(3.3)	
EHR can flag patients who smoke cigarettes (among practices w/EHR)											
Yes	392	(90.1)	127	(85.2)	127	(92.0)	84	(92.3)	54	(93.1)	.139
No	43	(9.9)	22	(14.8)	11	(8.0)	7	(7.7)	4	(6.9)	
EHR can flag patients who use e-cigarettes (among practices w/EHR)											
Yes	216	(49.7)	76	(51.4)	59	(42.8)	46	(50.5)	35	(60.3)	.140
No	219	(50.3)	72	(48.6)	79	(57.2)	45	(49.5)	23	(39.7)	
Sociodemographic Variables											
Race											
White	324	(70.6)	87	(57.6)	103	(68.7)	84	(85.7)	50	(83.3)	p ≤ .0001
Non-White	135	(29.4)	64	(42.4)	47	(31.3)	14	(14.3)	10	(16.7)	
Gender											
Male	239	(47.9)	106	(70.2)	97	(64.7)	18	(18.4)	18	(30.0)	p ≤ .0001
Female	220	(52.1)	45	(29.8)	53	(35.3)	80	(81.6)	42	(70.0)	

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Table 1 (*continued*)

	Total N = 459		Oncologists n = 151 (32.9%)		PCPs n = 150 (32.7%)		NPs n = 98 (34.4%)		PAs n = 60 (13.2%)		P value
	N(%)/M(SD)		n(%)/M(SD)		n(%)/M(SD)		n(%)/M(SD)		n(%)/M(SD)		
Age (mean)	46.8	(11.0)	47.3$_a$	(10.8)	48.8$_a$	(10.9)	46.4$_a$	(10.7)	40.8$_b$	(10.9)	p ≤ .0001
Age											
25-34	58	(12.7)	13	(8.7)	13	(8.7)	11	(11.3)	21	(35.0)	p ≤ *.001*
35-44	157	(34.3)	58	(30.0)	45	(30.0)	36	(37.1)	18	(30.0)	
45-54	119	(26.0)	36	(26.7)	40	(26.7)	29	(29.9)	14	(23.3)	
55-64	94	(20.5)	30	(27.3)	41	(27.3)	17	(17.5)	6	(10.0)	
65+	30	(6.6)	13	(7.3)	11	(7.3)	4	(4.1)	1	(1.7)	

Notes:

PCP=Primary care physician; NP=Nurse practitioner; PA=Physician assistant.

P-values are results from tests of one-way analyses of variance for continuous variables and Chi-square tests for categorical variables. Means with different subscripts differ significantly at $p = .05$ with Bonferroni correction (and means sharing a subscript do not differ significantly).

Subtotals may not equal actual totals due to exclusion of respondents missing data on a particular characteristic.

[a] Chi-square not calculated because some cells have less than n = 5.

Table 2

Results of multivariate regression models of factors associated with five cessation practices.

Predictors	Cessation Practices									
	In-house cessation treatment, including follow-up		Referrals to external services & tools for quitting		Discuss patient use of e-cigarettes		Discuss patient use of cigarettes		Discuss risks of smoking/benefits of quitting	
	$R^2 = .20$		$R^2 = .13$		$R^2 = .34$		$R^2 = .11$		$R^2 = .08$	
	β	P-value	β	P-value	β	P-value	β	P-value	β	P-value
Provider Specialty										
Primary care physicians	**0.14**	p ≤ .01	**−0.11**	p ≤ .04	0.04	0.47	0.01	0.93	−0.03	0.61
Physicians assistants	**0.17**	p ≤ .001	**−0.11**	p ≤ .03	**0.10**	p ≤ .03	−0.06	0.28	−0.04	0.48
Nurse practitioners	0.06	0.28	**−0.18**	p ≤ .001	**0.16**	p ≤ .001	**0.14**	p ≤ .01	−0.04	0.41
Oncologists	Ref.		Ref.		Ref.		Ref.		Ref.	
Race/ethnicity										
White (vs. Non-White)	–	–	–	–	**−0.09**	p ≤ .05	–	–	–	–
Urbanicity										
Suburban	–	–	**−0.12**	p ≤ .02	**0.09**	p ≤ .05	–	–	–	–
Rural	–	–	−0.07	0.17	−0.03	0.45	–	–	–	–
City	–	–	Ref.		Ref.		–	–	–	–
Main Practice Setting										
Multi-specialty group	**0.09**	p ≤ .05	–	–	–	–	–	–	–	–
Hospital	−0.06	0.20	–	–	–	–	–	–	–	–
Community health center or clinic	0.02	0.72	–	–	–	–	–	–	–	–
Physician's private practice	Ref.									
Years Practicing										
1–5 years	–	–	–	–	–	–	–	–	**−0.11**	p ≤ .04
6–10 years	–	–	–	–	–	–	–	–	**−0.14**	p ≤ .02
11–15 years	–	–	–	–	–	–	–	–	**−0.12**	p ≤ .03
16–20 years	–	–	–	–	–	–	–	–	0.06	0.30
20+ years (ref)									Ref.	
Estimated % of patients on Medicaid	**0.19**	p ≤ .0001	**0.11**	p ≤ .02	−0.08	0.08	–	–	–	–
EHR allows ID of patients who smoke e-cigarettes among practices w/EHR.							−0.08	0.09		
Perceived barriers to providing cessation-related treatment										
Patient does not want to quit smoking	–	–	−0.09	0.06	–	–	**0.11**	≤ < .02	–	–
Patient does not want to quit with assistance of health care provider	**0.15**	p ≤ .001	–	–	–	–	–	–	–	–
Smoking is not primary reason for visit, need to address and treat illness first									−0.08	0.10
Comfort treating patient cigarette use	**0.22**	p ≤ .0001	–	–	**0.15**	p ≤ .001	**0.26**	p ≤ .0001	**0.16**	p ≤ .001
Positivity of attitudes toward treating patients' smoking	–	–	–	–	**−0.11**	p ≤ .01	–	–	–	–
Free quitline awareness	–	–	**0.12**	p ≤ .01	–	–	–	–	**−0.19**	p ≤ .0001
E-cigarette knowledge	**0.13**	p ≤ .003	**0.28**	p ≤ .0001	**0.32**	p ≤ .0001	**−0.11**	p ≤ .02		

Notes:

Dashes indicate variable not included in the final regressions because p > .1; For all R^2 p ≤ .001.

compared to oncologists.

Discussing *smoking risks and quitting benefits* was associated with greater comfort treating patient smoking ($\beta = 0.16$, $p \leq .001$), but being less aware of free telephone counseling for smoking cessation ($\beta = -0.19$, $p \leq .0001$).

4. Discussion

The current cross-sectional study compared health professionals from four specialties on frequencies of engagement in cessation practices, and examined a wide range of barriers and factors that might explain them. Our results suggest that some barriers remain, including among less-studied health professionals such as NPs and PAs. Indeed, less than a third of NPs were aware of the availability of free telephone counseling for patients' cessation. This suggests greater outreach is needed to increase clinicians' awareness that the 1-800-QUIT-NOW is an established proven intervention and that callers from any state who dial 1-800-QUIT-NOW are routed automatically to their state's own quitline service if their state has one (otherwise the National Cancer Institute (NCI) provides the counseling service).

Clinicians in the sample also reported low levels of knowledge about e-cigarettes. Sales of electronic cigarettes have increased in recent years [17,18], with some researchers and public health organizations supporting their use as a quitting method [19,20]. If e-cigarettes' potential benefits and risks are included in discussing patients' past and future quit attempts, more informed decisions on which quitting methods to use can be made. This could be aided by the integration and flagging of e-cigarette use in EHRs, which according to 50% of the sample, was not currently available in their practice's EHR.

PAs more frequently reported providing in-house cessation treatment for cessation compared to oncologists, and were more likely to ask patients about their e-cigarette use. Nurse practitioners also reported more frequently discussing patients' smoking and use of e-cigarettes compared to oncologists. Oncologists, however, reported more frequently recommending external services and tools for quitting compared to the other specialties. Strategies to increase referrals among *all* specialties could include an automatically generated email with links to the state quitline and other local services sent after the clinic visit [39].

Overall, clinicians in the sample had generally positive attitudes about assisting their patients with quitting smoking and indicated being comfortable providing cessation support. Importantly, greater comfort with providing cessation support was a significant predictor of 4 of the 5 cessation practices. This suggests that strategies to increase comfort (e. g., through education about effective cessation tools) could substantially increase assistance for cessation in clinical settings.

Unexpectedly, two barriers were each positively associated with a cessation practice. One explanation may be that clinicians who more often discuss patients' smoking or recommend treatments are more likely to recall instances of patients' resistance to their recommendations or offers of support. Some patients may indeed not be ready or want to quit which may be uncomfortable or frustrating for clinicians [40]; however, there are brief communications that physicians can be trained to use to confidently express their wish for the patient to consider quitting and that can lead to significantly greater uptake in patients' use of services for quitting [41]. Medical education that starts at the undergraduate level, but which is generally lacking according to data from several countries [42–47], may help normalize and hopefully increase the provision of cessation practices among health professionals [48]. Novel methods of training for health care providers, for example online modules or role playing [49], could also be incorporated to increase knowledge about effective cessation treatments, e-cigarettes, and how to address resistance among patients. These and other approaches for delivering cessation assistance to patients (such as Ask-Advise-Connect) [39,40], have considerable potential for significantly reducing smoking prevalence.

4.1. Limitations

Because the current study was cross-sectional there is the possibility of reverse causality, but cessation practices causing beliefs or attitudes seems less plausible (attitudes or beliefs are often significant predictors of behavior [50]).

We relied on respondents' self-reported provision of cessation practices, as most previous studies have done, but which may be subject to social desirability biases (e.g., possibly overstating one's provision of cessation care).

5. Conclusions and implications

Additional medical education is needed to inform oncologists, PCPs, NPs, and PAs about effective interventions for smoking cessation and about electronic cigarettes. This may potentially increase providers' comfort with asking about, advising and assisting in patients' quitting. Greater comfort may translate to more provision of cessation assistance, as results indicated greater comfort was significantly associated with 4 of 5 cessation practices.

Perceived resistance from patients about accepting treatment for cessation appears to be a significant barrier, suggesting that further research is needed on how to address patient resistance to cessation assistance in the health care setting [51].

Nurse practitioners' and PAs' greater provision of cessation practices, and their roles in the health care setting, suggest they are uniquely positioned to provide cessation assistance. Future efforts to increase their involvement in patient cessation care are likely to be fruitful, along with strategies to coordinate workflows for cessation services among providers in clinical practices.

Ethical approval

Ethical approval for this anonymous survey was handled by M3 Global Research (https://www.m3global.com/about-us.cfm). Data collection was compliant with regulatory bodies for the market research industry (i.e., HIPAA, Insights Association Code of Standards and Ethics for Marketing Research and Data Analytics, and CASRO Institute of Research Quality).

Data availability

Data supporting the conclusions of the current study are available to readers upon request.

Declaration of competing interest

No conflicts of interest are declared by any authors.

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