

Special Article – Tobacco and Smoking Cessation

Investigating Electronic Nicotine Delivery Systems (Ends) Use Amongst Telephone Quitline Participants

Lukowski A* and Olson K

Health Initiatives, National Jewish Health, USA

*Corresponding author: Lukowski AV, Health Initiatives, National Jewish Health, 1400 Jackson Street, S113, Denver, CO 80206, USA

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Abstract

Introduction: Tobacco cessation quitlines are effective in helping smokers quit. With recent classification of Electronic Nicotine Delivery Systems (ENDS) as a tobacco product further investigation is needed to understand the impact of ENDS on quit attempts. ENDS products have increased in popularity for a variety of reasons including public policies aimed at protecting others from secondhand smoke and claims that they aid in cessation. This report compares the proportion of quitline participants using ENDS products from those that do not.

Methods: National Jewish Health collected data from numerous state and corporate quitlines. Participants were separated into three groups including participants using only ENDS products (EcigO), participants using both ENDS and cigarettes (E&Cig) and participants using cigarettes but no ENDS products (CigO). Enrolled participants are eligible to receive up to 5 coaching sessions and 8 weeks of Nicotine Replacement Therapy (NRT).

Results: Both EcigO and E&Cig reported similar reasons for ENDS use, however, EcigO use ENDS more frequently compared to E&Cig ($\chi=317.619$, $p\text{-value}<.0001$). EcigO completed more coaching calls ($F\text{-Value}=86.85$, $p\text{-value}<.0001$), had significantly higher proportion of males ($\chi=109.86$, $p\text{-value}<.0001$) and were more likely to have a college education ($\chi=1029.48$, $p\text{-value}<.0001$) compared to E&Cig and CigO.

Conclusions: These findings highlight the increased use of ENDS year over year within a telephonic quitline population. Furthermore it outlines how this population differs from the traditional tobacco users and may need tailored coaching to quit both traditional tobacco and ENDS products.

Keywords: E-cigarettes; Electronic Nicotine Delivery Systems; Quitline; Telephone cessation

Introduction

Electronic Nicotine Delivery Systems (ENDS) products were introduced into the market in 2007 and have seen steady growth in prevalence across all populations. ENDS have been marketed primarily as a replacement to combustible products, an option to use when traditional products cannot be used (i.e., where clean indoor air policies have been instituted), and as a cessation tool [1]. The prevalence of these products has grown steadily and significantly year over year since their introduction, across age groups with the most significant uptake by middle and high school students [2,3]. Current national trends for ENDS use show prevalence around 3.5% and 58.8% used ENDS products in addition to cigarettes [3]. However, ENDS have yet to pass the scientific and regulatory rigor required to be deemed a proven cessation aid or the data to be considered a safe product [4]. In addition, the FDA recently deemed ENDS as tobacco products in May 2016, providing more regulations than ever before [3]. Even with these latest regulations, there are still several outstanding questions for the public health community about how to best help all populations to be completely tobacco free [5]. That coupled with the lack of significant data to support tobacco industry marketing claims call on the tobacco control community to

better understand prevalence, use patterns and reasons for ENDS use.

The Current Study

One of the most successful evidence-based treatment modalities for tobacco cessation is telephonic (and Web-supported) quitlines, which offer education, support, phone coaching, and nicotine replacement therapy for most callers [6]. Available in all U.S. States since 2002, telephonic quitlines typically offer a combination of coaching and nicotine replacement therapy (NRT) to populations who want to quit tobacco [7,8]. These services are available to anyone in the U.S. and are available at low to no cost. For the general population, a recent Cochrane review found that proactive telephonic services help smokers to quit compared to brief counseling or self-help materials [7].

Since quitlines primary audience is to help tobacco users with cessation, they are well positioned to understand ENDS as well as other tobacco use behaviors in this population. In the current study, we report on data from National Jewish Health (NJH), which provides telephonic cessation services for 17 states along with various corporate and health plan clients. Our primary aim is to examine how ENDS users compare to non-ENDS users across the

Table 1: ENDS Questions included in Intake.

Question	Response Options	First Recorded Year
Do you currently use E-Cigarette/Vapor/Electronic Nicotine Delivery Systems (ENDS) in combination with (a) tobacco product/s every day, some days, or not at all?	<ul style="list-style-type: none"> • Yes • No • Don't Know • Refused 	2015
Do you currently use E-Cigarette/Vapor/Electronic Nicotine Delivery Systems (ENDS) every day, some days, or not at all?	<ul style="list-style-type: none"> • Every Day • Some Days • Not at all • Don't Know • Refused 	2013
Do you use an e-cigarette/e-vaping product that contains nicotine?	<ul style="list-style-type: none"> • Yes • No • Don't Know • Refused 	2014
Do you use e-cigarette cartridges or a tank system?	<ul style="list-style-type: none"> • Cartridge • Tank 	2016
Electronic or e-cigarettes	<ul style="list-style-type: none"> • Yes • No • Don't Know • Refused 	2011
Have you used an e-cigarette or other electronic vaping product in the past 30 days?	<ul style="list-style-type: none"> • Yes • No • Don't Know • Refused 	2013
How soon after you wake, do you first smoke an e-cigarette?	<ul style="list-style-type: none"> • Within five minutes • 6 to 30 minutes • 31 to 60 minutes • More than 60 minutes • Don't know • Refused 	2013
People use e-cigarette/e-vaping products for a variety of reasons, are you currently using e-cigarettes/e-vaping products to quit smoking?	<ul style="list-style-type: none"> • Yes • No • Don't Know • Refused 	2014
What would you say is your reason for using E-Cigarette/Vapor/Electronic Nicotine Delivery Systems (ENDS)?	<ul style="list-style-type: none"> • Cut down on other tobacco • Quit other tobacco • When I cannot smoke/ use other • I like how I feel when I use them • Refused to answer • Other 	2014
Do you intend to quit using e-cigarettes (usually within 30 days)?	<ul style="list-style-type: none"> • Yes • No • Don't Know • Refused 	2013

following domains: demographic characteristics, dual use of tobacco products, and time of first use. A better understanding of the unique characteristics of quitline callers who use ENDS may help direct future best clinical practices for a tobacco using quitline population. This analysis compares three defined groups including ENDS only users (EcigO), dual ENDS and cigarette users (E&Cig) and cigarette only users (CigO). A majority of participants who report using ENDS products also report cigarette use. Participants were excluded from the analysis if they did not answer “yes” or “no” to questions regarding use of ENDS products or Cigarettes.

Quitlines started collecting some data on ENDS use in 2011 but the questions have evolved just as ENDS products have changed and we learn more about prevalence. The percent of overall participants using the quitline that reported ENDS use increased from 2.85% in 2011 to 8.11% in 2016. Knowing the reasons for use is a critical part of understanding prevalence; therefore we collect information in this area. See Table 1 for questions and possible responses which include the reasons why participants use ENDS.

Methods

Sample Selection

NJH has been a quitline service provider since December 2002, and has served approximately 1.3 million participants across 18 states, several corporations, and numerous health plans. NJH collected data regarding ENDS from 17 state quitlines and various employer or health plan groups (Alabama, Arkansas, Idaho, Massachusetts, Michigan, Montana, Nevada, New Hampshire, North Dakota, Ohio, Rhode Island, Utah, Iowa, Kentucky, Pennsylvania, Wyoming, Colorado, Vermont; $n = 293,257$) over a 5 year period from October 1, 2011 and September 30, 2016. This time period was selected because of implementation of the ENDS questions into an NJH case management system (Table 2).

Measures

Quitline intake assessment: Participants who enrolled in the quitline program completed minimal data set (MDS) questions recommended by North American Quitline Consortium (NAQC).

Table 2: Demographic Characteristics for Sample.

State	Number of participants		
	ENDS Only (EcigO)	Dual User (E&Cig)	Cigarette Only (CigO)
Vermont	22	283	5200
Alabama	63	1182	17595
Arkansas	46	879	11699
Colorado	296	3974	72130
Idaho	3	44	1976
Iowa	2	83	1048
Kentucky	56	823	14311
Massachusetts	29	305	5943
Michigan	48	503	1751
Montana	70	833	20513
Nevada	22	312	3473
New Hampshire	11	130	1830
North Dakota	26	438	7897
Ohio	106	1342	27670
Pennsylvania	175	5649	37643
Rhode Island	6	94	1156
Utah	69	538	11494
Wyoming	36	590	5764
Employer or Health plan	221	1146	23706
Total	1310	19148	293257

The MDS, consisting of 18 questions is collected from eligible callers at intake. Eligibility requires residency of the state offering the program. Question categories include reasons for calling and awareness of the quitline, tobacco behaviors and caller characteristics (e.g., demographics, health status). Included in the intake are questions related to ENDS and responses are presented in Table 1.

Quitline program

Intake to coaching: The standard telephonic quitline treatment consists of an intake that includes the ENDS questions and up to five coaching calls with the opportunity for additional calls throughout the program. NJH's clients have differing offerings of quit medications ranging from none to nicotine patches only to multiple forms of NRT (i.e., including gum and lozenges). These offerings change based on funding and participant eligibility. Multiple states also offered prescription medications (i.e., bupropion, varenicline) sometime during the 5 year period including Montana and Wyoming.

Statistical analysis

Data were analyzed using a combination of Microsoft Excel (v.2013) and statistical analysis system (SAS, version 9.3). Descriptive statistics were evaluated by ENDS status (ECigO, E&Cig and CigO). Differences in average age and number of coaching calls completed were evaluated using an ANOVA test between the three study groups followed by Tukey's Studentized Range test to determine significance between individual groups. Proportions for demographic characteristics and tobacco use patterns were evaluated using chi-square analysis. Statistical assumptions were reviewed and accounted

for in this analysis.

Results

ENDS use reasons and dependence level

Quitline participants identify many reason for utilizing ENDS products but the top three include "Quit other tobacco", "Cut down on other tobacco" and "For times when the participant cannot smoke or use other tobacco". These reasons stayed consistent regardless of the participant's tobacco use patterns as an EcigO or E&Cig participant.

EcigO participants use e-cigarettes more frequently compared to E&Cig participants. EcigO participants reported everyday use 22.52% of the time compared to 8.64% of E&Cig participants ($\chi=317.619$, $p\text{-value}<.0001$). E&Cig participants also have their time to first use later in the day, but this metric was not statistically significant due to low response rate. A potential cofounder for the first time to use metric for E&Cig participants pertains to first time of cigarette use. While these participants may use the ENDS product later in the day, E&Cig participants (48.89%) were slightly more likely to smoke a cigarette within five minutes of waking compared to CigO participants (48.41%) ($\chi=1.07*10^7$, $p\text{-value}<.00001$). The time to first use of tobacco product upon waking is a standard proxy based on the Fagerström Test for Nicotine Dependence (FTND) [9] for dependence level in a tobacco using population, so thus may indicate a lower addiction level for EcigO users.

Quitline engagement

One of the ways that quitlines measure level of engagement in participants is the utilization of coaching services as measured by the number of coaching calls completed by an individual when participating in a telephone coaching program. EcigO participants appear to utilize coaching at a higher rate compared to dual and cigarette only participants. EcigO participants completed an average of 2.28 coaching calls compared to E&Cig participants (1.1.63) and CigO participants (1.70). The differences is average number of coaching calls were statistically significant ($df=2$, $F\text{-Value}=86.85$, $p\text{-value}<.0001$). With further post hoc analysis using Tukey's Studentized Range test for the average number of coaching calls it is determined that the mean number of coaching calls differs between all group combinations.

Demographics

The overall gender distribution of quitline callers is typically 60% women and 40% men. As shown in Table 3, the EcigO participants (43.84%) had significantly higher proportion of male compared to E&Cig participants (34.81%) and CigO participants (38.40%) ($\chi=109.86$, $p\text{-value}<.0001$).

The average age of the entire sample was 46.09 years of age, E&Cig participants were the youngest (44.29) average group followed by CigO (46.21) and ECigO (46.36). The differences is average age were statistically significant ($df=2$, $F\text{-Value}=170.54$, $p\text{-value}<.0001$). With further post hoc analysis using Tukey's Studentized Range test for the average age it is determined that the mean ages differ between all group combinations except ECigO and CigO.

ECigO participants were more likely to have a college education (22.06%) compared to E&Cig (17.55%) and CigO (16.31%)

Table 3: Comparison of Demographic Characteristics.

Demographics		ENDS only User	Dual User	Cigarette only
Age*	Average Age	46.362	44.279	46.214
Age Grouped*	Young Adult (18-30)	16.58%	20.89%	17.22%
	Adult (31-45)	28.57%	12.91%	28.13%
	Middle adulthood (46-60)	38.04%	35.91%	38.81%
	Older adulthood (61+)	16.81%	30.29%	15.84%
Sex*	Female	56.16%	65.19%	61.60%
	Male	43.84%	34.81%	38.40%
N. Coaching Calls*	Average N. Coaching Calls	2.189	1.746	1.766
Education*	High School Degree or GED	24.96%	34.11%	36.15%
	Some College	28.93%	31.27%	28.62%
	College Degree	22.06%	17.55%	16.31%
	Less than high school degree	10.00%	14.59%	16.68%
	No Response	14.05%	2.48%	2.23%
	Trade/Vocational school	0.00%	0.01%	0.02%
Insurance Levels*	Uninsured	31.07%	26.43%	31.47%
	Commercial	20.69%	19.65%	21.06%
	Medicaid	18.85%	22.86%	21.49%
	Medicare	14.66%	15.09%	14.24%
	Other	11.07%	14.56%	10.39%
	Don't Know	3.66%	1.42%	1.35%

*Indicates significant difference between the groups at $p < .05$.

participants. The percentage of participants in a higher level of education by study group was significant ($\chi=1029.48$, p -value $<.0001$).

There were also differences in insurance coverage amongst the three study groups. EcigO participants reported being uninsured (31.07%) more than E&Cig (26.43%) but similar to CigO (31.47%). E&Cig participants were most likely to be insured through Medicaid (22.86%) compared to EcigO (18.85%) and CigO (21.49%). When evaluating insurance groups to study population there was a significant difference in the proportions ($\chi=535.37$, p -value $<.0001$).

Discussion

ENDS products are becoming increasingly prevalent among current combustible tobacco users as well as those who have never used tobacco products [2,3]. Callers to tobacco quitlines provide an opportunity to understand ENDS use patterns in this population. The current study looks at one of the largest U.S. quitline databases to better understand how ENDS users compare to non-ENDS users in demographics and prevalence. These findings will contribute to knowledge about the use patterns of current tobacco users who access tobacco quitlines.

Quitline participants that utilize both ENDS and Cigarette products tend to be similar to cigarette only users, but notable differences arise when reviewing participants that reported ENDS use without cigarette use. ENDS only participants are more likely to be male and have a college education. This unique demographic profile provides insight into how the ENDS population differs from

a quitline perspective and potential barriers in their attempt to quit tobacco products.

E&Cig participants, who are sometimes, consider dual tobacco users, demonstrated time to first use of ENDS later in the day compared with EcigO and CigO. It is important to note that these users did demonstrate time to first cigarette significantly earlier than ENDS, thus potentially speaking to a difference in dependence level between ENDS and combustible products [10,11]. Another potential reason for this difference is that ENDS products physiologically impact the brain differently than combustible products, providing more of a quick hit to nicotinic receptors in the brain [11].

EcigO and E&Cig participants showed no difference in their rationale for ENDS use, indicating the two of the top three reasons as cessation focused (i.e., “quit other tobacco”) or harm reduction (i.e., “cut down on other tobacco”). The reasons endorsed by participants help inform quitline practices to continue to work with participants on cessation and/or harm reduction from all tobacco products because these are their reasons for using these products. It also allows quitline staff to provide participants with information on evidence-based cessation practices that include coaching and quit medication combined. On the other hand, the third reason endorsed by ENDS users (i.e., “For times when the participant cannot smoke or use other tobacco”) highlights a growing fear from the health community. This is the fear that dual use of products will reduce the urgency to quit tobacco products [11], which has ramifications for continued prolonged use which has the potential for long-term health effects [12].

Other data that demonstrates consistency with cessation or harm reduction as primary motivators is how ENDS users engage with a quitline cessation program. These results show that EcigO participants utilize telephone coaching at a significantly higher rate compared to E&Cig and CigO users. This data is consistent with previous studies that found that ENDS users more frequently cite cessation as their primary motivation for using ENDS products [13-16] which highlights a difference in motivation. This motivation has the potential to impact quitline participants’ progress and potential success in a telephone quitline cessation program. Furthermore, the EcigO group may have been previous dual users who have moved to EcigO prior to entering the quitline program. Since EcigO participants maybe further in their quit attempt compared to E&Cig and CigO participants another possibility for the higher program engagement may be that EcigO users may have a lower dependence level on ENDS products overall compared with more traditional ones.

Limitations

One possible limitation to this study is that there is likely a selection bias with the participants. Due to the fact that participants who enroll and utilize a telephonic quitline program may be very different from those individuals who choose not to call, potentially limiting the generalizability of study findings. For example, the average profile of a quitline participant is female, over 45 years of age and has been utilizing tobacco products for more than ten years.

Conclusion

ENDS use has increased in both the general population and the

NJH quitline population, with rates even higher in these tobacco users. Better understanding the needs of tobacco users who use ENDS products is crucial to continued understanding of use patterns overall. The characteristics for this large, multistate sample of quitline callers has important implications for further investigation and informing the broader tobacco community about ENDS use patterns in a quitline population. This data has the potential to inform more targeted and tailored cessation strategies for all ENDS users.

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