

E-cigarette Awareness Among Providers: Helping to Decrease Nicotine Use

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The author has no known conflict of interest to disclose.

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Abstract

Introduction: Electronic cigarettes (e-cigarettes) among youth has increased drastically in recent years. E-cigarettes are being used with nicotine which can lead to dependency. Healthcare providers (HPs) are in a unique position to advise against the use of e-cigarettes. Recent studies report a lack of formal education among HPs about e-cigarettes. The purpose of this quality improvement project is to examine how increasing e-cigarette awareness among HPs can change their behavior on patient counseling against e-cigarette use. **Methods:** A modified *E-cigarette Knowledge, Beliefs and Attitude Questionnaire* was proctored before and after a virtual educational training about e-cigarettes. All advanced HPs employed, in a Southwestern state, at the organization were invited to participate by email. **Results:** 29 participants completed the pre-survey, and 4 participants completed the post-survey. While 90% of the participants reported that they first learned about e-cigarettes through informal sources, 72% of the participants reported interest in learning more about e-cigarettes to enhance their practice. Further, a two-tailed Mann-Whitney U test was significant on the “e-cigarettes are helpful aid for smoking cessation” statement based on an alpha value of 0.05, $U = 12$, $z = -2.69$, $p = .007$. **Conclusions:** Increasing the knowledge about e-cigarettes among HPs is critical in decreasing nicotine use among the public. This project will help in the fight against the use of tobacco products, and adds to the literature on how formal education about e-cigarettes among HPs can increase their intention to screen and counsel patients.

Keywords: youth, e-cigarette, screening, subsequent smoking

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Nicotine use and its consequences is a topic that has been studied extensively. Currently, there are novel devices being used to deliver nicotine, called electronic cigarettes (e-cigarettes) (Centers for Disease Control and Prevention [CDC], 2020). Over the past few years, e-cigarettes have gained in popularity in the younger population, and its use is growing at an alarming rate (Cullen et al., 2019). For that reason, e-cigarette use overall is a topic of concern and an issue that has become a public health problem. Healthcare providers have a unique position to inform patients about the negative consequence of e-cigarettes use (American Academy of Pediatrics [AAP], 2015), and to provide possible interventions or resources when an individual has an intention to quit.

Problem Statement

E-cigarettes are the leading tobacco product used in the adolescent and young adult population (Cullen et al., 2019; Jenssen & Walley, 2019). The nicotine in tobacco products, such as e-cigarettes, is highly addictive (U.S. Department of Health and Human Services [USDHHS], 2020). During 2018 there was a 78% increase in the number of e-cigarette users among high school students reported in one year, and during the same period the number of middle schoolers using e-cigarettes grew by 48% in the United States (Cullen et al., 2018). By 2019, 27.5% of high-schoolers and 10.5% of middle schoolers reported using e-cigarettes (Cullen et al., 2019). Further, in Arizona, 48.4% of high school students reported ever trying e-cigarettes in 2019 (CDC, n.d.). The American Academy of Pediatrics (2015) and the U.S. Preventive Task Force (2020) recommends screening and advising against all tobacco products including e-cigarettes; unfortunately, screening may not be happening consistently. For instance, a recent study showed that 95% of pediatricians do not screen for e-cigarette use routinely (Gorzowski et al., 2016).

For that reason, there is a need to increase awareness among healthcare providers about e-cigarettes to increase counseling against e-cigarette use.

E-cigarettes come in different shapes and sizes, and have the option to provide different flavors (USDHHS, n. d.). Further, these devices have different names, such as, e-cigs, vapes, hookahs, and vape pens; the liquid that is used for the e-cigarettes is called juice, vape juice, and many others names (CDC, 2020b). These devices are constantly changing and upgrading, giving them a heterogenous characteristic. This characteristic makes it difficult to research these devices. For the purpose of this paper, e-cigarette use and vaping will be used interchangeably.

Purpose and Rationale

Between the years of 2011-2015 e-cigarette use in the United States among teens and young adults increased by 900% (USDHHS, n.d.). The increasing numbers of e-cigarette users is concerning to the public. By reviewing the current literature, the need to increase knowledge about e-cigarette use in clinical practice can be understood. Increasing awareness among healthcare providers could help to both identify individuals with current or prior use of e-cigarettes and those with the intent to quit. For this reason, the purpose of this project is to increase healthcare providers' awareness of e-cigarette use among youth, thus, leading to a behavior change about counseling against e-cigarette use, referral to appropriate resources, and reducing rates of e-cigarette use in the population. Consequently, healthcare providers can deliver interventions and resources to all patients with an intention to quit e-cigarette use or provide advice and guidance for patients that are not ready to quit.

Background/Significance

Vaping or e-cigarette use has grown in popularity among the youth in the United States (Cullen et al., 2019). Nicotine, when consumed at a young age, can create catastrophic

dependency consequences as their brain are still developing (USDHHS, n.d.). Concerning side effects such as dependency to tobacco products needs to be taken seriously considering that e-cigarettes are being used with liquid that contains nicotine (CDC, 2020c). Consequently, the American Academy of Pediatrics (AAP, 2015) and the U.S. Preventive Task Force (2020) recommends screening and counseling people under the age of 18 for the use of e-cigarettes to prevent future dependence.

Teens and Young Adults Using E-Cigarettes

The number of teen and young adult e-cigarette users is rising at an alarming rate (Cullen et al., 2019; Gentzke et al., 2019). National initiatives, such as Healthy People 2030, have a goal to decrease usage of e-cigarettes to 10.5% among teens (Office of Disease Prevention and Health Promotion [ODPHP], 2020). Unfortunately, the current growth in popularity of e-cigarettes among youth have eliminated previous progress made in tobacco control among this population (Gentzke et al., 2019; see also Cullen et al., 2019; Jenssen & Walley, 2019). When using e-cigarettes there is a chance of experiencing nicotine dependence (Morean et al., 2018). Teenagers are more susceptible to the use of other drugs if exposed to nicotine early in their development (Ren & Lotfipour, 2019). For instance, Morean et al. (2018) assessed characteristics of young individuals with e-cigarette nicotine dependence. The researchers used a validated screening tool among adolescent participants. Higher scores of e-cigarette nicotine dependence on the tool were correlated with an earlier age of starting e-cigarette use, consuming higher concentrations of nicotine e-liquid, and smoking conventional cigarettes (Morean et al., 2018). Hence, e-cigarette use in young people is unsafe, and nicotine use among the young population can create long-lasting changes in their developing brains, which can result in dependency (USDHHS, 2020 see also Morean et al., 2018; Ren & Lotfipour, 2019).

Screening for E-Cigarettes

National organizations recommended screening for the use of all tobacco products, including e-cigarettes, as a part of all healthcare visits (AAP, 2015; American Academy of Family Physicians, 2019; U.S. Preventive Task Force [USPTF], 2020). John et al. (2019) examined the use of e-cigarettes in primary care offices (PCO) using a screening tool in adults. The results showed that 7.7% of adults used e-cigarettes in the past 90 days, and 72.7% of e-cigarette users consumed other tobacco products daily, not including e-cigarettes. The study results showed a correlation among e-cigarette use with nicotine dependence, and concluded that screening for e-cigarette use can help patients by using tobacco cessation interventions (John et al., 2019). In addition, several studies have used screening tools to assess e-cigarette use in clinical practice. For instance, the National Addiction & HIV Data Archive Program (2020) is a website that has an unrestricted tobacco screening tool that includes e-cigarette use. Further, this website has a data user forum that can help clinicians if they have a question on how to use the screening tool. The website adds to the literature of screening tools that can be used in clinical practice without restriction. Likewise, Vogel et al. (2019) examined different assessment tools to evaluate e-cigarettes use and correlated screening results with nicotine biomarkers, such as salivary cotinine, to establish the validity of the tools. Study findings demonstrated these screening tools showed strong correlation with identifying e-cigarette use (Vogel et al., 2019).

Healthcare Providers Not Screening for E-Cigarettes

Failing to screen for e-cigarette use may be a pattern among healthcare providers. For instance, Pepper et al. (2015) found that only 14% of physicians screened for e-cigarette use. Likewise, Gorzkowski et al. (2016) conducted a study that included 37 providers, of which 95% did not screen for e-cigarettes. Consequently, providers in the study felt that the lack of a

systematic screening tool may be one of the issues as to why conversations about e-cigarette use in clinical practice are not occurring. Despite the small number of participants, Gorzkowski et al. (2016) adds to the literature of why failing to screen for e-cigarettes can lead to a missed opportunity to talk about the consequences of e-cigarettes in PCO. Another barrier to screening e-cigarette use is the constant evolution of these devices. To illustrate, there are several different generations of e-cigarettes on the market from first generation, such as disposable cigars, to fourth generation which are called pod mods (Galstyan et al. 2019). The novelty and diversity of these devices makes them unique; hence, providers have expressed the need to have more evidence-based education about these products (Zgliczyński et al., 2019).

Zgliczyński et al. (2019) examined the knowledge about e-cigarette use among providers. The participants reported that 67% learned about e-cigarettes from news stories and from the point of sale. Further, 55.7% reported learning about e-cigarettes from family members, and only 20.9% reported learning from evidence-based articles (Zgliczyński et al., 2019). It is concerning to note that healthcare providers reported the majority of their knowledge gained about e-cigarettes is through advertisements or through discussions with friends (Dwedat et al., 2019; Zgliczyński et al., 2019). This adds to the necessity of having evidence-based education about e-cigarettes offered to all healthcare providers. Equally important, Dai and Clements (2018), in a cross-sectional survey, evaluated the tendency for screening by clinicians and advice to quit or prevent use of tobacco products, including e-cigarettes. According to the authors, during the years 2011 to 2013 there was an increase in the numbers of youth screenings by health providers after the American Academy of Pediatrics recommended screening for any substance use 2011. However, after 2015 there was no rise in the number of screenings (Dai & Clements, 2018). Equally important, failing to screen for tobacco products results in a missed opportunity to

educate the individuals about the consequences of using e-cigarettes (Gorzowski et al., 2016). This adds to the importance of needing to have the e-cigarette conversation with patients, and to have evidence-based education for providers to be able to recognize individuals that may need e-cigarette quitting support in PCO.

Future Cigarette Use and Intention to Quit

Tobacco use in the United States is a growing problem, and currently e-cigarettes are leading as the most used tobacco product in the younger population (ODPHP, 2020). Use of e-cigarettes among individuals who have never smoked significantly increases their chances of future conventional cigarette smoking (Soneji et al., 2017; Zhong et al., 2016). Further, hookah use increases the chances of starting other tobacco products (Case et al., 2018). Research also suggests that e-cigarette use leads to subsequent marijuana use (Chadi et al., 2019), and the combination of e-cigarette use with conventional cigarettes can increase predisposition towards marijuana use (Lozano et al., 2017). For that reason, all tobacco products including e-cigarettes should be monitored when screening patients for nicotine use.

Pardavila-Belio et al. (2019) used the Theory of Triadic Influences in a randomized controlled trial study that evaluated the changes in the beliefs, self-efficacy, and intention to avoid smoking among the adult participants. Results showed that the intention to quit is a mediator to stop smoking (Pardavila-Belio et al., 2019). Another study found that e-cigarette use does not help with smoking cessation (Wang et al., 2017). Equally important, Piper et al. (2018) found that an enhanced intervention to help individuals to quit has better results in smoking cessation, which adds to the literature to use tobacco cessation interventions to increase intention to quit.

Significant evidence about the importance of e-cigarette screening has been presented so far. The evidence provided shows that there is a need for consistent screening for all tobacco products, and counseling against e-cigarette use in the younger population. In addition, the data has provided evidence for the concerning effects of e-cigarette use such as subsequent cigarette smoking and marijuana use (Soneji et al., 2017; Zhong et al, 2016 see also Chadi et al. 2019; Lozano et al., 2017). For that reason, increasing awareness among healthcare providers about e-cigarette use among youth can help clinicians provide anticipatory guidance about e-cigarettes, recognize an opportunity to counsel for e-cigarette use (AAP, 2015), and help patients in their intention to quit.

Internal Evidence

Stakeholders from a healthcare organization in a large metropolitan area are expressing concern about the effects of vaping or using e-cigarettes. An electronic survey poll was deployed among providers at the organization in which it was asked, *“Do you feel vaping continuing medical education (CME) would be useful for you in your practice?”* (A. Dean Martin, personal communication, May 29, 2020). A total of 49 emails with a survey were sent out with 22 responses received indicating 20 affirmative responses, one dissenting response, and one maybe response (A. Dean Martin, personal communication, May 29, 2020). The need for education about e-cigarettes is deemed necessary according to these responses from the providers’ perspective at this organization. In addition, stakeholders are expressing their worry about the increasing number of youth that are using nicotine products. Data and evidence that has been shown in this paper support the concerns of the stakeholders of this organization. There is need for a practice change in which all patients are screened for all tobacco products, including e-cigarettes, in clinical practice. Further, the increasing number of reported e-cigarette users shown

by Cullen et al. (2018) is alarming, and warrants a practice change that can give clinicians an opportunity to provide advice against the use of tobacco products which include e-cigarettes. Having proper education among providers about e-cigarettes can help clinicians to recognize individuals who vape. This education can provide resources for patients intending to quit vaping or help individuals to not progress to subsequent cigarette smoking.

PICOT Question

E-cigarettes are the latest devices that are being used among youth to consume nicotine (CDC, 2020a). Increasing providers' knowledge about e-cigarettes could lead to more screening and improved counseling against nicotine use. Strong evidence has linked e-cigarette use to subsequent conventional cigarette smoking (Soneji et al., 2017; Zhong et al., 2016), and providers should be screening and counseling patients on all tobacco products including e-cigarettes (AAP, 2015; USPTF, 2020). This inquiry has led to the clinically relevant PICOT question: "In teens and young adults (P) how does screening for e-cigarettes (I), compared to not screening (C), affect their future cigarette use or intention to quit (O)?"

Search Strategy

An exhaustive literature review was performed to answer the PICOT question. Databases included: Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and PsycINFO. These databases were chosen because of their medical relevance, peer review, and latest evidence-based information to the topic of e-cigarette and nicotine prevention. In addition, all of these databases are well known for their relevant contributions to the medical field.

A combination of keywords was included in order to answer the PICOT question. Keywords included: *teen, teenager, young adult, youth, vaping, e-cigarette, screening, nicotine dependence, nicotine addiction, nicotine cessation, smoking, intention to quit, study, subsequent*

smoking, tobacco cessation. In addition, MESH terms included: *electronic nicotine delivery systems, quitting smoking, adolescents*. Including MESH terms helped to broaden the search and retrieved more articles and studies. The inclusion criteria for the search encompassed studies that ranged from 2017 to present, were in the English language, and peer-reviewed. Articles that were older than three years were excluded. Limitations in this search included all studies that were not published in English, and were further filtered for relevance by reading titles and abstracts.

The initial search of PubMed using the terms: *young or teens, screening, e-cigarette, subsequent smoking and intention to quit* had zero results. However, another search retrieved 62 articles using the terms: *e-cigarette, subsequent smoking and youth*. When using MESH terms, *electronic nicotine delivery systems, quitting smoking, and adolescents*, a total of 356 articles were retrieved and subsequently screened for relevance.

The CINAHL search retrieved four articles using the terms: *tobacco cessation and intention to quit smoking*. A second search included: *e-cigarette, screening and study* with a total of 21 results. A third search retrieved 254 results when using: *tobacco cessation, intention to quit smoking, study and e-cigarette*. All of these studies were screened and only relevant studies were included.

An initial PsychInfo search retrieved 127 articles using the terms: *e-cigarette, subsequent smoking and youth*. Another search retrieved 31 articles using the terms: *teen, e-cigarette, and intention to quit*. To increase the number of results the following terms were used: *e-cigarette, smoking, study, and intention to quit* and retrieved 734 results.

Further, grey literature was included in the literature review such as websites from U.S. Food and Drug Administration, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, and the Centers for Disease Control and Prevention.

Selection of these websites was contingent on available information about e-cigarettes to the public.

The studies found in all three databases were assessed by reading titles and abstracts. As a result, the studies were selected based on their relevance to the PICOT question, and the forward and backward referencing technique was performed to retrieve results that the search may not have found. After a rigorous selection process, a total of 10 articles were selected to include in the evaluation table. Final selection included: three longitudinal, two cross-sectional, two randomized control trial (RCT), one meta-analysis (MA), and two systematic review (SR) studies (see Appendix A, Table A1).

Critical Appraisal & Synthesis

High level evidence was found examining e-cigarette use among the youth. Although there is a relative paucity of data on this new and emerging health topic, several sources included level 1, level 2, and level 4 studies. Melnyk and Fineout-Overholt's (2019) rapid critical appraisal was used to evaluate the studies that were selected. Six of the studies included the use of e-cigarettes; however, the use of other nicotine delivery devices such as hookah was also included in one study (see Appendix A, Table A2). None of the studies had recognized bias. However, nine of the 10 studies indicated a funding source. The study of Chadi et al. (2019) was the only study that had no funding recognized. Additionally, nine studies included a large sample size, but the study by Wang et al. (2017) only included 189 participants. However, this study was chosen because it included several parts of the PICOT question. Furthermore, the literature review included six studies from the United States, and four international studies. The studies included broad demographics. For instance, some studies assessed e-cigarette use in the youth, in the adult population, or in both. In addition, none of the studies had restrictions about gender.

Further, all of the studies included in the literature review were quantitative studies, and had some type of survey or assessment tool proctored to the individual.

The heterogeneity of the tools in the studies were noted, and included mostly unvalidated self-reported surveys. In addition, eight of the 10 studies included e-cigarettes or electronic nicotine delivery systems (ENDS) in their independent variable or their dependent variable. All of the studies selected concluded in one way or another on the importance of not using tobacco products, including e-cigarettes. Further, all of the studies used some type of statistical data analysis and their results indicated whether they were significant (Appendix A, Table A1).

Theoretical Framework

Increasing provider awareness about e-cigarette use among the youth is critical. Many providers do not have robust knowledge regarding e-cigarette use and have learned about these devices through informal sources (Dwedat et al., 2019; Zgliczyński et al., 2019). Creating awareness could lead to a practice change about e-cigarette screening, and could help individuals that are using e-cigarettes by providing advice or interventions to decrease nicotine use. For this reason, the Theory of Planned Behavior (Ajzen, 1991) was chosen because it shows the different phases that an individual may experience regarding attitudes toward screening for e-cigarettes and how a behavior can be changed. The Theory of Planned Behavior (1991) includes: *attitudes toward the behavior, subjective norm, perceived behavioral control, intention, and behavior* (Ajzen, 1991). The theory fits perfectly in providers' awareness about e-cigarette use, as it may change their *intention* to screen patients about e-cigarette use to help change *behavior* (Ajzen, 1991). This *intention* to screen may be influenced by *their perceived behavioral control* on screening and providing interventions to patients (Ajzen, 1991). Equally important, the provider may have an *attitude* toward the use of e-cigarettes which may influence their likelihood to

screen and provide interventions (Ajzen, 1991). Likewise, their *subjective norm* about screening for the use of e-cigarettes could influence whether interventions, resources, or advice to patients about e-cigarette use are provided or not (Ajzen, 1991).

The Theory of Planned Behavior (Ajzen, 1991) explains the different stages that an individual may have when trying to change a behavior. For that reason, clinicians can make a difference if interventions are provided to help minimize the use of e-cigarettes.

Implementation Framework

The framework chosen for this project is the Rosswurm and Larabee Model (1999). This framework includes six linear steps that drive the process of change in evidence-based practice. These steps include: *assess, link, synthesize, design, implement and evaluate, and integrate and maintain* (Rosswurm et al., 1999). Further, the Rosswurm and Larabee Model (1999) has a systematic approach that allows for reexamining and revisiting the prior steps if there is a need to refine the process. These steps can lead the process of implementing education about e-cigarettes among providers in primary care offices that will increase screening for e-cigarettes and help patients with the intention to quit. Hence, *assessing the need for change in practice* (Rosswurm et al., 1999) is necessary as the number of youth using e-cigarettes is increasing (Cullen et al., 2018). Recognizing e-cigarette use among the youth as the problem and linking the provider to education about e-cigarettes as the intervention would increase the likelihood to screen for e-cigarettes. This could lead to delivering interventions for patients to decrease e-cigarette use as the outcome. This approach aligns with the second step in the process called *linking the problem, interventions, and outcomes* (Rosswurm et al., 1999). Third, *synthesize the best evidence* (Rosswurm et al., 1999) provides the foundation to review the best literature needed for raising more awareness among providers about the topic of e-cigarette use. Fourth, *designing the*

practice change will provide the guidance to elaborate the change in clinical practice and can define the factors included, and fifth, *implement and evaluate the practice change* can help evaluate the proposed project by getting feedback from providers. Finally, the model uses *integrate and maintain the practice change* to assess the sustainability of the project in primary care offices (Rosswurm et al., 1999). This model aligns with the different steps included in the proposed practice change, guiding the implementation of e-cigarette use education among providers in primary care offices.

Methods

Ethical Considerations

A rigorous application process through the organization where the project was launched was required. The organization has a Research Determination Committee (RDC) which reviewed the project proposal first. Participant's privacy was the main reason that the RDC reviewed applications (C. Clark, personal communication, August 10, 2020). Then, the project was reviewed by the Institutional Review Board (IRB) at Arizona State University (ASU). To maintain privacy of the participants' survey's responses were confidential, participation in this project was voluntarily, and there was no compensation for participating in the project. In addition, no personal health information was used in this project. QuestionPro was the platform used to gather data from surveys. Participants were provided with a unique identification number generated by QuestionPro when they took the survey. Furthermore, as added protection for the participants, the surveys featured a Responders Anonymity Assurance by QuestionPro that includes protecting their IP address and location from where the participant took the survey. Lastly, the emails to the participants were sent by an employee at the organization that does not have access to the data of the project.

Description of the Population and Setting

This project was launched virtually and all Advanced Practice Providers (APP) in the organization's Medical Group, in a Southwestern state of the United States, were invited to participate. The organization consists of many hospitals and primary care offices. In order to participate in the project, the individual must be at least 18 years of age, be able to read and write in English, and be part of the APP Medical Group in the Southwestern state of the organization. In addition, to participate in the post-survey the individual had to take the virtual education class on e-cigarettes.

Project Description

A total of six weeks were used for the intervention part of the project. The intervention period consisted of two phases. Phase 1 included the introduction/recruitment and the virtual education period with a duration of four weeks. Phase 2 included the post-intervention period with a duration of two weeks. During Phase 1, recruitment took place with an invite email that was sent out to all APP employed in the Southwestern state at the organization by the site champion. The email included an explanation of the project, and had a link that opened up a webpage that started with an invitation to participate. The webpage provided each participant with a unique -identification code. Once the subjects agreed to the invitation to participate, the demographics questionnaire and survey were accessed. At the end of the survey there was another link that took the participant to an online education website about e-cigarette use through the American Lung Association (ALA, 2020) called *Ask, Advise, Refer to Quit Don't Switch*. Depending on the type of provider, this online education gave the option for some participants to claim continuing education (CE) hours. The CE was credited only for Nurse Practitioners. Phase 2 consisted of another invitation to participate in a post-intervention survey. This second email

was sent by the site champion to all the same individuals that were invited to participate about 4 weeks after the first email. The first question in the post-survey asked “Did you complete the Webinar *Ask, Advise, Refer to Quit Don't Switch?*” If the participant answered “No,” the survey ended and went to a thank you page. However, if the participant answered “Yes” the survey continued with the post-survey questions.

Instrumentation, Data Collection, and Data Analysis

The survey used in the project was adapted from the questionnaire called *E-cigarette Knowledge, Beliefs and Attitudes Questionnaire* (Mbe et al., 2017). The pre-test survey includes questions about demographics in addition to e-cigarette knowledge, beliefs and attitudes, perceived behavioral control, and behavioral intention. The pre-survey had a total of 19 questions, and the post-survey included 8 questions. The same e-cigarette questions about beliefs and attitudes, perceived behavioral control, and behavioral intention were used in the pre and post survey. Each section of the questionnaire by Mbe et al. (2017) used a range of Likert scales with no scoring linked to the specific answer. To elaborate, questions about beliefs and attitudes were measured by using a four-point Likert scale from *strongly agree* to *strongly disagree*. The question about perceived behavioral control used a 5-point Likert scale from *extremely easy* to *extremely difficult*. One question assessing behavioral intention used a 7-point Likert scale from *extremely likely* to *extremely unlikely*. The e-cigarette knowledge section of the questionnaire was a combination of *yes* or *no* answers and a 4-point Likert scale from nothing at all to *quite a lot* (Mbe et al., 2017). The questionnaire was proctored online with an electronic data collector called QuestionPro to gather the baseline and post intervention data. The results were used to compare changes in responses of healthcare providers after the education. Furthermore, statistical analysis was conducted to analyze healthcare provider’s change in behavior. Currently,

the *E-cigarette Knowledge, Beliefs and Attitude Questionnaire* by Mbe et al. (2017) has not been found to be used in other studies. The authors of the questionnaire have given permission to use the tool, however, psychometric properties such as reliability and validity are not yet known. After the pre and post questionnaires were completed, data analysis was conducted with the information gathered using the *Intellectus Statistics* software, and the data was reported in aggregate form.

Budget

The project was funded mainly by in-kind donations (see Appendix C). The webinar *Ask, Advise, Refer to Quit Don't Switch* was completely free for all participants, and there was no additional cost for the participants that requested a CE certificate through the American Lung Association (See Appendix C, Table C1).

Results

Demographic Data

The participants of this project were advanced healthcare providers, such as nurse practitioners (NP) or physician assistants (PA). Of the 29 participants 72.41% ($n=21$) were females and 27.59% ($n=8$) were males. In regards to the age of the participants, 24.14% ($n=7$) of participants were between the age of 18-24 years old, 34.48% ($n=10$) were between 25-34 years old, 20.69% ($n=6$) were between 35-44, 17.24% ($n=5$) were between 45-54, 3.45% ($n=1$) were between 55-64, and no participants reported being above the age of 64 years old. 10.34% ($n=3$) reported being of Hispanic or Latino ethnicity, and 89.66% ($n=26$) reported not being of Hispanic or Latino ethnicity. Further, 6.90% ($n=2$) of respondents indicated of being of Asian race, and 93.10% ($n=27$) reported being of White race. For the question, *how long have you been a healthcare provider?* 27.59% ($n=8$) reported less than 5 years of practice, 27.59% ($n=8$) of the

participants reported 5-10 years, 3.45% ($n=1$) reported 11-15 years, and 41.38% ($n=12$) reported being a healthcare provider for more than 15 years. Further, for the type of provider, 65.52% ($n=19$) reported being a NP, 31.03% ($n=9$) reported being a PA, and 3.45% ($n=1$) reported being other type of provider, but did not indicate what type. Lastly, 72.41% of the participants reported interest in learning more about e-cigarettes (see Appendix D, TableD1).

Data Analysis

Intellectus Statistics Software was used to perform the data analysis. The data from Question Pro was transferred to Intellectus. Descriptive statistics were used to analyze the data in the pre and post-test. In addition, a two-tailed Mann-Whitney two-sample rank-sum test for the pre and post-test questions on knowledge, beliefs, and attitudes was conducted.

Outcomes

Knowledge about E-cigarette

The participants were asked several knowledge questions about e-cigarette. Descriptive statistics were calculated for the questions: How did you first learn about e-cigarette? How much do you know about e-cigarette? About what percentage of your patients are e-cigarette users? And would you be interested in learning about e-cigarette? The category with most responses for the question *how did you first learn about e-cigarette?* were Media Ads ($n=12$, 41%) and From patients/clients ($n=12$, 41%), other responses such as newspaper and roadside poster (Billboard or signpost) obtained 3.45% each. Further, it is important to mention that the response for professional sources only had 6.90% of the total responses. The most frequently observed category on the question *how much do you know about e-cigarette?* was A moderate amount ($n=13$, 45%). The most frequently observed category on the question *about what percentage of your patients are e-cigarette users?* was 0-25% ($n=19$, 66%) (See Appendix A, Table A4).

Beliefs and Attitudes

Beliefs and Attitudes were also analyzed using descriptive statistics. There were a total of five questions that were included in this section. As the sample was unmatched, the questions were not paired. There were 29 participants in the pre-sample, and 4 participants in the post sample.

Frequencies and Percentages. In the pre-test, the most reported category for the statement *e-cigarettes are safer to use than regular cigarette* was *disagree* ($n = 17, 59\%$) and for the post-test were *disagree* and *strongly disagree*, each with an observed frequency of 2 (50%). In the statement *e-cigarettes are helpful aid for smoking cessation* for the pre-test the most frequently reported response was *disagree* ($n = 13, 45\%$), and for the post-test, the majority of the participants responded *strongly disagree* in this category ($n = 4, 100\%$). For pre-test, the most frequently observed category for the statement *e-cigarette may be a gateway to conventional smoking* was *agree* ($n = 15, 52\%$). For the post-test, the most frequently reported category for the statement *e-cigarette may be a gateway to conventional smoking* was *agree* ($n = 3, 75\%$). For the pre-test, the most frequently selected category for the statement *e-cigarette use is a public health concern* was *strongly agree* ($n = 15, 52\%$). For the post test, the most frequently responded categories for the statement *e-cigarette use is a public health concern* were *agree* and *strongly agree*, each with an observed frequency of 2 (50%). For the pre-test, the most frequently selected category for the statement *e-cigarette should be regulated like any other tobacco product* was *strongly agree* ($n = 17, 59\%$). For the post-test, the most frequently responded category for the statement *e-cigarette should be regulated like any other tobacco product* was *strongly agree* ($n = 4, 100\%$) (See Appendix A, Table A5).

Perceived Behavioral Control

Frequencies and Percentages. Descriptive statistics were used to analyze one question in this section. In the pre-test, for the question *how difficult would it be for you to counsel your patients or their family members about e-cigarettes?* the most frequently selected category was *moderately easy* ($n = 12, 41\%$). For the post-test, for the question *how difficult would it be for you to counsel your patients or their family members about e-cigarettes?* a majority of respondents selected category *moderately easy* ($n = 2, 50\%$) (See Appendix A, Table A5).

Behavioral Intention

This section used descriptive statistics to analyze the question *how likely are you to counsel your patients or their family members about e-cigarettes?*

Frequencies and Percentages. In the pre-test, the most frequently selected category for the question *how likely are you to counsel your patients or their family members about e-cigarettes?* was *extremely likely* ($n = 11, 38\%$). For the post test, *how likely are you to counsel your patients or their family members about e-cigarettes?* the majority of participants selected the category of *extremely likely* ($n = 3, 75\%$). Frequencies and percentages are presented in Appendix A, Table A5.

Two-Tailed Mann-Whitney U Test

A two-tailed Mann-Whitney two-sample rank-sum test was conducted on the question *e-cigarettes are helpful aid for smoking cessation* to examine whether there were significant differences between the levels of pre-test and the post-test. There were 29 observations in the pre-test and 4 observations in the post-test. The result of the two-tailed Mann-Whitney *U* test was significant based on an alpha value of 0.05, $U = 12, z = -2.69, p = .007$. The mean rank for the pre-test was 15.41 and the mean rank for the post-test was 28.50. This suggests that the distribution for the question *e-cigarettes are helpful aid for smoking cessation* (AID) for group

the pre-test was significantly different from the distribution for the post-test. The median for the pre-test ($Mdn = 3.00$) was significantly lower than the median for the post test ($Mdn = 4.00$). Appendix A, Table A3 presents the result of the two-tailed Mann-Whitney U test. Appendix B Figure 3 presents a boxplot of the ranks of AID by pre-test and the post-test.

Impact of the Project

Throughout this paper, evidence has shown that e-cigarette use in youth is increasing (Cullen et al., 2018; see also Cullen et al., 2019; Gentzke et al., 2019; Janssen & Walley, 2019), and providers are in a unique position to be able to help decrease its use. Education among healthcare providers about e-cigarettes can help decrease nicotine use by creating awareness; hence, this awareness could lead to more screening and counseling. Screening not only provides an opportunity to counsel patients about the use of nicotine, but also an opportunity to intervene if the person has an intention to quit. This approach will indirectly help to decrease e-cigarette use in any population, adult or teen. Implementing more awareness among providers can create a practice change on screening and counseling for e-cigarettes in a primary care office. This helps with the recognition of patients that need help with interventions for quitting e-cigarettes. Decreasing the use of e-cigarettes not only can help the individual, but also can help society, as this is a public health issue. Evidence gathered in this paper shows the need to help decrease usage of e-cigarettes especially among the youth. Screening as recommended by the AAP (2015), the American Academy of Family Physicians, (2019), and the U.S. Preventive Task Force (2020) can provide valuable information for clinicians to counsel individuals that may have an intention to quit and to provide recommendations to prevent future cigarette smoking.

The increased number of youth using e-cigarettes is a topic of concern for society. The project provided education to healthcare providers as Continuing Education (CE) by a virtual class; hence, they will screen and counsel patients at every wellness health visit as they will be more aware of the topic of e-cigarette use. Having formal education on e-cigarettes could help the clinician to assess for e-cigarette use, and provide an opportunity to deliver an intervention or offer resources for patients. This virtual education could directly increase the number of people that receive counseling without having to ask for help with quitting, providing support for the planned behavior change and helping to decrease e-cigarette use.

Potential Outcomes

Evidence suggests that most of the provider's knowledge about e-cigarettes has been obtained from informal sources (Dwedat et al., 2019; Zgliczyński et al., 2019). Further, e-cigarette use among the youth is increasing drastically every year (Cullen et al., 2019), and most of these devices are being used with nicotine (CDC, 2020a). Measures to decrease e-cigarette use among the youth, such as awareness among providers, are necessary to help with decreasing nicotine intake. The project was geared to provide education about e-cigarette use among providers with the goal to increase awareness about its use among the youth. Hence, the increased awareness can increase knowledge of the importance of screening to identify individuals that are using e-cigarettes. Consequently, the provider can deliver advice, and provide resources or interventions to patients. Further, increasing healthcare providers awareness about e-cigarette can provide an opportunity to make a difference in the wellbeing of the public.

Discussion

Evidence presented in this paper shows that healthcare providers have the opportunity to counsel patients against e-cigarette use. Clinicians in different settings, such as primary care

offices, can make a difference in a patient's health behavior by screening the population for all tobacco products, including e-cigarettes. As the use of e-cigarettes continues to rise (Cullen et al. 2018), clinicians can provide different interventions that can facilitate an intention to quit. Thus, they will help decrease the number of people that are currently using e-cigarettes. In addition, subsequent smoking after using e-cigarettes is another problem that has been recognized (Soneji et al., 2017), and screening for all tobacco products can help the clinician to provide interventions that can help with future nicotine dependence. For that reason, increasing knowledge about e-cigarettes can help the clinician to include interventions as part of the wellness health visit as recommended by the American Academy of Pediatrics (2015). Currently, the evidence for quitting e-cigarettes is limited; however, the evidence provides information for nicotine dependence (Morean et al., 2018; Wang et al., 2017), which can be utilized as e-cigarettes are being used with nicotine (CDC, 2020). Hence, screening and counseling for all tobacco products can not only provide an opportunity to quit, but a moment to educate the patient about e-cigarette use.

Limitations

There were several limitations encountered in this project. The first limitation was that the number of participants in this project was small ($n=29$). The pre-survey had 29 participants and the post-survey had 4 participants. Due to the unequal number of the participants in the post-survey, some of the questions about a change in behavior in the questionnaire were unanswered. However, it is important to consider that this project was implemented during the COVID-19 pandemic. It is assumed that the COVID-19 pandemic impacted the project in regards to participation because the project was implemented when the second wave of the pandemic was affecting Arizona, which at that point was in a public health crisis (University of Arizona, 2020).

Further, during that time many hospitals were working over capacity, and news reported that medical personnel in Arizona were stretched thin (AZ central, 2020; see also Arizona Public Health Association, 2020). Another limitation was that the invitation to participate in the project was only sent once. This could have led to the invitation being overlooked by the potential participants. The same happened with the invitation to participate in the post-survey. In a future project it is recommended that invitations to participate are sent more than once. The third limitation was that the study was performed only among advanced healthcare providers and this did not include Medical Doctors or Doctors of Osteopathic Medicine which could have provided for a broader population of healthcare providers in the sample. Lastly, the post-survey was sent four weeks after the pre-survey in a different email, instead of being linked to American Lung Association website at the end of the CE activity. For that reason, participants could have assumed that they answered all of the questions needed for the project already.

Findings

The current quality improvement project demonstrated that most of the healthcare providers (89.66%) that participated in this project first learned about e-cigarettes through non-evidence-based education. This finding is critical as this supports prior evidence which shows that learning about e-cigarettes was done through informal sources (Dwedat et al., 2019; Zgliczyński et al., 2019). In addition, another critical finding is that healthcare providers changed their beliefs from e-cigarette being a helpful aid for smoking cessation to strongly disagreeing that it was a helpful aid for smoking cessation after the virtual education about e-cigarettes. Further, 72.41% of the participants reported willingness to learn more about e-cigarettes.

Recommendations

It is recommended that more formal education is provided to healthcare providers about e-cigarettes as evidenced by the percentage of participants reporting willingness to learn more about e-cigarettes, and by the large number of participants reporting that they first learned about e-cigarettes through casual learning. Further, having more evidence-based education could provide more support for healthcare providers to facilitate with their likelihood to screen and counsel patients.

Conclusion

This quality improvement project not only demonstrated the willingness of healthcare providers to acquire knowledge about e-cigarettes, but also that most of the providers reported that they first learned about e-cigarettes through informal sources. Further, the importance of providing knowledge to healthcare providers about e-cigarettes to help change their beliefs and attitudes about e-cigarettes being a helpful aid. In this project 100% of the providers reported, after the intervention, that they strongly disagree that e-cigarettes were a helpful aid for smoking cessation. While the sample was small the relevance of this result can help for future research. Lastly, this project presents the immediate need to provide more education about e-cigarettes among healthcare providers in a near future to help aid the likelihood and decrease the difficulty to counsel against e-cigarette use in the general population.

References

- American Academy of Family Physicians. (2019). *Electronic cigarettes: Common questions and answers*. <https://www.aafp.org/afp/2019/0815/p227.html>
- American Academy of Pediatrics. (2015). Clinical practice policy to protect children from tobacco, nicotine, and tobacco smoke. *Pediatrics*, 136(5), 1008-1017. <https://doi.org/10.1542/peds.2015-3108>
- American Lung Association. (2018). *Ask, advise, refer to quit don't switch*. <https://quitswitchtraining.lung.org/>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Arizona Public Health Association. (2020). Public health today. <http://www.azpha.org/wills-blog?offset=1607355308007>
- AZ Central. (2020). *Arizona hospitals scramble to boost staffing as state's COVID-19 crisis deepen*. <https://www.azcentral.com/story/news/local/arizona-health/2020/12/02/arizona-hospitals-struggle-find-staff-during-second-covid-19-surge/6423782002/>
- Case, K. R., Creamer, M. R., Cooper, M. R., Loukas, A., & Perry, C. L. (2018). Hookah use as a predictor of other tobacco product use: A longitudinal analysis of Texas college students. *Addictive Behaviors*, 87, 131-137. <https://doi.org/10.1016/j.addbeh.2018.06.028>
- Centers for Disease Control and Prevention. (2020a). *About Electronic Cigarettes (E-Cigarettes)*. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/about-e-cigarettes.html

Centers for Disease Control and Prevention. (2020b). *Adult smoking cessation—The use of e-cigarettes*. https://www.cdc.gov/tobacco/data_statistics/sgr/2020-smoking-cessation/factsheets/adult-smoking-cessation-e-cigarettes-use/index.html

Centers for the Disease Control and Prevention. (2020c). *Quick facts on the risks of e-cigarettes for kids, teens, and young adults*. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/Quick-Facts-on-the-Risks-of-E-cigarettes-for-Kids-Teens-and-Young-Adults.html#:~:text=The%20use%20of%20e%2Dcigarettes,other%20harmful%20substances%20besides%20nicotine.

Centers for Disease Control and Prevention. (n.d.). *High school YRBS: Arizona 2017 results*. <https://nccd.cdc.gov/youthonline/app/Results.aspx?LID=AZB>

Chadi, N., Schroeder, J. D., Jensen, J. W., & Levy, S. (2019). Association between electronic cigarette use and marijuana use among adolescents and young adults: A systematic review and meta-analysis. *JAMA Pediatrics*, *173*(10), 1-10. <https://doi.org/10.1001/jamapediatrics.2019.2574>

Cullen, K. A., Ambrose, B. K., Gentzke, A. S., Apelberg, B. J., Jamal, A., & King, B. A. (2018). Notes from the field: Use of electronic cigarettes and any tobacco product among middle and high school students — United States, 2011–2018. *Morbidity Mortality Weekly Report*, *67*(45), 1276–1277. <https://doi.org/10.15585/mmwr.mm6745a5>

Cullen, K. A., Gentzke, A. S., Sawdey, M. D., Chang, J. T., Anic, G. M., Wang, T. W., Creamer, M., Jamal, A., Ambrose, B. K., & King, B. A. (2019). E-cigarette use among youth in the United States. *JAMA*, *322*(21), 2095- 2103. <https://doi.org/10.1001/jama.2019.18387>

- Dai, H., & Clements, M. (2018). Trends in healthcare provider advice on youth tobacco use, 2011–2015. *American Journal of Preventive Medicine*, 55(2), 222-230.
<https://doi.org/10.1016/j.amepre.2018.04.015>
- Dwedar, I., Ruby, D., & Mostafa, A. (2019). Survey exploring knowledge and beliefs about electronic cigarettes between health care providers and the general population in Egypt
International Journal of Chronic Obstructive Pulmonary Disease, 14, 1943-1950.
<http://dx.doi.org/10.2147/COPD.S214389>
- Galstyan, E., Galimov, A., & Sussman, S. (2019). Commentary: The emergence of pod mods at vape shops. *Evaluation & the Health Professions*, 42(1), 118–124.
<https://doi.org/10.1177/0163278718812976>
- Gentzke, A. S., Creamer, M., Cullen, K. A., Ambrose, B. K., Willis, G., Jamal, A., & King, B. A. (2019). Vital signs: Tobacco product use among middle and high school students — United States, 2011–2018. *Morbidity and Mortality Weekly Report*, 68(6), 157–164.
<http://dx.doi.org/10.15585/mmwr.mm6806e1>
- Gorzowski, J. A., Whitmore, R. M., Kaseeska, K. R., Brishke, J. K., & Klein, J. D. (2016). Pediatrician knowledge, attitudes, and practice related to electronic cigarettes. *Journal of Adolescents Health*, 59, 81-86. <https://doi.org/10.1016/j.jadohealth.2016.03.036>
- Jenssen, B. P., & Walley, S. C. (2019). E-cigarettes and similar devices. *Pediatrics*, 143(2), 1-8.
<https://doi.org/10.1542/peds.2018-3652>
- John, W. S., Grover, K., Greenblatt, L. H., Schwartz, R. P., & Wu, L. (2019). E-cigarette use among adult primary care patients: Results from a multisite study. *Journal of General Internal Medicine*, 35(1), 268-275. <https://doi.org/10.1007/s11606-019-05488-4>

- Lozano, P., Barrientos-Gutierrez, I., Arillo-Santillan, E., Morello, P., Mejia, R., Sargent, J. D., & Thrasher, J. F. (2017). Longitudinal study of electronic cigarette use and onset of conventional cigarette smoking and marijuana use among Mexican adolescents. *Drug Alcohol Dependence*, 180, 427-430. <https://doi.org/10.1016/j.drugalcdep.2017.09.001>
- Mbe, Q., Ayodele, O., & Doss, D. (2017). Nurses' knowledge, beliefs, attitudes, and practices regarding electronic cigarettes: A cross-sectional study. *Tobacco Prevention Cessation*, 3(125), 1-2. <https://doi.org/10.18332/tpc/76550>
- Melnyk, B.M., & Fineout-Overholt, E. (2019). *Evidence-based practice in nursing and healthcare: A guide to best practice* (4th ed.). Lippincott, Williams & Wilkins.
- Morean, M. E., Krishnan-Sarin, S., & O'Malley, S. S. (2018). Assessing nicotine dependence in adolescent e-cigarette users: The 4-item patient-reported outcomes measurement information system (PROMIS) nicotine dependence item bank for electronic cigarettes. *Drug and Alcohol Dependence*, 188(1), 60-63. <https://doi.org/10.1016/j.drugalcdep.2018.03.029>
- National Addiction & HIV Data Archive program. (2020). *Population assessment of tobacco and health (PATH) study series*. <https://www.icpsr.umich.edu/icpsrweb/NAHDAP/series/606>
- Office of Disease Prevention and Health Promotion. (2020). Tobacco Use. In *Healthy People 2020*. U.S. Department of Health and Human Services. <https://www.healthypeople.gov/2020/topics-objectives/topic/tobacco-use>
- Pardavila-Belio, M. I., Canga-Armayor, A., Duaso, M. J., Pueyo-Garrigues, S., Pueyo-Garrigues, M., & Canga-Armayor, N. (2019). Understanding how a smoking cessation intervention changes beliefs, self-efficacy, and intention to quit: A secondary analysis of a pragmatic

- randomized controlled trial. *Translational Behavioral Medicine*, 9(1), 58-66.
<https://doi.org/10.1093/tbm/ibx070>
- Pepper, J. K., Gilkey, M. B., & Brewer, N. T. (2015). Physicians' counseling of adolescents regarding e-cigarette use. *Journal of Adolescent Health*, 57(6), 580–586.
<https://doi.org/10.1016/j.jadohealth.2015.06.017>
- Piper, M. E., Cook, J. W., Schlam, T. R., Jorenby, D. E., Smith, S. S., Collins, L. M., Mermelstein, R., Fraser, D., Fiore, M. C., & Baker, T. B. (2018). A randomized controlled trial of an optimized smoking treatment delivered in primary care. *Annals of Behavioral Medicine*, 52(10), 854–864. <https://doi.org/10.1093/abm/kax059>
- Ren, M., & Lotfipour, S. (2019). Nicotine gateway effects on adolescent substance use. *Western Journal of Emergency Medicine*, 20(5), 696-709.
<https://doi.org/10.5811/westjem.2019.7.41661>
- Rosswurm, M. A. & Larrabee, J. H. (1999). A model for change to evidence-based practice. *Image Journal of Nursing Scholarship*, 31(4), 317-322. <https://doi.org/10.1111/j.1547-5069.1999.tb00510.x>
- University of Arizona. (2020). *COVID-19 forecast models report for arizona, November 27*.
<https://publichealth.arizona.edu/news/2020/covid-19-forecast-model-november-27>
- U.S. Department of Health and Human Services (2020). *Smoking cessation: A report of the Surgeon General*. <https://www.hhs.gov/sites/default/files/2020-cessation-sgr-full-report.pdf>
- U.S. Department of Health and Human Services. (n. d.) *Surgeon General's advisory on e-cigarette use among youth*. <https://e-cigarettes.surgeongeneral.gov/documents/surgeon-generals-advisory-on-e-cigarette-use-among-youth-2018.pdf>

U.S. Preventive Task Force. (2020) *Prevention and cessation of tobacco use in children and adolescents: Primary care interventions.*

<https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/tobacco-and-nicotine-use-prevention-in-children-and-adolescents-primary-care-interventions#bootstrap-panel--4>

Soneji, S., Barrington-Trimis J. L., Wills T. A., Leventhal, A. M., Unger, J. B., Gibson, L. A., Yang, J., Primack, B. A., Andrews, J. A., Miech, R. A., Spindle T. R., Dick, D. M., Eissenberg, T., Hornik, R. C., Dang, R., & Sargent, J. D. (2017). Association between initial use of e-cigarettes and subsequent cigarette smoking among adolescents and young adults: A systematic review and meta-analysis. *JAMA Pediatrics*, *171*(8), 788–797.

<https://doi.org/10.1001/jamapediatrics.2017.1488>

Vogel, E. A., Prochaska, J. J., & Rubinstein, M. L. (2019). Measuring e-cigarette addiction among adolescents. *Tobacco Control*, *29*(3), 1-5. <https://doi.org/10.1136/tobaccocontrol-2018-054900>

Wang, M. P., Li, W. H., Wu, Y., Lam, T. H., & Chan, S. S. (2017). Electronic cigarette use is not associated with quitting of conventional cigarettes in youth smokers. *Pediatric Research*, *82*(1), 14-18. <https://doi.org/10.1038/pr.2017.80>

Zgliczyński, W. S., Jankowski, M., Rostkowska, O., Gujski, M., Wierzba, W., & Pinkas, J. (2019). Knowledge and beliefs of e-cigarettes among physicians in Poland. *Medical Science Monitor*, *25*, 6322–6330. <https://doi.org/10.12659/MSM.916920>

Zhong, J., Cao, S., Gong, W., Fei, F., & Wang, M. (2016). Electronic cigarettes use and intention to cigarette smoking among never-smoking adolescents and young adults: A meta-

analysis. *International Journal of Environmental Research and Public Health*, 13(5), 1-9.

<https://doi.org/10.3390/ijerph13050465>.

Appendix A

Evaluation of Quantitative Studies

Table A1

Evaluation Table

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
<p>Case et al. (2018). Hookah use as a predictor of other tobacco product use: A longitudinal analysis of Texas college students</p> <p>Funding: Grant from the National Cancer Institute and the FDA Center for Tobacco Products (CTP)</p> <p>Bias: None recognized</p> <p>Country: USA</p>	None recognized	<p>Longitudinal analysis data</p> <p>Purpose: 1) To determine if after 30 days of hookah use there is subsequent initiation of tobacco products 2) To determine if after 30 days of hookah use there is subsequent initiation of ENDS use</p>	<p>N1: 5482 N2: 4384</p> <p>Setting: 5 counties in Texas</p> <p>Sample Demographics: College students from Texas who were enrolled in 4-year college or 2-year vocational program.</p> <p>Inclusion Criteria: Individuals 18 -29 years of age Never users of ENDS</p>	<p>IV: Hookah use</p> <p>DV1: Other tobacco product use.</p> <p>DV2: ENDS use</p>	<p>Brief Sensation Seeking Scale 4</p> <p>Substance Use Risk Profile Scale</p>	Chi-square analysis and t-test	<p>DV1: AOR=3.27, 95% CI=2.37, 4.51 p<0.001</p> <p>DV2: AOR=2.60, 95% CI=2.04, 3.76 p<0.001</p>	<p>LOE: Level IV</p> <p>Strengths: Examines hookah use with not only tobacco use, but also with ENDS</p> <p>Weakness: It only examined hookah use for 30 days.</p> <p>Conclusions: Hookah use increases chances of future/subsequent tobacco product.</p> <p>Feasibility: Case et al. (2019) used questionnaires that could be integrated in clinical practice.</p> <p>Utility: Adds to the PICOT question as it</p>

Abbreviation Key: ANCOVA-Analysis of Covariance; AOR-Adjusted Odds Ratio; CI-Confidence Interval; DV-Dependent Variable; ENDS-Electronic Nicotine Delivery System; FTND-The Fagerström Test of Nicotine Dependence; GEE-Generalized Estimation Equation; IV-Independent Variable; LOE-Level of Evidence; LS-Longitudinal Studies; MA-Meta-analysis; N-Number of participants; n-Number of participants in subset; OR-Odds Ratio; PROMIS-E-Patient-Reported Outcomes Measurement Information System Nicotine Dependence Item Bank for E-cigarettes; ROBINS-I-Risk of bias in Non-Randomized Studies of Interventions; RCT-Randomized Control Trial; R2-Relative Risk; r-correlation coefficient; SR-Systematic Review; TTMOC-Transtheoretical Model of Change; y.o.-years-old; α-Cronbach’s alpha value

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
			<p>Exclusion Criteria: Using any tobacco products. Participants need to participate in at least two study waves.</p> <p>Attrition: 20%</p>					<p>provides evidence that not using any type of nicotine products can lead to increased chances of subsequent tobacco products.</p>
<p>Chadi et al. (2019). Association between electronic cigarette use and marijuana use among adolescents and young adults: A systematic review and meta-analysis</p> <p>Funding: None recognized</p> <p>Bias: None recognized</p> <p>Country: USA.</p>	<p>None recognized</p>	<p>SR and MA</p> <p>Purpose: To characterize and quantify the association between e-cigarette and marijuana use among the youth.</p>	<p>N:128,227</p> <p>Setting: various</p> <p>Sample Demographics: Youth 10-24 y.o.</p> <p>Inclusion Criteria: Studies had to compare marijuana use and ENDS. Participants aged 10-24 y.o.</p> <p>Exclusion Criteria: Participants older than 24 y.o AOR/CI not reported</p>	<p>IV: E-cigarette use</p> <p>DV1: Marijuana use in adolescents aged 12 to 17 year</p> <p>DV2: Marijuana use in young adults aged 18 to 24 years</p>	<p>MA of Observational Studies in Epidemiology (MOOSE) reporting guidelines</p> <p>The Newcastle-Ottawa Scale</p> <p>Most of the included studies used surveys.</p>	<p>I² statistic</p> <p>Random effects model</p>	<p>DV1: AOR, 4.29 [95% CI, 3.14-5.87]; I², 94%)</p> <p>DV2: AOR, 2.30 [95% CI, 1.40-3.79]; I², 91%).</p>	<p>LOE: Level I</p> <p>Strengths: Large sample size</p> <p>Weakness: most studies Cross-sectional</p> <p>Conclusions: Increased odds of people to use marijuana if they use e-cigarettes.</p> <p>Feasibility: Age group used in these studies can be used in clinical practice.</p> <p>Utility: Adds to the PICOT question as it highlights the importance</p>

Abbreviation Key: ANCOVA-Analysis of Covariance; AOR-Adjusted Odds Ratio; CI-Confidence Interval; DV-Dependent Variable; ENDS-Electronic Nicotine Delivery System; FTND-The Fagerström Test of Nicotine Dependence; GEE-Generalized Estimation Equation; IV-Independent Variable; LOE-Level of Evidence; LS-Longitudinal Studies; MA-Meta-analysis; N-Number of participants; n-Number of participants in subset; OR-Odds Ratio; PROMIS-E-Patient-Reported Outcomes Measurement Information System Nicotine Dependence Item Bank for E-cigarettes; ROBINS-I-Risk of bias in Non-Randomized Studies of Interventions; RCT-Randomized Control Trial; R2-Relative Risk; r-correlation coefficient; SR-Systematic Review; TTMOC-Transtheoretical Model of Change; y.o.-years-old; α-Cronbach’s alpha value

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
			Abstract only Attrition: None					of screening for e-cigarette use
John et al. (2019). E-cigarette use among adult primary care patients: Results from a multisite study Funding: Patient Centered Outcomes Research Institute Bias: Sample had a minority ethnicity as the majority of the subjects in the study. Only included subjects that spoke English. Country: USA	None recognized	Cross-sectional analysis from a multisite validation study of a substance use screening instrument Purpose: To examine the prevalence and correlates of e-cigarette use among tobacco users in the sample	N: 2000 Setting: Adults of 5 primary care offices in Eastern USA Sample Demographics: Subjects 18 y.o. or older 56.2% females 43.7% males Inclusion Criteria: 18 y.o. or order Exclusion Criteria: Not a patient from the clinics, non-English language. Attrition: 2057/2000 (97.2%)	IV: E-cigarette use (Past 3-month) DV1: Tobacco use disorder (TUD) DV2: Nicotine Dependence	FTND score DSM-5 tobacco use disorder severity	Adjusted Logistic Regression	DV1: AOR, 2.49; 95% CI, 1.55-2.54 p < 0.05 DV2: AOR, 1.69; 95% CI, 1.12-2.54) p < 0.05	LOE: Level IV Strengths: Large sample size Weakness: Self-report Only cross-sectional studies not longitudinal. Conclusions: Screening for e-cigarette use among adult tobacco users in primary care, may have implications for helping patients with tobacco cessation Feasibility: Screening tools like the ones used in the study can be used in clinical practice. Utility: This adds to the PICOT questions, because the study was performed in primary care offices
Lozano et al. (2017) Longitudinal study of electronic	None recognized	Design: Longitudinal survey that	N: 6574 Follow up	IV1: trial of electronic cigarette.	Scale of sensation seeking	Estimating equations (GEE) with	DV1: R2 1.41, 95% CI 1.18-1.70	LOE: Level IV

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
<p>cigarette use and onset of conventional cigarette smoking and marijuana use among Mexican adolescents</p> <p>Funding: Fogarty International Center and the National Cancer Institute of the United States' National Institute of Health</p> <p>Bias: None recognized</p> <p>Country: Mexico</p>		<p>used a stratified, multistage random sampling scheme.</p> <p>Purpose: Evaluated whether e-cigarette use in teens in Mexico raised the chances of using cigarettes or marijuana use at follow-up survey</p>	<p>n: 4695 (conventional cigarette smoking)</p> <p>Follow up n: 5672 (marijuana)</p> <p>Setting: Public middle school in Mexico</p> <p>Sample Demographics: 12 to 13-y.o. middle school students. 48% males 52% females</p> <p>Inclusion Criteria: Individuals who have never tried conventional cigarettes, cocaine, or marijuana at baseline</p> <p>Exclusion Criteria: Individuals with</p>	<p>DV1: trial conventional cigarette.</p> <p>DV2: Marijuana use.</p>	<p>$\alpha = 0.80$</p> <p>Survey</p>	<p>log-binomial models</p>	<p>DV2: R2 1.42, 95% CI for 0.84-2.37</p>	<p>Strengths: Sample was taken in 3 main cities in Mexico.</p> <p>Weakness: The sample was taken only in 3 urban cities not rural areas. Assessment was only at baseline; there were no assessments in between.</p> <p>Conclusions: Need of new health policies to regulate e-cigarette use.</p> <p>Feasibility: A survey to assess for e-cigarette use like the one used by Lozano et al. (2017) could be used in clinical practice.</p> <p>Utility: Adds to the PICOT as it shows e-cigarette consequences in countries other than USA.</p>

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
			missing data or previously tried marijuana, conventional cigarette or cocaine. Attrition: 25% (84/63) causes included the students that followed up.					
Morean et al. (2018) Assessing nicotine dependence in adolescent e- cigarette users: The 4-item patient- reported outcomes measurement information system (PROMIS) nicotine dependence item bank for electronic cigarettes. Funding: FDA Center for Tobacco Products Bias: Some bias noted as The FDA	None recognized	Design: Cross- sectional Purpose: To evaluate the PROMIS-E for assessing youth e- cigarette nicotine dependence and examined risk factors for experiencing stronger dependence symptoms	N: 520 Setting: High school students Sample Demographics: Female: 50.5 % White 84.8% Inclusion Criteria: Affirmative response on the survey about the use of e-cigarette Exclusion Criteria:	IV: E-cigarette nicotine dependence DV1: Higher grade level at school DV2: vaping more frequently DV3: using higher nicotine concentration	PROMIS-E Assessment tool Survey	Descriptive statistics	DV1: r = 0.13 DV2: r = -0.31 DV3: r = 0.46	LOE: Level Strengths: Large sample Weakness: Self-reported. Conclusions: Teen e- cigarette users reported nicotine dependence. Stronger nicotine dependence symptoms were correlated with increased risk for frequent vaping and tobacco cigarette dependence. Feasibility: Tool used in this study could be used to

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Center for Tobacco products funded the study. Country: USA			Not filling out all the data in the survey Attrition: None					assess nicotine dependence Utility: It adds to the PICOT question because it supports the importance of screening for e-cigarette use.
Pardavila-Belio et al. (2019). Understanding how a smoking cessation intervention changes beliefs, self-efficacy, and intention to quit: A secondary analysis of a pragmatic randomized controlled trial Funding: Chair of María Egea, University of Navarra (Spain). Bias: None recognized Country: Spain	Theory of Triadic Influence (TTI)	Single-blind, pragmatic randomized controlled trial Purpose: Evaluate the changes in self-efficacy, beliefs, and intention to stop smoking, after an intervention among college student smokers.	N: 255 n: 133 (intervention group) n: 122 (control group) Setting: 2 Universities in Northern Spain. Sample Demographics: Undergraduate and Master students in the year 2013-2014. Inclusion Criteria: Individuals 18-24 who smoked a minimum of one	IV: Smoking cessation intervention DV1: Self-efficacy. DV2: Belief. DV3: Intention to quit.	Smoking-related self-efficacy, belief, and intention scale ($\alpha = 0.68$)	ANCOVA	DV1: (95% CI) 1.85 (1.22 to 2.49) p <0.001 DV2: (95% Ci) 1.89 (0.96 to 2.81) p<0.001 DV3: (95% CI) 1.32 (0.90 to 1.75) p<0.001	LOE: Level II Strengths: Evaluated self-efficacy, beliefs, and intention related to quitting smoking as potential mediators. Weakness: Only done with university students, with only one university Conclusions: Increased self-efficacy and intention to quit to decrease smoking. Intention to quit is partial mediator to stop smoking. Feasibility: Pardavila-Belio et al. (2019) used the smoking-related self-efficacy, belief, and intention scale, and this could be used

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
			cigarette a week within past 6 months Exclusion Criteria: Being former smoker Attrition: 29% (359/255)					after it is recognized that a person wants to quit. Utility: Add to the PICOT question as it provides interventions of how receiving an intervention can increase your chances to stop using cigarettes when an individual has intention to quit.
Piper et al. (2018). A randomized controlled trial of an optimized smoking treatment delivered in primary care Funding: National Institute of Health Bias: None recognized Country: USA	None recognized	RCT Purpose: To validate an optimized smoking cessation treatment package that comprises intervention components identified as effective in factorial screening experiments conducted as per the Multiphase Optimization	N: 627 Setting: Primary care clinics Sample Demographics: Adult smokers motivated to quit White 69.2% Hispanic 3.4% Inclusion Criteria: >17 y.o. Smoke > 4 cigarettes per day in the past 6 months. Able to speak, read, and write in English. Phone access.	IV: optimize smoking cessation treatment DV1: Recommended usual care (RUC) DV2: Abstinence optimized treatment. (AOT)	FTND	Logistic regression	DV1: ORs: 1.91- 3.05 p < 0.001 DV2: OR=2.94, p <0.001	LOE: Level II Strengths: Large sample size Weakness: Self-reported Conclusions: A smoking cessation treatment that is optimized via MOST enhances tobacco cessation rates. Feasibility: Interventions in this study could be implemented in primary care clinics. Utility: It adds to the PICOT question in that screening for e-cigarettes can help recognize

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
		Strategy (MOST)	<p>Exclusion Criteria: psychiatric diagnosis, taking Bupropion</p> <p>Attrition: None reported</p>					individuals with intention to quit.
<p>Soneji et al. (2017). Association between initial use of e-cigarettes and subsequent cigarette smoking among adolescents and young adults: A systematic review and meta-analysis</p> <p>Funding: National Cancer Institute, National Institute of Health.</p> <p>Bias: None recognized</p> <p>Country: USA</p>	None recognized	<p>SR and MA of LS</p> <p>Purpose: To perform a systematic review or meta-analysis of longitudinal studies of e-cigarette use with subsequent cigarette smoking</p>	<p>N:17389 (9 studies included)</p> <p>Setting: 5 studies were in urban cities in USA</p> <p>Sample Demographics: 14-30 y.o 56% females</p> <p>Inclusion Criteria: LS</p> <p>Exclusion Criteria: Cross-sectional studies, qualitative studies. Studies conducted before 2014.</p> <p>Attrition: None reported</p>	<p>IV: E-cigarette use</p> <p>DV: Subsequent cigarette smoking</p>	<p>Newcastle Ottawa Scale ROBINS-I tool</p> <p>Surveys or questionnaires used in the studies included</p>	<p>I² statistic</p> <p>Observed probability</p>	<p>DV: 3.50 (95% CI, 2.38-5.16)</p>	<p>LOE: Level I</p> <p>Strengths: Being a MA, all of the studies were LS.</p> <p>Weakness: Unknown kind of e-cigarette</p> <p>Conclusions: E-cigarette use was associated with subsequent cigarette use</p> <p>Feasibility: The feasibility is limited, however, the population used in the study is relevant for the PICOT question.</p> <p>Utility: The conclusion adds evidence to the PICOT question.</p>

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
<p>Wang et al. (2017). Electronic cigarette use is not associated with quitting of conventional cigarettes in youth smokers.</p> <p>Funding: Tobacco Control Office, Department of Health, Government of Hong Kong SAR</p> <p>Bias: None recognized</p> <p>Country: Hong Kong</p>	TTMOC	<p>LS</p> <p>Purpose: To investigate the associations of e-cig use with smoking cessation behaviors, level of nicotine dependence, and perceived self-efficacy on quitting cigarette smoking in youth smokers in Hong Kong.</p>	<p>N:189</p> <p>Setting: Phone call surveys.</p> <p>Sample Demographics: Mean age: 18.1 y.o. Full time student: 74.3% Male: 82%</p> <p>Inclusion Criteria: Cantonese speaking Smoked at least one cigarette in the past month. ≤ 25 y.o</p> <p>Exclusion Criteria: Going to other cessation programs Inability to communicate.</p> <p>Attrition: None reported.</p>	<p>IV: E-cigarette</p> <p>DV1: Nicotine dependence</p> <p>DV2: Self-efficacy/confidence</p> <p>DV3: Intention to quit.</p>	FTND Survey	Two tailed with $\alpha=0.05$	<p>DV1: b: 0.75, 95% CI: -0.39 to 1.90</p> <p>DV2: -0.13, 95% CI: -1.80 to 1.54</p> <p>DV3: adjusted OR: 0.55, 95% CI: 0.15 to 2.05</p>	<p>LOE: Level IV</p> <p>Strengths: Study was longitudinal.</p> <p>Weakness: Small sample, study was performed outside USA</p> <p>Conclusions: E-cigarette use had no association with successful smoking cessation</p> <p>Feasibility: Tool used in this study can be used to assess nicotine dependence.</p> <p>Utility: It adds to the PICOT question because it specifically measures e-cigarette use and intention to quit</p>

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentatio n	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
<p>Zhong et al. (2016). Electronic cigarettes use and intention to cigarette smoking among never-smoking adolescents and young adults: A meta-analysis</p> <p>Funding: Medicine and Health Care in Zhejiang Province Science and Technology Plan</p> <p>Bias. None recognized</p> <p>Country: USA, China, United Kingdom.</p>	None recognized	<p>MA</p> <p>Purpose: Examine the link between e-cigarettes use and smoking intention among adolescents and young adults.</p>	<p>N:91,051 (9 studies)</p> <p>Setting: Various</p> <p>Sample Demographics: teenagers or young adults.</p> <p>Inclusion Criteria: Cross-sectional or LS, providing CI 95%, never smokers.</p> <p>Exclusion Criteria: Non-English, publication was a review, or news.</p> <p>Attrition: None reported</p>	<p>IV: e-cigarette use DV: smoking intention</p>	<p>Epidemiology (MOOSE) guidelines</p> <p>Surveys used in the studies included</p>	<p>Q-test</p> <p>I2 statistic</p>	<p>DV: OR 2.46, 95% CI = 2.01–3.01</p> <p>Heterogeneity: (p = 0.64, I2 = 0%)</p>	<p>LOE: Level I</p> <p>Strengths: Large sample size</p> <p>Weakness: Search was done only in three data bases.</p> <p>Conclusions: E-cigarettes use by never-smoking youth is associated with cigarette smoking intention.</p> <p>Feasibility: Questionnaires used in the studies could be used in clinical practice.</p> <p>Utility: Adds to the PICOT question about e-cigarette and smoking intentions in the youth.</p>

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Table A2*Synthesis Table*

Author	Case et al., 2018	Chadi et al. 2019	John et al., 2019	Lozano et al., 2017	Morean et al., 2018	Pardavila- Belio et al., 2019	Piper et al., 2018	Soneji et al., 2017	Wang et al., 2017	Zhong et al., 2016
Design	LS	SR and MA	Cross-sectional	LS	Cross-sectional	RCT	RCT	SR & MA	LS	MA
Number of Subjects	M1: 2355 M2: 2590	128,227	2000	6574	520	255	623	17,389	189	91,051
Demographics										
Age (Mean y.o.)	M1: 19.7 M2: 20.0	12-24	47.3	12-13	16.22	20	49.7	14-30	18.1	NR
% Females / % of Males			56.3/ 42.7		50.5/NR		57.3/NR	56/NR	NR/82	
18 or older	X					X	X		X	
17 y.o or younger				X	X				X	
Setting										
United States	X	X	X		X		X	X		
International				X		X			X	X
Independent Variable										
Hookah use	X									
EC use or EC nicotine dependence		X	X	X	X			X	X	X
Smoking cessation intervention						X	X			

Abbreviation Key: EC: E-cigarette; ENDS: Electronic Nicotine Delivery System; LS: Longitudinal Study; MA-Meta-analysis; M1: Model 1; M2: Model 2; NR- Not reported; RCT: Randomized Control Trial; SR-Systematic Review; y.o. – years-old; ↓: decreased; ↑: increased

Dependent Variables										
EC or ENDS use or vaping more frequently	X				X					
Marijuana use		X		X						
Tobacco products use or Intention	X		X	X				X		X
Nicotine Dependence			X						X	
Self-efficacy & Intention to quit						X				
Enhanced Cessation Rate							X		X	
Using higher nicotine level					X					
Finding										
Odds of marijuana use		↑		↑						
Cigarette smoking initiation or Intention	↑			↑				↑		↑
Tobacco use disorder/Nicotine Dependence			↑		↑					
Smoking Cessation						↑	↑		↓	
ENDS use	↑									

Abbreviation Key: EC: E-cigarette; ENDS: Electronic Nicotine Delivery System; LS: Longitudinal Study; MA-Meta-analysis; M1: Model 1; M2: Model 2; NR- Not reported; RCT: Randomized Control Trial; SR-Systematic Review; y.o. – years-old; ↓: decreased; ↑: increased

Table D3 *Two-Tailed Mann-Whitney Test for AID by Pre-test_Post-test*

Variable	Mean Rank		<i>U</i>	<i>z</i>	<i>p</i>
	1	2			
AID	15.41	28.50	12.00	-2.69	.007

Table D1*Participant Demographics*

Variable	<i>n</i>	<i>%</i>
Gender		
Male	8	27.59
Female	21	72.41
No response	0	0.00
Age		
18-24	7	24.14
25-34	10	34.48
35-44	6	20.69
45-54	5	17.24
55-61	1	3.45
No response	0	0.00
Ethnicity		
Hispanic or Latino	3	10.34
Not Hispanic or Latino	26	89.66
No response	0	0.00
Race		
Asian	2	6.90
White	27	93.10
No response	0	0.00
Type of Provider		
Nurse Practitioner	19	65.52
Physician Assistant	9	31.03
Other	1	3.45
No response	0	0.00
Heard about E-cigarettes (EC)		
Yes	28	96.55
No response	1	3.45
How did you FIRST LEARNED about EC		
Media ads	12	41.38
Newspaper	1	3.45
Roadside Poster (Billboard or signpost)	1	3.45
From patients/clients	12	41.38
Professional sources	2	6.90
No response	1	3.45

How long have you been a healthcare provider?

Less than 5 years	8	27.59
5-10 years	8	27.59
11-15 years	1	3.45
More than 15 years	12	41.38
No response	0	0.00

How much do you know about EC?

Nothing at all	1	3.45
A little	11	37.93
A moderate amount	13	44.83
Quite a lot	3	10.34
No response	1	3.45

About what % of your pts are EC users?

0-25%	19	65.52
26-50%	3	10.34
51-75%	2	6.90
76-100	4	13.79
No response	1	3.45

Note. Due to rounding errors, percentages may not equal 100%.

Table D2

Variable	Pre-test	Post-test
E-cigarette (EC) are safer than regular cigarette		
Strongly Agree	0 (0%)	0 (0%)
Agree	5 (17%)	0 (0%)
Disagree	17 (59%)	2 (50%)
Strongly Disagree	7 (24%)	2 (50%)
No response	0 (0%)	0 (0%)
EC are helpful AID for smoking cessation		
Strongly Agree	1 (3%)	0 (0%)
Agree	9 (31%)	0 (0%)
Disagree	13 (45%)	0 (0%)
Strongly Disagree	6 (21%)	4 (100%)
No response	0 (0%)	0 (0%)
EC may be a gateway to conventional smoking		
Strongly Agree	9 (31%)	1 (25%)
Agree	15 (52%)	3 (75%)
Disagree	5 (17%)	0 (0%)
Strongly Disagree	0 (0%)	0 (0%)
No response	0 (0%)	0 (0%)
EC use is a public concern		
Strongly Disagree	0 (0%)	0 (0%)
Disagree	1 (3%)	0 (0%)
Agree	13 (45%)	2 (50%)
Strongly Agree	15 (52%)	2 (50%)
No response	0 (0%)	0 (0%)
EC should be regulated in work and public places		
Strongly Disagree	1 (3%)	0 (0%)
Disagree	1 (3%)	0 (0%)
Agree	10 (34%)	0 (0%)
Strongly Agree	17 (59%)	4 (100%)
No response	0 (0%)	0 (0%)

How difficult would it be for you to counsel your pts or their family members about EC?

Extremely easy	6 (21%)	1 (25%)
Moderately easy	12 (41%)	2 (50%)
Slightly easy	4 (14%)	1 (25%)
Moderately difficult	6 (21%)	0 (0%)
Extremely difficult	1 (3%)	0 (0%)
No response	0 (0%)	0 (0%)

How likely are you to counsel your pts or family members about EC?

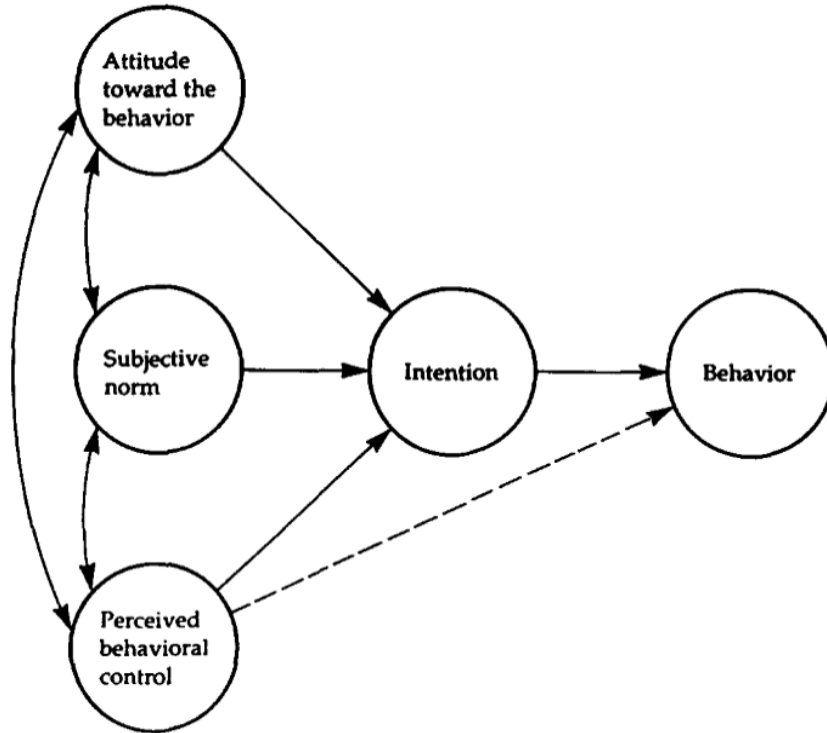
Extremely unlikely	1 (3%)	0 (0%)
Moderately unlikely	1 (3%)	0 (0%)
Slightly unlikely	1 (3%)	0 (0%)
Neither likely or unlikely	1 (3%)	0 (0%)
Slightly likely	4 (14%)	1 (25%)
Moderately likely	10 (34%)	0 (0%)
Extremely likely	11 (38%)	3 (75%)
No response	0 (0%)	0 (0%)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Appendix B
Models and Frameworks

Figure 1

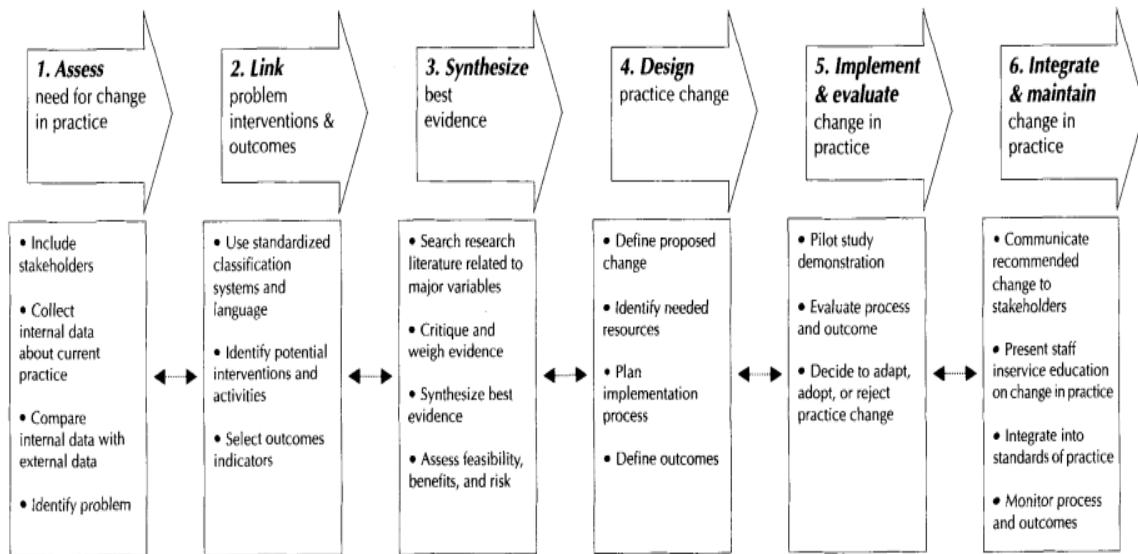
Theory of Planned Behavior



Ajzen (1991).

Figure 2

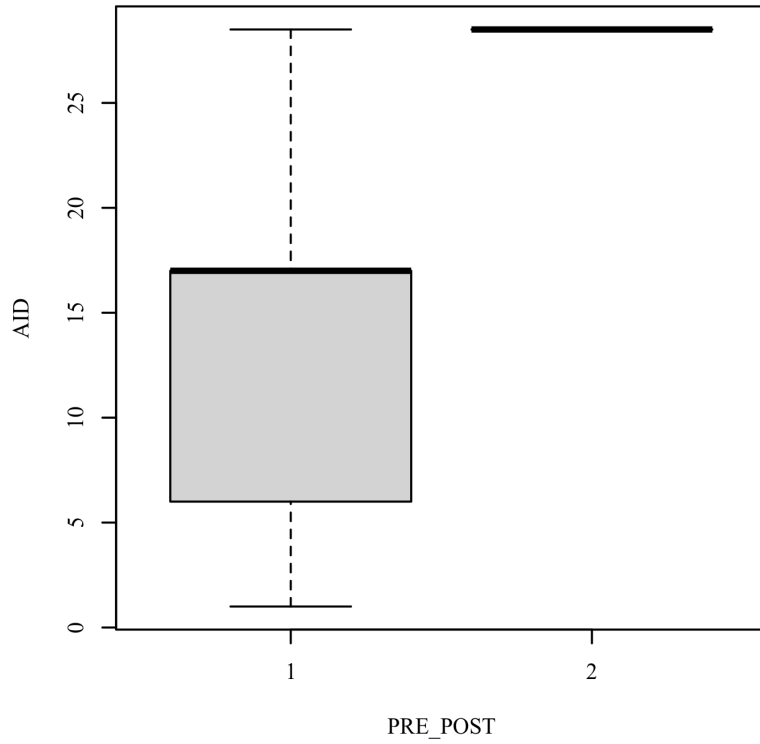
Rosswurm and Larabee's Model



Rosswurm and Larrabee (1999).

Figure 3

Ranks of AID by PRE_POST



Appendix C

Table C1

Budget

Projected Expenses			
Type of Cost	Activity	Expenses	In-Kind-Support
	Personnel		
Direct	Project Lead (DNP student) \$40/hour 20 hours per week for 12 weeks		\$9,600
	Site Champion Chief, Division of Advanced Practice & Clinical Integration 1 hours per month at \$69.74/hour for 12 months		\$836.88
	Site Champion Clinical Services Senior Manager 2 hours per month at \$48.55/hour for 4 months		\$388.40
	IT department support QuestionPro 15 hours at \$26.33/hour		\$394.95
	Primary Care Providers (Advance Practice Providers) 29 providers (2 hour each provider at \$53.50/hour)		\$3103

Indirect	Office and Operations		
	Utilizing computers at the facility to complete CME (depreciation of computers due to usage)		\$500
	Utilizing different spaces in the organization to complete CME (air conditioning, electricity, different offices throughout organization)		\$500
	Office space for project director to develop CME and implement project remotely (internet usage, electricity, air-conditioning, laptop computer depreciation) for 12 weeks		\$200
	Materials		
	Intellectus Software one-year access		\$149
Potential Cost	TOTAL	\$0	\$15,172.33