

DANGERS OF ELECTRONIC NICOTINE DELIVERY
SYSTEM USE: HEALTHCARE PROVIDER
SCREENING IN COLLEGE
STUDENTS

Julie Wood Barney

A Project Report Submitted to
the Faculty of The School of Nursing at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the
Doctorate in Nursing Practice

Greensboro
2024

Approved by

Dr. Kathryn Lawrence

Project Team Leader

Ms. Brittany Hill, Clinic Administrator

Project Team Co-Leader

Dr. Wanda Williams

DNP Program Director

Table of Contents

Dedication and Acknowledgements.....	3
Abstract.....	4
Background and Significance.....	5
Purpose.....	9
Review of Current Evidence.....	9
Conceptual Framework/ Theoretical Model.....	19
Translational Framework.....	20
Plan.....	22
Do.....	26
Study.....	29
Act.....	42
Conclusion.....	43
References.....	46

Appendices

Appendix A Site Approval Letter from Clinic Administrator

Appendix B Recruitment Script

Appendix C Email Correspondence with Clinic Administrator

Appendix D Educational offering

Appendix E HONC Screening Tool

Appendix F Pre-Education Survey

Appendix G Post-Education Survey

Appendix H Post-Implementation Survey

Dedication

I dedicate this project to my nephew, Trace. During the COVID 19 pandemic, when homeschooling became a sudden reality for most American families and all extra-curricular activities came to a halt, Trace, 15, had more free time than he was accustomed. His parents encouraged him to get a part-time job at a local pizza joint. He quickly found that he loved the responsibilities that came with working, and even more so, he loved having his own money to spend. One of his older coworkers introduced him to vaping. Trace loved how the vape made him feel. Within seconds he felt a boost of confidence, less anxiety, and an increased ability to focus and concentrate. Within two years, Trace was an addict; not only to the nicotine in the vape, but also to THC, the active ingredient in marijuana which is vaporized in a synthetic form in vape pens. Trace craved anything that gave him the same “dopamine” surge the vape did, even if that included high risk, dangerous behaviors. Despite mental health counseling, addiction specialists, multiple nicotine replacement therapies, etc. Trace continued to struggle and eventually wound up in an in-patient rehabilitation setting after he stole his parent’s car and credit card and was found beat up, passed out face down in front of a Red Roof Inn.

Trace is a lucky one. Because he was only 17 at the time, and not legally an adult, his parents were able to admit him to a youth residential program in Fort Worth, Texas. It was there, that Trace found the hope and help he desperately needed. While the road has not been an easy one, Trace is now a freshman in college, and he is living free from addiction. He has accountability at his university and remains in contact with his addiction specialist and counselors. He is strong and determined and committed to his faith. I am honored to dedicate this project to him and hope that with increased education and screening efforts we can begin to see the numbers of youth choosing to vape to decline.

Abstract

Purpose: This quality improvement project sought to increase intent to screen for Electronic Nicotine Delivery System (ENDS) use in college students by providing an in-person educational PowerPoint for healthcare providers regarding the dangers of ENDS. **Background:** While smoking rates among college students have plummeted over the last decade, vaping rates have reached epidemic levels. The negative consequences of nicotine addiction and (ENDS) use are well documented in literature. The lack of screening and prevention efforts for ENDS use presents a gap in the care currently offered to college students. Screening provides an opportunity for providers to educate students on vaping dangers and encourage cessation efforts. **Methods:** Participants received education that highlighted the dangers and negative health impacts of ENDS, a screening tool for clinic employees to use to screen students for END use, and how to ACT (Ask-Counsel-Treat) in 2-3 minutes. Providers were surveyed pre/post education and six weeks after the screening tool implementation with a closed-end Likert scale survey that evaluated providers' perceptions and self-efficacy. **Results:** Improving providers' ENDS knowledge increased intent to screen for ENDS, increased willingness to provide patient education regarding ENDS, and increased provider inclination to advise against ENDS. **Recommendations & Conclusions:** With updates to the electronic medical record (EMR) and placement of ENDS screening with cigarette and tobacco use screening, future studies to examine if screening rates continue to rise in this population after providers are educated on the dangers of ENDS are crucial. *Keywords:* Electronic nicotine delivery systems, vaping, college students, screening tools

Background and Significance

Adolescents and young adults are more likely to engage in risky health behaviors, including the dangers of using products containing nicotine (US Food and Drug Administration: Center for Tobacco Products [FDA], 2022). Electronic nicotine delivery systems (ENDS), also commonly referred to as e-cigarette use or vaping, are most significant among younger adults compared to older adults. Of younger adults aged 18-24 years, 7.6% reported using ENDS, compared to 4.3% of adults aged 25-44, with the least reported use in adults, at 2.1%, for aged 45-64 years. (Centers for Disease Control and Prevention [CDC], 2022a). The total number of adult smokers in the United States is at its lowest point since the Great Depression, with the number at 15% of the population or the equivalent of 38 million Americans (Drope et al., 2017). ENDS use, however, tends to drive patterns of overall tobacco product usage among American adolescents and young adults. The 2022 National Youth Tobacco Survey (NYTS), a survey conducted by the FDA in collaboration with the CDC of middle and high school students, determined that more than 1 in 10 middle and high school students (3.08 million) had used a tobacco product during the past 30 days - including 16.5% of high school and 4.5% of middle school students (CDC, 2022a). For the fifth consecutive year, ENDS were the most used inhaled product among U.S. youth (FDA, 2022). One in four students, or 27.6%, are daily users, and four in ten, or 39.4%, are regularly using ENDS (greater than 20 days of the past 30 days) (FDA, 2022).

Though introduced initially in 2007 as a safer, more discrete, more efficient, and better-tasting alternative to traditional tobacco products, ENDS have failed to live up to their expectations as cessation aids to traditional smokers. Adolescents are becoming addicted to these nicotine products at alarming rates (Ward et al., 2023). Among U.S. middle and high

school students, ENDS use increased 900% during 2011-2015, declined slightly during 2015-2017, then rose 78% among high schoolers to 11.7% in 2017, to 20.8% in 2018, and up to a shocking 27.5% in 2019 (Surgeon General's Advisory on E-Cigarette Use Among Youth, 2022; Goldenson et al., 2019). Traditional smoking is at an all-time low of 13.7% for adults and 2.2% among college students (CDC, 2021; Bourdon & Hancock, 2019). Currently, 12-21% of college-age adults, which number at approximately 9,000,000, are vaping nicotine (Bourdon & Hancock, 2019; NIH, 2020).

With these alarming figures in mind, the dramatic rise in the use of these substances can be attributed to several factors. Factors affecting ENDS use include smoking cessation, alternatives to other tobacco products, pleasure/sensation seeking, and even harm reduction, as many ENDS manufacturers and, therefore, healthcare providers initially deemed ENDS safer than smoking (Drope et al., 2017). The two most influential factors associated with smoking initiation and ENDS use are parental smoking and parental nicotine dependence (Becker et al., 2020). Youth are especially susceptible to nicotine addiction (FDA, 2022; Goldenson et al., 2019), which activates the brain's reward circuits, and repeated nicotine exposure is reinforced (CDC, 2022b). Nicotine addiction can predispose adolescents and young adults to future addiction to other substances and harm parts of the brain that control mood and impulse control by changing the way synapses are formed between brain cells in the adolescent brain (CDC, 2022b; FDA, 2022). In addition, nicotine addiction increases the risk of systemic physiologic disorders, immune responses, and reproductive health. In adolescents with developing brains, nicotine has lasting impacts on learning, attention, and memory (CDC, 2022b; FDA, 2022).

Additionally, ENDS use has been linked to nicotine addiction, vaping of other substances, including marijuana concentrates, which are known to be more powerful physically

and psychologically than plant marijuana (Drug Enforcement Agency [DEA], 2019), increased respiratory conditions, chronic obstructive pulmonary disease (COPD), asthma, and cancer (Owotomo et al., 2022). The recent rise and popularity of vaping and ENDS use are changing the way teens and young adults interact with tobacco products. With the outbreak of Electronic Cigarette and Vaping Associated Lung Injury (EVALI), cases of severe pulmonary disease with unclear etiology were reported in 2019. With the current body of evidence establishing that ENDS is not safer than smoking, it is essential for healthcare providers to learn more about the dangers of vaping and identify potential adverse health effects in patients (Jatlaoui et al., 2019; Owotomo et al., 2022).

ENDS products like JUUL, Puff Bar, and Vuze, favorites among young users, deliver significantly higher levels of nicotine than combustible cigarettes, and as a result, young people are dealing with significant addiction rates (Giovacchini et al., 2022; Ward et al., 2023). One 20 mg/ml disposable vape that holds 2 ml of e-liquid would have a total of 40 mg of nicotine, equal to approximately 40 or 50 cigarettes (CDC, 2022b). These products contain nicotine salts, which permit higher nicotine levels to be inhaled easily, with significantly less irritation than free-base nicotine in other ENDS (CDC, 2022b; Giovacchini et al., 2022). As mentioned previously, these higher concentrations of nicotine can potentiate the incidence of nicotine addiction among vulnerable users (Ward et al., 2023).

Current literature demonstrates the negative consequences of nicotine addiction and ENDS, but there is a gap in screening and prevention services for adolescents and college students. The U. S. Preventative Services Task Force (USPSTF) members recommend that all youth be screened for exposure to ENDS and that brief education be provided to prevent initiation of use (USPSTF, 2022). In the work of Becker et al. (2022), the researchers concluded

that it is essential to develop interventions to mitigate the use of ENDS to prevent the further progression of use to even riskier substances, like synthetic marijuana. Counseling must occur early in the pre-teen years to introduce the dangers of these substances (Collins et al., 2017). Schools, community agencies, and even churches should all take part in educating young people about these products. The FDA must be vigilant in reviewing applications for these flavored products and issuing marketing denial orders (MDOs) when the products are a proven public health concern (CDC, 2021). Moreover, it is recommended that physicians refrain from prescribing ENDS as part of their smoking cessation protocols to teens or young adults who are currently attempting to quit smoking (Jatlaoui et al., 2019; Ward et al., 2023). Along with prevention efforts in the community and the medical clinic, screening by healthcare providers is a critical component of this fight for the health of our young people.

Notably, screening for disease processes, such as lung cancer, breast cancer, and colon cancer, provides opportunities for healthcare providers to educate patients, offer decision-making support tools, and reinforce appropriate screening triage protocols according to evidenced-based interventions (Richards et al., 2020; Ward et al., 2023). For the most part, healthcare providers in the college setting are aware of the dangers of heavy drinking, and screening tools for alcohol use are numerous. While screening for traditional smoking is common, few providers screen for ENDS use (Cano Rodriguez et al., 2020). Healthcare providers do not regularly screen adolescents and young adults for ENDS use despite potential detrimental health effects (Cano Rodriguez et al., 2020; Ward et al., 2023). Providers have cited a lack of education regarding ENDS as well as the lack of a process for screening for ENDS use as reasons for the delinquency in screening their adolescent and young adult patients (El-Shahawy et al., 2016).

Purpose

This quality improvement project sought to increase the intent to screen for ENDS use in college students by providing an in-person educational PowerPoint for healthcare providers at a university-based clinic to receive current data regarding the dangers of ENDS use. Current screening practices were analyzed prior to and after the educational offering. The specific aims of this QI project include:

Aim 1: Offer evidence-based education on ENDS health risks, causative factors, and efficacy of the screening tool.

Aim 2: Measure healthcare providers' results of pre/post-intervention ENDS knowledge and perceptions of self-efficacy on screening for ENDS use.

Aim 3: Offer the *Hooked-on Nicotine Checklist* (HONC) for providers to use as a screening tool for college students and evaluate its efficacy and ease of administration (DiFranza et al., 2002).

Aim 4: Provide a summary to the clinical administrator regarding the providers' intent to screen for ENDS use after implementing the HONC screening tool into practice.

Review of Current Evidence

Purpose of the Synthesis

This literature review explored the adverse health effects of ENDS use, the prevalence of patient education and prevention efforts, and current screening practices and documentation of ENDS use in college medical clinics. This review provided current evidenced-based research regarding ENDS use in adolescents and young adults and screening practices among health care providers.

Search Strategy

An initial query of database searches was performed in CINAHL, PubMed, and Google Scholar. Search terms such as “e-cigarette and vaping health effects,” “electronic cigarettes and youth,” “young adults and e-cigarettes,” “screening for e-cigarette/vaping use,” and health care providers and screening for ENDS use” were all applied. Articles published within the last five years, from 2018 to the present, with available full-text versions, were utilized, with the search ~~was~~ limited to peer-reviewed articles. Snowballing was used to look for additional sources and review overlap and source penetration. The search yielded 24 articles, including randomized control trials, nonexperimental qualitative studies, non-randomized studies, and two extensive retrospective cohort studies. The terms “marijuana,” “THC,” “smoking,” “cigarettes,” and “pediatric” or “children” were excluded from narrowing the scope of the search to those adolescents and young adults vaping nicotine. Three themes were identified in the literature synthesis and will be discussed in this review. These include the adverse health effects of ENDS use in adolescents and young adults; the prevalence of patient education and prevention efforts for ENDS use; and the delinquency in screening practices and documentation of ENDS habits in youth (Becker et al., 2020; Hein et al., 2020; LeLaurin et al., 2019).

Adverse Health Effects of ENDS

Many undergraduate students consider smoking and drinking an integral part of their college experience, almost as if it is a rite of passage. The introduction and widespread use of ENDS has dramatically changed the way teens and young adults interact with tobacco products.

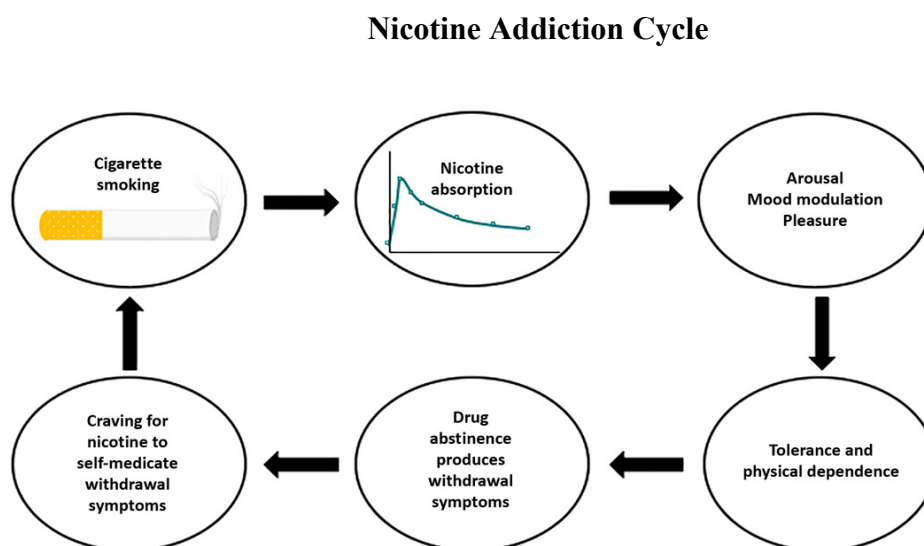
Nicotine Addiction

Multiple studies and systematic reviews find that nicotine addiction in young adults is by far the most common adverse health consequence of ENDS (Demody, 2021; Trucco et al., 2020;

Walley et al., 2019). Youth are especially susceptible to nicotine addiction (FDA, 2022; Trucco et al., 2020; Walley et al., 2019), which activates the brain's reward circuits, and repeated nicotine exposure is reinforced (CDC, 2022b). Nicotine activates neural pathways in the brain, increasing disease risk and adversely affecting maternal health and fetal development (Drope et al., 2017; Trucco et al., 2020). Nicotine binds to and activates nicotinic acetylcholine receptors in the brain, releasing dopamine and other neurotransmitters (Trucco et al., 2020). Dopamine is the pleasure center of the brain and provides feelings of pleasure, satisfaction, and motivation. When dopamine levels are excessive, young people can be more aggressive, have difficulty sleeping, and have poor impulse control (Trucco et al., 2020). The nicotine addiction cycle outlines the process of cigarette smoking (nicotine use) and its effects on the brain (Figure 1)

Figure 1

Nicotine addiction cycle



Note. From “Current advances in research in treatment and recovery: Nicotine addiction,” by Prochaska & Benowitz, 2019, *Science Advances*, 5(Eaay9763) (<https://doi.org/10.1126/sciadv.aay9763>). Copyright © 2019. The Authors, some rights reserved, exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. Distributed under a Creative Commons Attribution-Noncommercial License 4.0 (CC BY-NC).

Nicotine addiction increases the risk of systemic physiologic disorders, immune responses, and reproductive health (Trucco et al., 2020; Walley et al., 2019). In adolescents with developing brains, nicotine impacts learning, attention, and memory (CDC, 2022b; Drope et al., 2017; FDA, 2022; Walley et al., 2019).

Respiratory Conditions

In addition to the harmful effects of nicotine, young adults who vape are at increased risk for respiratory conditions, including asthma, COPD, and e-cigarette or vaping-associated lung injury or EVALI (Jatlaoui et al., 2019; Trucco et al., 2020; Walley et al., 2019). Patients with EVALI present with critical symptoms such as shortness of breath, chills, fever, cough, vomiting, diarrhea, headache, elevated heart rate, chest pain, or dizziness and often require mechanical intubation (CDC, 2022a; Jatlaoui et al., 2019). As of February 18, 2020, 2807 cases of EVALI have been reported from all 50 states (CDC, 2022a). This number included over sixty deaths, and nearly half of the patients diagnosed with EVALI required intensive care to treat the respiratory symptoms (CDC, 2020a).

When students vape, an aerosol is produced when the liquid, often called “e-juice,” “e-liquid,” or “vape juice,” is heated and inhaled into the lungs (Jatlaoui et al., 2019). The aerosol can contain harmful substances like formaldehyde, acetaldehyde, acrolein, vitamin E acetate, nicotine, tetrahydrocannabinol, and other ultrafine particles that are inhaled into the lungs (Jatlaoui et al., 2019). Of those ENDS users, 84% use flavored e-cigarettes (FDA, 2022). These devices often appeal to adolescents using flavors like candy, fruit, and desserts. Disturbingly, ENDS may also contain diacetyl, vitamin E acetate, and tetrahydrocannabinol, which are linked to EVALI (Center for Tobacco Products, 2022; Jatlaoui et al., 2019). Providers are encouraged to

ask patients about ENDS use when treating respiratory illnesses like COVID-19, influenza, and RSV (CDC, 2022a).

Neurologic Disturbances

This review also revealed that ENDS use is associated with significant mental health issues. The addiction cycle described above leads to increased anxiety and stress, drastic mood swings and depression, increased risk of addiction and substance abuse, decreased impulse control and decision-making abilities, and decreased ability to concentrate and perform well academically (Drope et al., 2017; Riehm et al., 2019). Other mental health consequences of ENDS include difficulty internalizing, depression, suicidality, disordered eating, externalizing problems, attention-deficit/hyperactivity disorder (ADHD), conduct disorders, and can precipitate the use of marijuana and alcohol (Becker et al., 2020; FDA, 2022; Giovacchini et al., 2022; Walley et al., 2019). Accumulating evidence suggests mood and anxiety disorders, depressive symptoms, and negatively perceived mental health are all associated with ENDS use (Patten, 2021).

Neurologists are also asking clinicians to be aware that new-onset seizures and epilepsy are potential sequelae of ENDS use (Samson, 2021). Though more data is needed to draw significant conclusions, the FDA reports that over 100 incidences of seizures in consumers of ENDS products have been received to date (FDA, 2022). Nicotine is a neurotoxic and highly addictive drug (Ruszkiewicz, 2020). The FDA urges neurologists and other healthcare providers to be vigilant about screening for ENDS use and encourages ENDS users to share any of these neurological signs or symptoms with the FDA (US Food and Drug Administration: Center for Tobacco Products [FDA], 2022).

Cardiovascular Risks

According to the American Heart Association's Council on Basic Cardiovascular Sciences (Wold et al., 2022), the cardiovascular effects of ENDS accumulate over time and years of use and may lead to cardiovascular disease. Evidence of systemic inflammation and dysfunction of endothelial tissues and vascular tissues, along with elevated blood pressure and heart rate, all support the risks of vaping for the development of heart disease (Giovacchini et al., 2022; Wold et al., 2022). ENDS use causes changes in the blood that increase microvascular endothelial permeability, which impacts the intracellular oxidative state. (Mohammadi et al., 2022). Endothelial dysfunction is an early predictor of cardiovascular disease (Mohammadi et al., 2022). A cross-sectional analysis by the National Health Interview Survey revealed that daily ENDS use was associated with an increased incidence of myocardial infarction (Alzahrani et al., 2018). These systemic effects of ENDS are significant for providers to be mindful of as they screen, educate, and treat mental health and tobacco/ENDS use in their young adult patients.

Prevalence of Patient Education and Prevention Efforts for ENDS Use

Patient education on vaping cessation is essential to prevent adolescent and young adult ENDS users' progression to combustible cigarette use or other substances associated with chronic health conditions (Becker et al., 2020; Liu et al., 2020n; Camenga & Chadi, 2021; Rayman & Kessler, 2021). When adolescents are made aware of the impacts that vaping and nicotine can have on their bodies, including the long-term changes that can occur in the synapses of their brains, they are more likely to consider quitting (Giovacchini et al., 2022). Despite the overwhelming evidence supporting tobacco prevention and cessation efforts, only 20.8% of middle and high school students were educated and advised to quit (Liu et al., 2020 ; Camenga & Chadi, 2021). Nurse practitioners, often the most prevalent providers in the college setting,

should provide informed, evidenced-based educational initiatives (Rayman & Kessler, 2021). Patients often refer to physicians and their healthcare providers for guidance regarding ENDS use, yet many providers feel as though they are inadequately prepared to advise them and lack the knowledge to accurately discuss the evidence-based sequelae (Hurst & Conway, 2018; Sherratt et al., 2016; Ofei-Dodoo et al., 2017).

Researchers in one qualitative study used semi-structured interviews of 17 physicians in four outpatient locations to explore physicians' attitudes toward and knowledge of ENDS. The researchers found that physicians feel “generally uninformed” and lack the critical knowledge to discuss ENDS (Hurst & Conway, 2018, p. 7). Hurst & Conway (2018) also noted that 1/3 of all physicians surveyed do not strongly oppose ENDS. These physicians admitted that most of their assumptions regarding the use of ENDS were from mass media or patients themselves (Hurst & Conway, 2018). Patients are asking providers for ENDS advice, yet only 21% of healthcare providers felt confident giving patients’ advice regarding their ENDS use (Sergakis et al., 2019; Sherratt et al., 2017). In both studies, researchers expressed an urgent call for evidence-based research to guide practitioners when advising ENDS users. Metcalf et al. (2022) confirmed the above conclusions regarding the gap in healthcare providers’ vaping-related clinical skills and the need for training for ENDS prevention and cessation (Hurst & Conway, 2018; Sergakis et al., 2019; Sherratt et al., 2016).

Screening Practices and Documentation of ENDS

Screening by healthcare providers for the use of electronic nicotine substances provides an opportunity for education, counseling, and perhaps decreased use of these products (Joseph et al., 2018; Metcalf et al., 2022; Owotomo & Walley, 2022). Providers need to be trained to screen for substance use in a nonjudgmental way for patients to give honest answers (Samson, 2019).

Screening is essential to developing a treatment plan, referral options, and initiating appropriate medications (Metcalf et al., 2022; Owotomo & Walley, 2022; Samson, 2019). Recent studies suggest that training primary care providers in the shared decision-making process increases the implementation of appropriate screening measures (Richards et al., 2020; Joseph et al., 2018).

Much of the research reviewed for this literature appraisal found that investigators were in agreement concerning the fact that physicians rarely provided screening for ENDS use. This screening deficiency was even seen in patients who were known smokers and recipients of previous tobacco cessation education (Hurst & Conway, 2018; Liu et al., 2020; LeLaurin et al., 2019; Sergakis et al., 2019; Ward et al., 2023). Providers rarely screened for ENDS use, even when they believed ENDS was not a safe alternative to smoking or an aid to smoking cessation (Hurst & Conway, 2018; Ofei-Dodoo et al., 2017; Ward et al., 2023). Documentation of ENDS typically follows screening; therefore, without screening, documentation is significantly lacking.

LeLaurin et al. (2019) used a convergent mixed-methods approach to assess tobacco-related documentation practices and patterns of youth tobacco use relevant to documentation. In this study, 508 electronic health records (EHR) were reviewed; 51% of the records showed documentation of adolescent use of smokeless tobacco, 92% documented cigarette use, but no records included documentation for ENDS use for this cohort (LeLaurin et al., 2019). Collins et al. (2017) had similar findings, with only 49% of adolescent patients seen in the last year appropriately screened for ENDS use. Despite the staggering reported use of ENDS among adolescents and young adults, the under-documentation of ENDS use in the EHR is consistent (Liu et al., 2020; LeLaurin et al., 2019).

Other research has examined the effects of viewing a brief educational module on health professional students' attitudes, knowledge, and self-efficacy regarding ENDS (Sergakis et al.,

2019). Students viewed a seven-minute brief module that included up-to-date research on ENDS and a link to an online post-module survey. The results of this study supported the use of an educational module, and 80% of participants believed that ENDS training was essential (Sergakis et al., 2019). Additionally, this brief intervention significantly affected health professional students' knowledge, attitudes, and self-efficacy (Sergakis et al., 2019). These findings support using brief educational modules on the dangers of ENDS to increase providers' screening efforts, knowledge, attitudes, and self-efficacy in counseling (Kovach et al., 2021; LeLaurin et al., 2019; Sergakis et al., 2019).

Another critical point is that providers should also screen for mental health when treating adolescent ENDS users (Becker et al., 2020; Ward et al., 2023). Due to the significance of the two comorbidities, screening for depression and other mental health problems is an appropriate plan of care, according to the researchers, due to the prevalence of teens that turn to these products to relieve stress and anxiety, etc. (Becker et al., 2020; Kovach et al., 2021; Samson, 2019). These screening tools are recommended during any health maintenance visit and include the Home, Education, Activities/employment, Drugs, Suicidality, and Sex (HEADSS) screening tool and the Car, Relax, Alone, Forget, Friends, Trouble + Nicotine (CRAFFT 2.1 +N) to assess for risky behaviors and behavioral health concerns briefly (Ward et al., 2023).

Summary of Research, Gaps in Literature, and Future Directions

This introductory review of the literature regarding ENDS use in adolescents and young adults reveals significant health effects caused by ENDS use, many of which are similar to the health effects of traditional cigarette use (Becker et al., 2020; Drope et al., 2017; FDA, 2022; Giovacchini et al., 2022; Riehm et al., 2019; Walley et al., 2019). Patient education efforts that emphasize the specific harms caused by e-cigarettes have been shown to deter adolescents and

young adults from trying and habitually using ENDS (Hurst & Conway, 2018; Metcalf et al., 2022; Owotomo & Walley, 2022; Samson, 2019; Sergakis et al., 2019; Sherratt et al., 2016). Patients look to their healthcare providers for current, evidenced-based information on ENDS. Still, most providers lack confidence in their knowledge of ENDS and are not regularly screening adolescents and young adults for the use of these products (Hurst & Conway, 2018; Collins et al., 2017; LeLaurin et al., 2019; Ofei-Dodoo et al., 2017; Sergakis et al., 2019). Specifically, screening for mental illness among those who vape and simultaneously screening for ENDS use among those diagnosed with mental illness should be standard practice for providers (Becker et al., 2020; Samson, 2019). Unfortunately, several researchers in this review indicated that despite the belief that ENDS are not a safer option than traditional cigarettes, few providers are screening or documenting the use of ENDS in the electronic medical record (Collins et al., 2017; Hurst & Conway, 2018; LeLaurin et al., 2019; Ofei-Dodoo et al., 2017; Sergakis et al., 2019).

Several gaps in the current literature exist, including limited sample sizes and populations of college students and adolescents, which may not represent the larger population. While screening tools for substance abuse and alcohol exist, there is no widely accepted, standardized screening tool for ENDS use in college students. Most studies have been cross-sectional rather than longitudinal, which would help providers to understand the development and progression of ENDS use (Livingston et al., 2019). Finally, this review has not discussed the impact of marketing, advertising, governmental regulations, and policies. Each profoundly shapes the beliefs and attitudes that college students have regarding ENDS. There is a need for further research in these areas, especially with the rise of synthetic marijuana being vaped in ENDS, particularly among college students.

The literature in this review does support this quality improvement project's aim to educate healthcare providers to determine if their intention to screen students for ENDS use increases.

Theoretical Framework

The theoretical framework for this scholarly project was from the seminal work of E.M. Roger's Diffusion of Innovation (DOI) Theory. Initially identified in 1962, DOI is one of social science's oldest behavioral change theories (Rogers, 2003). The social response when individuals respond to an innovation, like a new evidence-based quality improvement initiative to improve health care, is known as diffusion (Dearing & Cox, 2018). The innovation in this project is ENDS screening in college students.

According to DOI, diffusion is adopting a new idea, behavior, or health practice that occurs at different rates among individuals based on their threshold for change (Dearing & Cox, 2018). Rogers identifies five "adopter" categories: innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003). Each of the participants in the innovation falls initially into one of the "adopter" categories. As the innovation spreads, peer networks and face-to-face communication are essential. Those early adopters and innovators serve as change agents and role models to influence the remainder of the population considering the innovation (Kaminski, 2011). Healthcare providers are in the ideal position to significantly impact college students by offering patient education and screening. Healthcare providers lack knowledge regarding ENDS use and the dangers ENDS pose to patients' health. This quality improvement project aims to increase the intent of healthcare providers to screen for ENDS use in the college population. The providers who receive the ENDS education are the change agents for this project

and serve as peer leaders to influence others with their knowledge of the need for ENDS screening.

Innovation adoption occurs in five stages, according to DOI (Rogers, 2003). These include 1) Knowledge or Awareness, 2) Persuasion or Interest, 3) Decision or Evaluation, 4) Implementation or Trial, and 5) Confirmation or Adoption (Kaminski, 2011). This scholarly project's knowledge or awareness stage occurred when the providers completed the pre-survey and identified gaps in awareness of the dangers of ENDS use or the importance of screening college students for use. The persuasion or interest stage occurred when the providers participated in the educational offering regarding the dangers of ENDS use. Thirdly, the decision or evaluation stage occurred with each participant deciding to implement ENDS screening in their practice. The actual performance of this screening innovation is the implementation or trial phase of DOI. Finally, the fifth and final stage of confirmation or adoption of a change occurs when ENDS screening has become a routine clinical practice.

Translational Framework

Design

This quality improvement (QI) DNP project utilized qualitative data collected from a convenience sample using pre- and post-implementation Likert Survey questionnaires. The Plan-Do-Study-Act cycle or PDSA method originates from the industry sector and the foundational work of Walter Shewhart and Edward Deming's articulation of iterative processes (Deming, 1982; NIH, 2023). The PDSA cycle is an often-utilized quality improvement model, now widely accepted in healthcare. The PDSA cycle provides consistency and structure to the scientific testing of the effectiveness of quality and safety improvements (Moen & Norman, 2010; Taylor et al., 2014). Researchers work through each “spoke” of the cycle to evaluate process

improvement changes, assess the effectiveness of the change, and make further recommendations for future changes (Taylor et al., 2014). The four-step cycle for problem-solving includes: (Plan)- define the problem and hypothesize possible causation and solution, determine the who, what, where, and when (Do)- plan is implemented, begin data analysis, and observe unexpected problems (Study)- data analysis is completed, data is compared to hypotheses, summarization of data (Act)- feeds directly into planning for needed changes to be made in the next cycle (The Deming Institute, 2023).

Figure 2

PDSA Cycle



(Crowfoot & Prasad, 2017, Figure 1.)

Plan

The “plan” cycle of the PDSA model involves the determination of the problem and the hypothesis to “fix” it (The Deming Institute, 2023). A needs assessment was completed at the student health clinic with an open discussion with the key clinical stakeholders.

The stakeholders identified ENDS use among college students as a significant medical problem. A subsequent review of the current literature was performed to ascertain the significance of the problem of ENDS use among college students. The review of scholarly work, based on scientific data, clearly demonstrated the dramatic rise in ENDS use in adolescents and young adults and the adverse effects of these products.

After a thorough review of the literature, it was noted that education on the dangers of ENDS use was needed to prompt the providers to consider screening and educating the students in the clinic setting. A meeting was held with the clinic administrator, and the details of the literature review were shared. Permission to conduct education and implement a screening tool was provided by the clinic administrator, who agreed to serve as the Project Team Co-Leader (Appendix A).

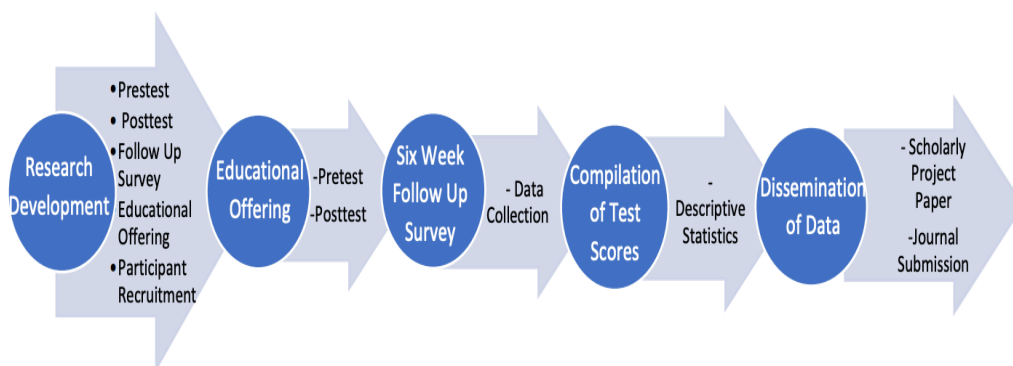
After gathering information, an educational PowerPoint presentation was prepared and planned to empower and inspire providers to screen for ENDS use more frequently and provide sufficient patient education and abstinence treatments. Healthcare providers are in the ideal position to significantly impact college students by offering patient education and screening. The time and date of the presentation were coordinated with the clinical administration and planned to be held during a staff lunch meeting in early August 2023.

The surveys were developed by the project investigator (PI) since a published instrument was unavailable which specifically for addressed this issue. The surveys were based on questions used in a similar study by Peppers et al. (2015). Peppers et al. initially sought to understand how providers communicated about ENDS when

counseling adolescent patients and their parents. They also explored providers' support for regulations aimed at discouraging adolescents' ENDS use (Peppers et al., 2015). This quality improvement project focused on provider screening rates at a local university student healthcare clinic and their lack of knowledge regarding ENDS use and the dangers ENDS pose to patients' health. This project aims to increase the intent of healthcare providers to screen for ENDS use in the college population. Below is an illustration of the design of this project.

Figure 3

Project Desig



Population

The population of the project was the medical staff of a university student health clinic located in the Central Piedmont of North Carolina. There were eight staff members, including one physician, one nurse practitioner, one physician assistant, one registered nurse, one licensed practical nurse, and three certified medical or nursing assistants. All staff involved in the care of the college students were invited to voluntarily participate in the DNP project. The sample participants included all genders and all races/ethnicities. To ensure buy-in from the clinic staff,

site authorization was obtained from the clinic administrator to conduct the quality improvement project (Appendix A).

Inclusion criteria were that healthcare providers participating in the project held a valid license for their chosen field and were at least 18 years of age with English as their primary language. Participants meeting inclusion criteria were invited to participate in the quality improvement intervention. Exclusion criteria were providers not employed by the university student health clinic, administrators, volunteers, or housekeeping services.

Setting

The setting of the clinic was on the campus of the university, a private liberal arts college with a student population of 6000 undergraduate and graduate students. The providers see an average of approximately 40 to 60 students per day in the clinic. The clinic is open Monday-Friday from 8 am-5 pm when the university is in session.

Budget and Timeline

The budget for this quality improvement project was minimal (<\$50) and was incurred by the PI at no cost to the DNP project site. This includes lunch for the participants, paper and office supplies for copies of the screening tool, and gas to and from the campus clinic. The timeline for the project began with an informal needs assessment in April 2021 and project planning and meeting with stakeholders in August 2021. Literature review and literature synthesis was performed throughout the project from August 2022 through completion in May 2024. Institutional Review Board (IRB) submission and approval were obtained from March- July 2023. Data collection and project implementation was from early August 2023, when the students returned to campus, until the end of September 2023, totaling six weeks in duration.

Data was then analyzed during October – December 2023 with final revisions to be completed in April 2023 and shared with the clinic administrator to plan and discuss future interventions.

Protection of Human Subjects

An Institutional Review Board (IRB) application was submitted to the University of North Carolina at Greensboro's Committee for the Protection of Human Research Subjects (CPHRS) for review and approval. An application was also submitted to the Novant Health Research Council after IRB approval at the university level. Exempt status was given for the implementation of this quality improvement project. The target population consisted of adult subjects over 18 years of age. Vulnerable subjects, including children, prisoners, and specific populations of race, religion, or ethnicity, were not included. To prevent the risk of criminal or civil liability or causing harm to the financial standing of the university or the student health clinic, the confidentiality of subjects was a priority. Confidentiality was maintained throughout the educational offering, the pre-and post-surveys, the post-implementation survey, and the data analysis. Participants were given the choice to answer the surveys on their password protected personal electronic devices or computers, as the clinic administrator sent them a link to the complete the survey. The survey originated from a 1-lock Qualtrics secure software through the University of North Carolina (UNCG). Care was taken to ensure that each participant was treated respectfully, without harassment, coercion, or discomfort during the study. The collected survey responses contained no participant identifiers and were anonymously collected and stored using the same UNCG's 1-lock secured Qualtrics software. Data from all surveys was submitted online, compiled in an Excel spreadsheet, and stored in the secure campus server. The data reviewed on the PI's personal laptop is password protected. The data was not viewed or analyzed

in public places such as restaurants, coffee shops, or public libraries. Only the PI or professors at UNCG directly involved in the project will have access to the data.

Do

Intervention

The “do” portion of the PDSA model is the implementation of the planned intervention (The Deming Institute, 2023). The clinic administrator determined the date and time of the staff meeting and notified her staff of the planned project implementation and the educational opportunity. Participants were invited via email directly from the clinic administrator (Appendix B, C). A brief educational PowerPoint was shared by the PI on August 14, 2023, and a light lunch was offered to the clinic employees. The education was provided in a lecture format using a PowerPoint presentation (Appendix D). Additional information based on the literature synthesis was shared throughout the presentation. There was an opportunity for the employees to ask questions after the presentation.

A packet of information was given to each participant after the presentation, including “*Resources for Professionals about Vaping & E-cigarettes*” produced by the U.S. Federal Drug Administration’s (FDA) Center for Tobacco Products (CTP) and the American Academy of Pediatrics, “*Youth Tobacco Cessation: Considerations for Clinicians*” (U.S. Federal Drug Administration [FDA], 2022; Gorzkowski, 2021). This packet of information also included a copy of the HONC screening tool with an interpretation guide of individual HONC items, the current U.S. Preventive Services Task Force (USPSTF) clinician summary of Interventions for Tobacco Smoking Cessation which includes new evidence on the harms of ENDS, and finally, current

prescribing guidelines for nicotine replacement (Wheeler et al., 2004; U.S. Preventive Services Task Force [USPSTF], 2021; Knudtson, 2023).

Data Collection

The project aimed to increase ENDS screening rates in the college-health setting. Participant data was obtained by completing the surveys from the convenience sample of providers at the university clinic. Participants completed a survey before viewing the education to answer demographic questions, ENDS knowledge questions, and current screening practices. A post-test survey was completed immediately after the educational opportunity with identical questions to the pre-test screening without the demographic information. Each of the three surveys was conducted utilizing UNCG's Qualtrics software, which allows for online delivery of assessment tools for participant convenience. Surveys were conducted to obtain the pre-test, post-test, and post-implementation survey six weeks after the educational offering.

No monetary compensation was offered for the voluntary education or the completion of the surveys. Screening practices were documented prior to the education, immediately after education, and six weeks after implementing the screening tool using the Qualtrics surveys. During the implementation, the PI included a pre-test/post-test survey and a follow-up survey after six weeks of the initial education (Appendix F, Appendix G, and Appendix H).

The *Hooked-on Nicotine Checklist* (HONC) screening tool was used for the DNP project. It is a 10-item self-administered instrument used to determine the onset and strength of tobacco dependence (DiFranza et al., 2002). The HONC has been used in research to identify nicotine-

dependent adolescents and provide information on the onset and degree of dependence. Reliability of test-retest at one week was $\kappa = .61$ and two weeks was $\kappa = .75$, and internal consistency with Cronbach's alpha was $\alpha = .91$ (National Cancer Institute Division of Cancer Control & Population Sciences [DCCPS], 2020). Adapted for ENDS use for this quality improvement project, the HONC is designed to identify the point at which students have lost full autonomy over their ENDS use (Appendix E). A positive response to any HONC item signals a loss of autonomy and the onset of dependence. The number of positive responses correlates to the degree of dependence (DCCPS, 2020). Healthcare providers then evaluated the HONC screening tools after each student completed them. The questionnaire did not include patient names or identifiers and were shredded onsite after the providers reviewed them.

Instruments

A questionnaire eliciting demographic data, including age, sex, years of practice, the professional license held, and practice area, were all included in the original pre-test survey. Additional questions were used regarding the provider's perceptions of ENDS harm and current screening and education practices. A 17-question Likert-scale survey, adapted from the Pepper et al (2015) survey, took approximately 4 minutes for participants to complete (see Appendix F, G, and H). Pepper et al., (2015) formulated a survey to determine ENDS screening rates among primary care providers. For the purposes of this quality improvement project, the Pepper survey was adapted and improved to assess demographic information, perceptions of knowledge of ENDS use, ENDS screening, and patient education practices. Identical, close-ended, Likert scale, and rating scale questions were utilized in both the pre-test and post-tests, with an open-ended section for comments in the final post-test survey (Pepper et al., 2015). To determine content

validity, the surveys were reviewed by UNCG DNP/AGNP faculty members, who offered minor feedback for the changes needed.

On August 14, 2023, all eight participants were given the pre-education survey via Qualtrics software which was sent through secure email from the site administrator. The participants were offered the education and immediately following the PowerPoint they completed the post-education survey. For the next six weeks, all students were given the HONC screening tool at check in and asked to complete the survey while they waited to be seen by the provider. Participants reviewed the responses of each HONC completed by their patients. On September 25, 2023, six weeks after the initial education and initiation of the HONC screening tool into the practice, participants were then provided with a post-implementation survey that was identical to the post-education survey.

Study

Overview

The study portion of the PDSA cycle examines the effectiveness of the interventions which included the educational PowerPoint and the use of the Hooked-On Nicotine Checklist (HONC) screening tool that were employed during the “Do” portion of the PDSA (The Deming Method, 2023). Each of the three surveys was conducted utilizing UNCG’s Qualtrics software, which allows for online delivery of assessment tools for participant convenience. Surveys were conducted to obtain the pre-test, post-test, and post-implementation survey six weeks after the educational offering. Data from the pre- and post-education surveys were analyzed to determine the providers' change in intention to screen college students for ENDS use after receiving evidenced-based ENDS education. To determine whether a statistically significant improvement

had been achieved in provider screening for ENDS among college students who visited the clinic, a critical review of the outcome data was conducted.

Data Analysis

Descriptive statistical analysis, using quantitative data and a paired samples t-test was performed using Qualtrics software to compare results before and after the educational PowerPoint and at six weeks post-implementation of the HONC screening tool. A result is considered significant if it is less than an alpha level set at 0.05. The null hypothesis is that there is no statistically significant difference in providers' current knowledge, awareness, and screening practices after offering an educational PowerPoint.

Results

From the convenience sample of healthcare providers working at a local college student health practice, the total sample population for the project was eight participants. The participants were employees of the student health center, at least 18 years of age, and spoke English as their primary language.

Participants were asked to identify their licensure. Of the eight total participants ($n = 8$): 37.5% held Certified Medical Assistant ($n = 3$). There was one each (or 12.5% each per licensure) of the following: Physician, Nurse Practitioner, Physician's Assistant, Registered Nurse, and Licensed Practical Nurse ($n = 1$) (see Table 1).

Table 1*Demographics*

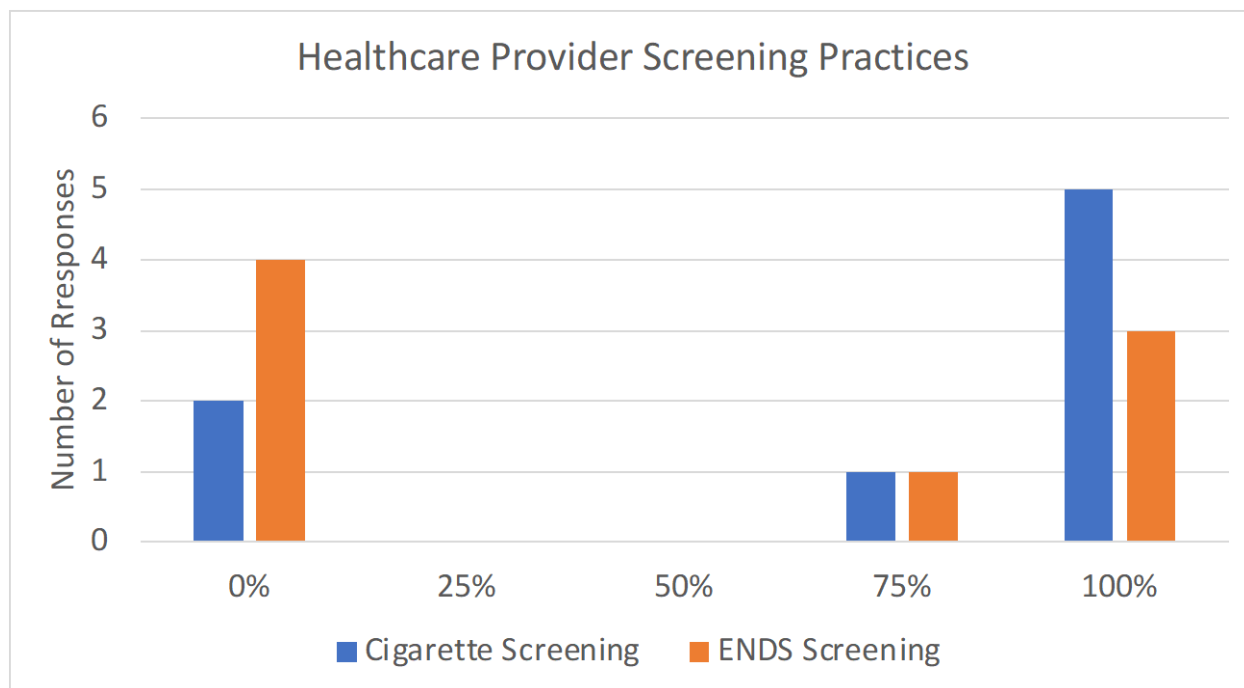
Characteristics	<i>n</i>	%
Licensure		
Physician	1	12.5
Nurse Practitioner	1	12.5
Physician Assistant	1	12.5
Registered Nurse	1	12.5
Licensed Practical Nurse	1	12.5
Certified Medical Assistant	3	37.5
Educational Preparation		
High School	1	12.5
Associate degree	2	25.0
Bachelor degree	2	25.0
Masters degree	1	12.5
Doctorial degree	2	25.0
Age		
18-30	2	25.0
31-40	2	25.0
41-50	3	37.5
51-60	1	12.5
61-70		
Years in practice		
0-5	2	25.0
6-10	2	25.0
11-15	1	12.5
16-20	1	12.5
21-25	1	12.5
26-30	1	12.5
Primary area of practice		
College Health	5	62.5
Family Practice	1	12.5
Other	2	25.0

*Note: $n = 8$

Participants were also asked to provide their level of educational preparation. The sample was diverse, with 25% of the respondents having a doctoral degree, 12.5% having a master's degree, 25% with their bachelor's degree, and 25% with an associate degree, and finally, 12.5% of participants had a high school diploma. Most participants (37.5%) were aged 41-50, 25% were aged 18-30, 25% ages 31-40, and 12.5% between the ages of 51-60. Participants shared years of experience in the pre-education survey. There were 25% with 0-5 years of experience, 25% with 6-10 years of experience, and 12.5% or 1 respondent with 11-15, 16-20, 21-25, and 26-30 years of experience (see Figure 3).

Figure 4.

Screening Practices of Healthcare Providers Prior to Education.



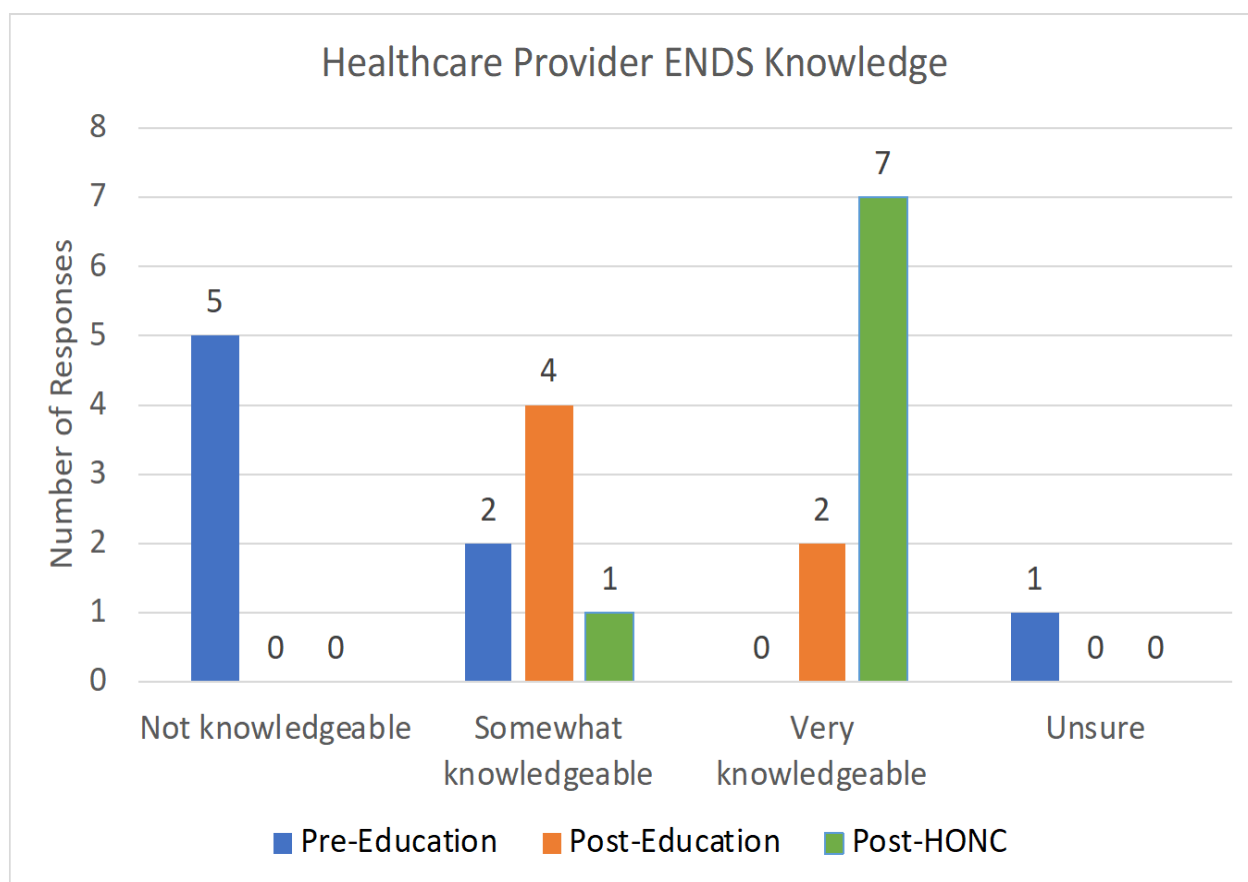
In addition to demographic data, the survey identified the current screening practices of the participating providers. Respondents indicated how often they screened college students for both cigarette and ENDS use. Of the eight responses, 62.5% indicated they screen 100% of the time for tobacco use, while only 37.5% of the participants screened for ENDS use prior to the educational PowerPoint shared during the implementation of this quality improvement project. Also of interest, while 25% of participants reported never screening for cigarette use, 50% reported never screening for ENDS use (see Figure 4).

Providers also responded to the question addressing their perceived knowledge regarding counseling college students on ENDS use. They were asked to rate their knowledge as “very

knowledgeable,” “somewhat knowledgeable,” “not knowledgeable,” or “unsure.” Respondents responded to this question prior to, immediately after, and six weeks following the education. Six participants (62.5%) reported that they were “not knowledgeable” of evidence-based ENDS knowledge prior to the education, while 20% of participants stated they were “somewhat knowledgeable” of ENDS knowledge, and one responded they were “unsure” (see Figure 5).

Figure 5.

Healthcare Provider ENDS Knowledge

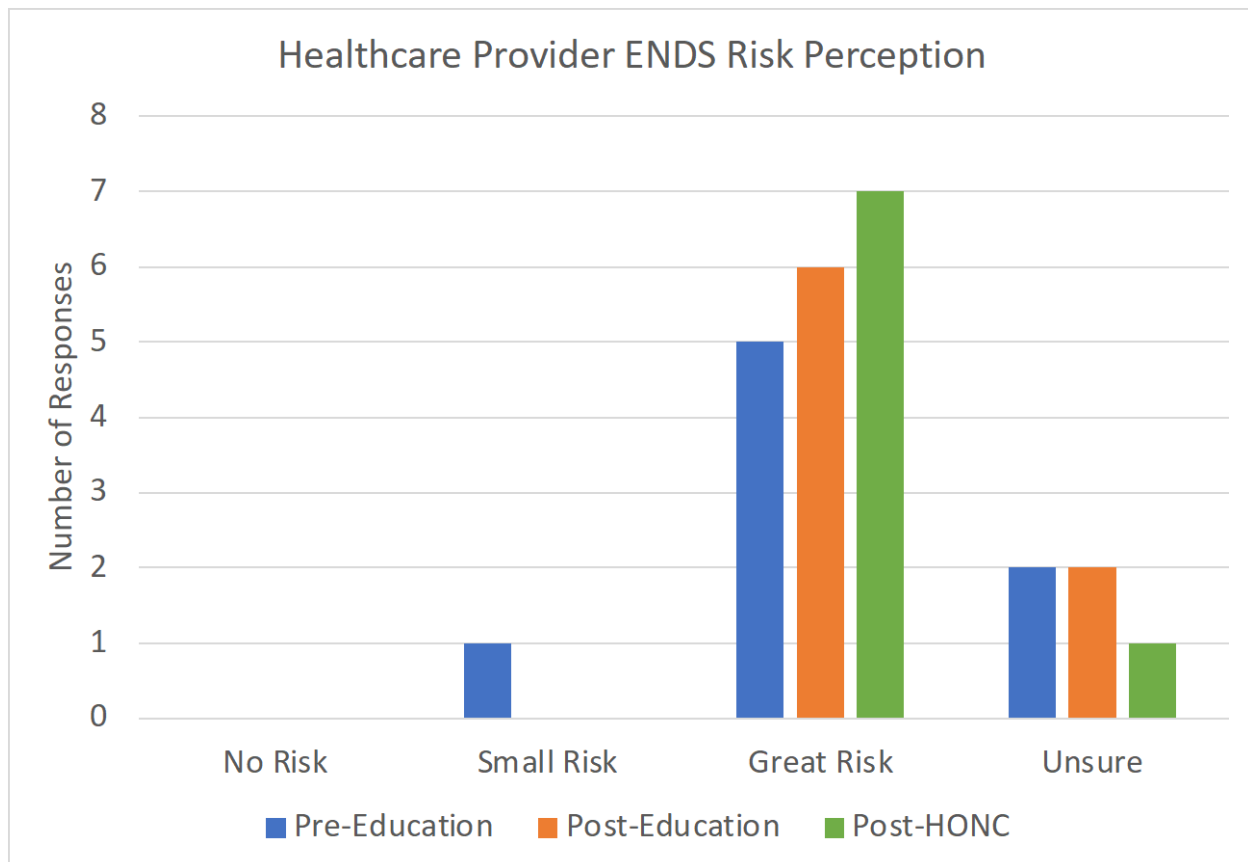


The six-week follow-up post-HONC implementation survey demonstrated that 87.5% of participants believed they were “very knowledgeable” regarding evidenced-based ENDS knowledge, and 12.5% perceived they were “somewhat knowledgeable” (see Figure 5).

Regarding the health risk that ENDS poses to the college student population, 62.5% of participants responding to the pre-education survey felt that ENDS posed a great risk, 25% were unsure about the risks, and 12.5% responded that ENDS poses a small risk to students. Following education and the implementation of the HONC screening tool, 87.5% of the providers surveyed believed that ENDS was a great risk to college students (see Figure 6).

Figure 6

Healthcare Provider ENDS Risk Perception.

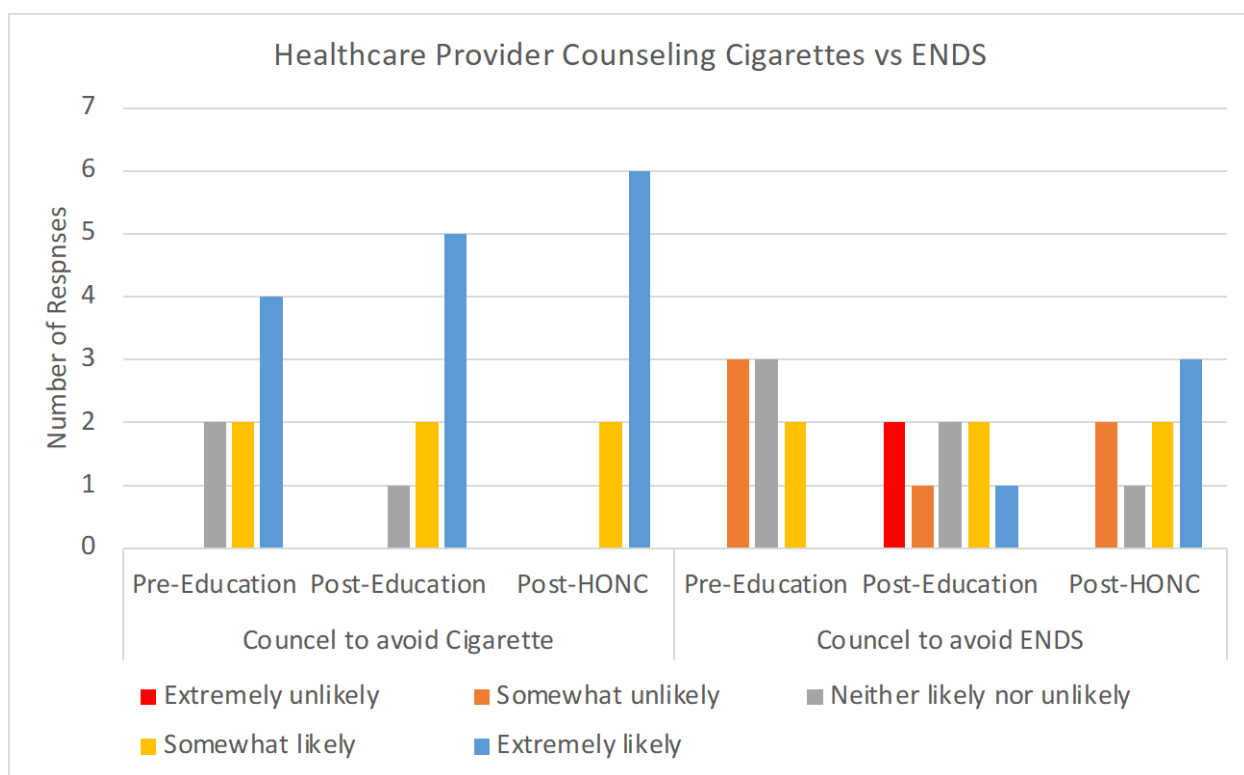


The questionnaires also surveyed participants on providers' habits of counseling against cigarettes and ENDS use. In the pre-test survey, 50% of providers indicated they were "very likely" to counsel against cigarette use, while 37.5% of participants said they would be

“somewhat likely” or “neither likely nor unlikely” to screen for ENDS. None of the providers stated in the pre-education questionnaire that they were “very likely” to screen for ENDS use. Six-week post-HONC responses indicated that 75% of providers were “very likely” to screen for cigarette use and 37.5% were “very likely” to screen for ENDS use (see Figure 7).

Figure 7

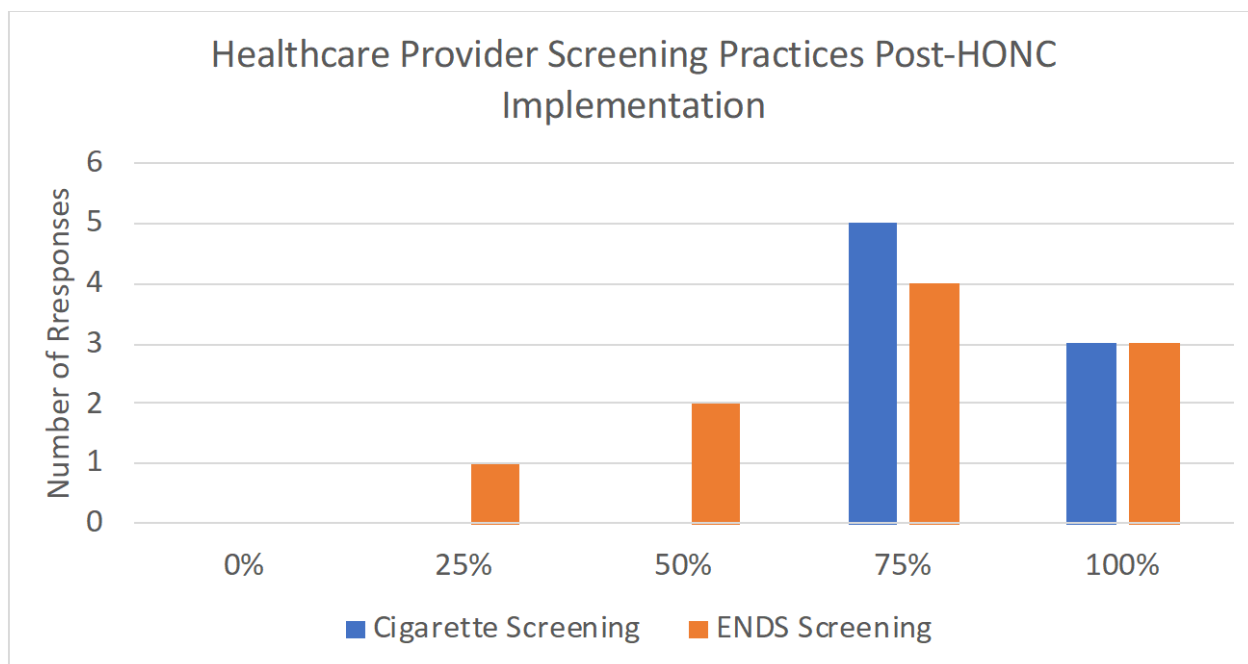
Healthcare Counseling Habits for Cigarettes and ENDS



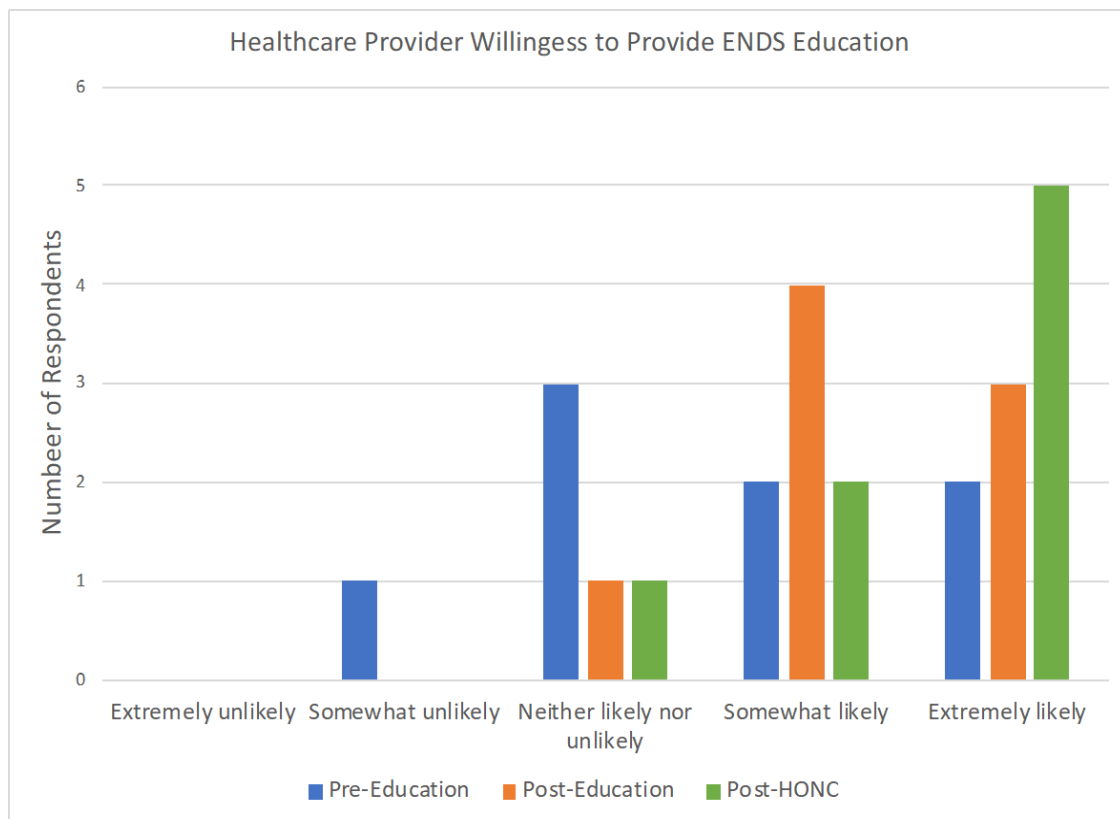
After six weeks of screening with the HONC screening tool, a post-HONC survey was given to providers to determine if a practice change occurred regarding ENDS screening. Five of the eight respondents reported screening 75% of the time and 37.5% (see Figure 8) reported screening 100% of the time compared to the pre-education rates stated earlier of 25% of providers screening 100% of the time and 37.5% screening 100% of the time (see Figure 3).

Figure 8

Healthcare Provider Screening Practices Post-HONC Implementation



Provider willingness to deliver educational materials to college students was also assessed. Of the eight total responses, 25% of the participants responded they were “extremely likely” to provide ENDS education to college students in the pre-education survey, whereas 62.5% of participants were “extremely likely” and 25% of providers were “somewhat likely” to provide ENDS education in the post-HONC survey (see Figure 8). One of the 8 respondents replied that they were “neither likely or unlikely” to provide education in the post-HONC survey (see Figure 9).

Figure 9*Healthcare Provider Willingness to Provide ENDS Education*

A paired samples *t*-test was performed to compare the means of the responses of the pre-education survey and the post-HONC implementation survey. The paired samples *t*-test (See Table 2) showed there was not a significant change in the means of the providers screening practices pre-education and the HONC screening tool implementation (pre-education $M = 3.45$, $SD = .65$ to post-HONC ($M = 2.75$, $SD = 1.26$, $t = 1.66$, $p < 0.14$, $d = 7$).

Table 2*Paired Two-Sample t- test for Means*

t-Test: Paired Two Sample for Means		
	<i>Pre</i>	<i>Post- HONC</i>
Mean	3.45	2.75
Variance	0.42	1.597143
Observations	8	8
Pearson Correlation	0.373267	
Hypothesized Mean	0	
df	7	
t Stat	1.669916	
P(T<=t) one-tail	0.069432	
t Critical one-tail	1.894579	
P(T<=t) two-tail	0.138864	
t Critical two-tail	2.364624	

We do not have evidence to conclude that there was a statistically significant difference in the means from pre- to post-survey data. The null hypothesis was therefore accepted, determining that there was no statistically significant difference in ENDS screening and counseling practices between the pre-education and post-HONC survey.

The participants in the post-HONC survey were also asked three additional questions about their perceptions of the HONC screening tool. Five of the 8 participants (62.5%) responded that they were “extremely likely” to continue using the HONC to screen college students for ENDS use. 12.5% were “somewhat likely to continue, and 25% were “neither likely or unlikely” to continue using the HONC with their patients. Five respondents (62.5%) reported that the HONC was “extremely easy” to implement into their practice, and 3 participants (37.5%) felt that the HONC was “neither easy nor difficult” to implement. Finally, the participants were asked what percentage of visits where the HONC screening tool was administered led to patient education or treatment. One (12.5%) of the respondents said 100% of visits, 25% said 50%, 25% said 75% of visits, and 37.5% of the respondents said 0% of visits. Providers were also asked to identify any barriers they faced using the HONC screening tool. Only one comment was

received, which stated that students who were sick and being seen for an acute illness often did not have the desire or energy to complete the screening tool.

Barriers and Strengths

The small sample size ($n = 8$) is a significant limitation of this quality improvement project. The practice chosen for the project has a very small staff, which affected the sample size. Therefore, the data results cannot be generalized to all university health clinics. Ideally, this project would be expanded and implemented system-wide across all practices within the selected healthcare organization that treats adolescents and young adults. The wording of some of the questions of the surveys may have led to the misreading of some of the questions. With response items like “extremely likely” and “extremely unlikely,” participants could have misidentified their responses. Another barrier could have been the term “ENDS.” Though the appropriate term used to capture all electronic nicotine devices on the market, the terms vaping and e-cigarettes are more commonly used.

Strengths included the simplicity of the self-administered HONC screening tool and the procedure in which they were given to students during the check-in process. Other than adding a copy of the tool to the student’s clipboard at check-in, the process did not add more work for the staff or providers. It was also very easy to quickly glance down at the tool and identify if a student had any positive responses. While the ease of administration was a strength, an electronic tool embedded into the electronic health record would have simplified the process even further and eliminated the need for shredding the tools at the end of each visit. Screening performed in this manner would have assured documentation of the screening process, whereas, during the implementation of the project, many responses may have gone undocumented due to paper screening forms. While the sample size was a limitation mentioned above, the smaller number of

participants allowed for excellent communication between the staff and the clinic administrator who administered the surveys and reminders to complete them.

Discussion

The purpose of this quality improvement project was to increase providers' intent to screen for ENDS use in the college student population. The project aimed to increase providers' evidence-based e-cigarette knowledge, increase providers' willingness to screen for ENDS use utilizing the HONC, evaluate the efficacy and ease of administration of the HONC, and lastly to determine if intent to screen resulted in a change of providers' screening practices after implementing the HONC screening tool into practice. Results were reviewed in relation to the review of literature performed earlier in the project.

Adverse Health Effects of ENDS.

Pepper et al. (2015) identified that the majority (89%) of primary care providers ($N=876$) needed additional information on the negative effects of ENDS. Alarming, a staggeringly small percentage of only 24% would recommend smoking cessation to their adolescent patients (Pepper et al., 2015). Routine counseling for smoking cessation was significantly more common (79%) for avoiding cigarettes than ENDS (18%) (Pepper et al., 2015). The finding of the present DNP project was supported by the studies of Pepper et.al, 2015 with similar recommendations for preventative health. The data in this QI project confirmed that most providers also indicated they needed more evidence-based education on the adverse effects of ENDS, which is in line with the previous studies of El-Shahawy et al., 2016, who also reported that there is a lack of education in this area for providers. This could help with a shared decision-making component of the clinical encounter. After a 30-minute educational presentation highlighting the literature regarding ENDS, the participants felt significantly more knowledgeable and perceived the ENDS

risk as greater and “*somewhat likely*” or “*extremely likely*” to provide ENDS education to their college students. The results indicated that edification had occurred among the participants on this important aspect of patient education and preventive health information.

Prevalence of Patient Education and Prevention Efforts for ENDS Use.

Despite the overwhelming evidence supporting tobacco prevention and cessation efforts, only 20.8% of middle and high school students were educated and advised to quit. This is in line with the previous studies of (Collins et al., 2017; and Camenga & Chadi, 2016), which supported this DNP project. These researchers also demonstrated that healthcare providers were more likely to counsel against cigarette use than ENDS use. Before receiving ENDS education, participants were “*extremely likely*” to counsel against cigarette use, while only “*somewhat likely*” to counsel against ENDS use. After education and the use of the HONC, most participants responded they were “*extremely likely*” to counsel against cigarettes and were “*extremely likely*” to counsel against ENDS use.

Prior to the educational presentation, only 25% of providers indicated a willingness to provide educational materials to students regarding the dangers of ENDS use. After the implementation of the project, 62.5% of providers indicated they would be willing to share education with students. The education and the implementation of the HONC screening tool served to increase the providers’ likeliness to provide ENDS education to their patients. The works of Pepper et al. (2015) confirmed the results of this present study. Additional findings of our DNP project were consistent with the recommendations from studies of Jatlaoui et al., 2019; Ward et al., 2023, that physicians should not recommend ENDS as an aid to smoking cessation. During the review of literature for the purposes of this doctoral nursing project, no evidenced-

based studies currently dispute the improved health benefits of vaping cessation and education, or the untoward health effects of ENDS use.

Screening Practices and Documentation of ENDS.

This project sought to increase screening and documentation of ENDS through the use of the HONC screening tool. As previously mentioned, 50% of the providers never screened for ENDS use before education. A similar conclusion was reached in previous studies of Joseph et al., 2018; Metcalf et al., 2022; Owotomo & Walley, 2022 whose data show that screening by healthcare providers for the use of ENDS provides an opportunity for education, counseling, and perhaps decreased use of these products. Following the implementation of the education and the HONC screening tool, the results demonstrated an increase in the providers intention to screen for ENDS use. This indicates a practice change with the majority of respondents (87.5%) intending to screen their patients after implementing this quality improvement project. These results confirmed those of previously mentioned studies which suggested that as screening increased, the opportunities for education and treatment increased (Peppers et al., 2015, Liu et al., 2020)

The theoretical framework for this quality improvement project was E.M. Roger's Diffusion of Innovation theory (DOI). While the immediate goal of the project was to increase the intention of providers to screen for ENDS use, the long-term, over-arching goal was to create a practice change in which healthcare providers routinely screen college students for ENDS use. The DOI theory describes how policy changes are innovated in a specific practice and eventually adopted by the practice or the healthcare system.

As delineated by the DOI theory, the pre-education survey generated awareness and interest in the project. The educational PowerPoint and information packets distributed with

evidence-based ENDS information and treatment guidelines served to increase provider knowledge, intention to screen for ENDS use, and to counsel against the use of ENDS for smoking cessation. After the education, providers decided to implement the practice change of screening for ENDS use and agreed to use the newly updated screening tool that has been inserted within the electronic health record at the practice. As providers indicated they were likely to screen consistently, adoption will occur. As screening rates of college students continue to rise, ENDS use will decline over time in this population. The DOI theory aligns with this iterative PDSA process for continuous improvement by affirming that adopting innovation is an active process that evolves over time. At the conclusion of the project, the respondents indicated the intention of adopting the innovation with the majority indicating they would screen at least 75% of their patients.

Act

The ACT cycle of the PDSA model addresses the future actions to be taken based on the findings of the quality improvement project (The Deming Institute, 2023). The practice will then decide, based on the findings, whether or not to adopt the practice change and implement screening and treatment protocols for ENDS use in college students. The project results will be disseminated to the practice administrator, with the long-term goal of routine screening for ENDS use to be implemented into practice permanently in the college health clinic.

After dissemination of the results to the practice administrator, it was recommended that the project be repeated on a larger scale in larger practices or possibly even amongst multiple practice sites, expanding the population to adolescents, and can possibly be replicated at the university level in other institutions. The average age of adolescents trying ENDS has decreased about two months each year for the last 10 years, with an average age of 13 years (Center for

Tobacco Products, 2022b). Screening must begin prior to this time if we want to impact this epidemic. Consideration to provide education to middle school children or school nurses as a part of health education may provide the needed venue for early intervention in this age group.

In addition to repeating the project in larger and varied populations, it is recommended that the electronic medical record (EMR) should be updated to include the HONC screening tool with an explanation of a positive response for provider ease and documentation. A “dataset” could also be created with up-to-date, evidence-based treatment guidelines and patient education readily available for easy accessibility for providers. A “hard stop” on all pediatric and adolescent patients requiring ENDS screening, as is already in existence for tobacco products, would also be beneficial for other practice specialties involving adolescents. These initiatives would help to increase the likelihood that screening will take place.

Conclusion

Recommendations for Future Practice

Several potential areas of research were identified during the implementation of this quality improvement project. As mentioned earlier, youth are especially susceptible to nicotine addiction (FDA, 2022; Goldenson et al., 2019), which activates the brain’s reward circuits, and repeated nicotine exposure is reinforced (Centers for Disease Control and Prevention [CDC], 2022b). The development of screening guidelines for younger adolescent students is recommended to target those individuals before nicotine addiction occurs. For the purposes of this study an existing screening tool, the HONC, was modified for ENDS users. The development of an ENDS screening tool specific for ENDS users could increase screening rates in clinical practice.

The pre, post, and post-HONC surveys require improvements for future research. The responses were tricky and often confusing for participants based on their responses. Making the responses more concise and concrete would be beneficial for participant interpretation of questions. To avoid confusion between cigarettes and ENDS, questions could be grouped together to ask cigarette questions in one portion of the survey and ENDS questions in another section of the survey. This could potentially prevent confusion and erroneous data.

With recent updates to the electronic medical record (EMR) and placement of ENDS screening with cigarette and tobacco use screening, it will be worthwhile for future studies to examine if screening rates continue to rise in this population. After providers are adequately educated on the dangers of ENDS and the processes for the documentation of ENDS screening with other tobacco products, screening and education in all youth populations will potentially increase.

Additionally, expanding the project to a larger sample would allow for a better representative of the population and provide more accuracy and significance to the paired *t*-test for the resultant means score. A study with a sample size that is too small may produce inconclusive results. This project is ideal to be replicated in adolescent and high school populations in large pediatric practices across the healthcare organization, where larger sample sizes may provide results that could be generalized to this specific population.

Though introduced initially in 2007 as a safer, more discrete, more efficient, and better-tasting alternative to traditional tobacco products, ENDS have failed to live up to their expectations as cessation aids to traditional smokers. As discussed and illustrated from previous studies in the foundational work in this DNP project, adolescents are becoming addicted to these nicotine products at alarming rates. Healthcare providers are uniquely positioned to squelch the

steep incline of ENDS use through patient education and proper screening. It has become clear that providers' intention to screen the students at the university clinic was increased following the educational presentation and implementation of the HONC screening tool.

With the growing emphasis on preventative interventions for the lifespan of the population, adolescent interventions should also include all forms of addictive behavior. There is no doubt that vaping causes health risks in its harmful effects which lead to addiction, lung disease and heart disease. It is imperative that the providers themselves improve their knowledge on the risks associated with vaping. Healthcare providers have the distinct opportunity to take the initiative in reducing the rates of ENDS use in adolescents through a proactive approach that leads to proper screening and education. In addition to improving the health of adolescent during the current patient visit, these interventions can have a lasting impact on the health of the patient in the future.

**I have abided by the UNCG Academic Integrity Policy on this assignment. Julie Barney,
2/15/24.**

Appendix A



High Point University Student Health
1300 N. University Pkwy
High Point, NC 27265
tel 336-841-4683

October 26, 2022

The Office of Research Integrity
The University of North Carolina at Greensboro
2714 MHRA Building, 111 Spring Garden Street,
Greensboro, NC 27412
(336)- 256- 1482

To the Office of Research Integrity,

I have reviewed the DNP project proposal submitted by Julie Barney, MSN, RN, and I agree to provide the support requested. This letter provides permission for Julie Barney, a DNP student at UNCG, to conduct the DNP project that will involve the presentation of a brief educational offering on the dangers of Electronic Nicotine Delivery Systems (ENDS) to the staff of High Point University Student Health to determine the effects of the educational offering on the staff's intent to screen for ENDS use in our practice. Specifically, the High Point University Student Health staff is committed to working with this DNP student to provide the opportunity for the student to provide the educational offering and to allow the student to use our facility for this project.

I understand that before data collection, the project proposal must first be reviewed and approved by UNCG Institutional Review Board for Research Involving Human Participants, and this support letter is required for the IRB review. It is also understood that our institution may require an IRB or research department review.

Sincerely,

A handwritten signature in cursive script that reads 'Brittany Hill'.

Brittany R. Hill, Clinic Administrator

High Point University Student Health Services

brhill@novanthealth.org (336) 515-7414

Appendix B

Good afternoon, Brittany,

I am a nurse with Corporate Health and work regularly with HPUSH for our COVID care with the students of HPU. In addition, I also worked last spring with the APPs at HPU for my clinical rotation. While I was there, we discovered that screening for vaping among college students was a quality improvement process that needed some updating. As part of my DNP at UNCG, I have been researching and developing a research project to improve the screening of our providers onsite. I wanted to ensure your permission to continue that research. It will involve me being onsite one afternoon during the Fall of 2023 to present to the staff a brief education during lunch to share education regarding vaping and its dangers. It will not involve direct patient care, and we do go through NH's IRB process. I look forward to hearing back from you and am excited for this opportunity to work with HPUSH again. Thank you, Brittany!

Sincerely,

Julie Barney

Recruitment Script:

In-person Script:

My name is Julie Barney, and I am a graduate student in the DNP program at UNCG. I am conducting a quality improvement project for my DNP project on electronic nicotine delivery systems (ENDS).

The educational component of my project should take about thirty minutes to complete during your lunch hour and approximately five minutes for each survey.

Would you like to participate in this educational offering?

1. Yes, provide the details of the educational offering.
2. No, thank them for their time.

Background

This study has been reviewed and received ethics clearance through the University of North Carolina Greensboro and the IRB at Novant Health. Should you have any comments or concerns resulting from your participation in this study, I can provide the contact information for the University of North Carolina Greensboro DNP Program and the NH IRB which is 704-384-8898.

All personal information, including your name, address, and survey answers, will be confidential. It will not be shared with any person or group that is not associated with this study. Your participation is voluntary, and you may refuse to answer any questions you do not wish to answer.

The data collected from this study will be summarized, and no individual person will be identifiable from the summarized results.

Email Script:

My name is Julie Barney, and I am a graduate student in the DNP program at UNCG. I am conducting a quality improvement project for my DNP project on electronic nicotine delivery systems (ENDS). The educational component of my project should take about thirty minutes to complete during your lunch hour. The results of your participation in the project will be used to further understand the effects of ENDS usage amongst college students. The educational offering will take place in the HPU Student Health Breakroom during lunch (TBD). Please let me know if you have any questions regarding your participation in this study and lunch will be provided as a thank you for your time and participation.

Background

This study has been reviewed and received ethics clearance through the University of North Carolina Greensboro and the IRB at Novant Health. Should you have any comments or concerns resulting from your participation in this study, I can provide the contact information for the University of North Carolina Greensboro DNP Program and the NH IRB which is 704-384-8898

All personal information, including your name, address, and survey answers, will be confidential. It will not be shared with any person or group that is not associated with this study. Your participation is voluntary, and you may refuse to answer any questions you do not wish to answer.

The data collected from this study will be summarized, and no individual person will be identifiable from the summarized results.

Appendix C

Hi Brittany,

Below is the email for you to forward to all the staff at HPUSH for my doctoral project. Thank you again for your support and willingness to forward this information to them.

Sincerely,

Julie Barney

Hi! My name is Julie Barney, and I am a graduate student in the DNP program at UNCG. I am looking forward to meeting each of you on August 14th at your staff meeting. I am conducting a quality improvement project for my DNP project on electronic nicotine delivery systems (ENDS). There will be a brief survey for you to complete prior to our meeting on the 14th. You will then be given a link to view a 30-minute educational PowerPoint on the dangers of ENDS and a post-survey to complete after viewing the education. I will be available on Thursdays and Fridays at HPUSH and can be reached at 336-682-2216 or jwbarney@uncg.edu should you have any questions regarding your participation in this study.

This project has been reviewed and received ethics clearance through the University of North Carolina Greensboro and Novant Health. Should you have any comments or concerns resulting from your participation in this project, I can provide the contact information for the University of North Carolina Greensboro DNP Program and the Novant Health IRB.

All personal information, including your name, address, and survey answers, will be confidential. It will not be shared with any person or group that is not associated with this quality improvement project. Your participation is voluntary, and you may refuse to answer any questions you do not wish to answer.

The data collected from this project will be summarized, and no individual person will be identifiable from the summarized results.

PRE-Education survey- Please click on link or scan QR code to take survey prior to our meeting on August 14th at 2pm.

https://uncg.qualtrics.com/jfe/form/SV_cIIH8FppNvcSbd4



Julie Barney MSN, RN
University of North Carolina at Greensboro
AGNP/DNP student

Dear Staff,

Thank you for your willingness to participate in my study. **Please view this presentation focused on ENDS and complete the post-presentation survey.** I appreciate your time and participation in my project.

Here is the link to the ENDS presentation: https://novanthealth-my.sharepoint.com/:f/g/personal/jwbarney_novanthealth_org/EoENfXwZu1Ag_JH_Xcr8-8BARxROrDc11eMdOr1mxxmxQ?e=bF3xYS

Here is the link to the survey: https://uncg.qualtrics.com/jfe/form/SV_cHXujul4O4EHZ6u.



Please let me know if you have any questions, and I am happy to address those.

Grateful,

Julie

Julie Barney MSN, RN

Novant Health Employer Solutions

Novant Health, Inc.

1399 Ashleybrook Lane, Suite 200, Winston-Salem, NC 27103

jwbarney@novanthealth.org | NovantHealth.org

Hi Brittany,

The implementation of my project is complete and below are links to the final Post-Implementation Survey. Would it be possible for you to forward the below instructions to your staff and include the new employee Teesha at kpeelee@novanthealth.org? Thank you so much for your help with my project and I will be in touch with a summary of my results soon. So thankful for you and your willingness to allow me to do this with HPUSH.

Julie

Dear Staff,

Thank you for your willingness to participate in my study. Please see the link below for you the final Post-Implementation Survey. It will take you a few short minutes to complete and please leave me any feedback as well. I appreciate your time and participation in my project.


https://uncg.qualtrics.com/jfe/form/SV_3z3qt69cDTuhL5s



With gratitude,

Julie Barney

Appendix D



Electronic, or Vaping, product use –Associated Lung Injury (EVALI)

In 2019 the Centers for Disease Control (CDC) introduced the term EVALI to describe ENU related lung injuries and illnesses including hypersensitivity pneumonitis, diffuse alveolar damage, lipid pneumonia, acute respiratory distress syndrome, and diffuse alveolar hemorrhage.


Typical chest imaging findings include “ground glass opacities” or hazy opacities.

Sharp rise in incidence since 2019 and creation of diagnostic code (D97.9) for EVALI.

Many cases missed due to COVID-19 pandemic and CDC not continuing to collect data on EVALI (Cottler, 2022).

<https://www.health.sabcs.edu/news/Headlines/Resolving-problems-in-texas-cases-of-lung-injury-due-to-vaping/2020/11>

7



Dangers to College Students and Young Adults

- Regulation is CRITICAL- Federal age to purchase tobacco products including ENDS raised to 21
- Public Policy Recommendations
 - Public Education Campaigns- “The Real Cost” educates teens vs ENDS marketing strategies
 - Environmental concerns, risk of poisoning

This Slides by Unknown Author is licensed under CC BY.

8

Recommendations for Clinicians “ACT”- Ask, Counsel, Treat to Address Cessation

ASK- Screen for tobacco/ENDS use with every clinical encounter

- Clinicians must ask all patients about the use of smokeless tobacco such as dip or chew and ENDS products!
- Patients falsely believe the use of ENDS may assist with smoking cessation
- Tobacco use is a signal to providers to screen all young patients for any nicotine use
- Ask during office visits for sports physicals, routine annual exams, or immunizations
- Health care providers address - ENDS screening components: personal, family, and friend usage; education about health risks; and provision of cessation, counseling
- Opportunities to interact with both youth and caregivers at school, community organizations, and primary care facilities

Centers for Disease Control and Prevention (CDC) Office on Smoking and Health, Youth Tobacco Considerations, 2022.

9



SCREENING TOOLS

- Screening tool specific for ENDS is not available
- Tools that could be used to assess ENDS usage and/or nicotine dependence
 - CAGE Questionnaire
 - Four Cs Test
 - Fagerström Test
 - Adolescent ENDS Checklist
 - Hooked on Nicotine Checklist (This is chosen screening tool to be used for this project)

Centers for Disease Control and Prevention (CDC) Office on Smoking and Health, Youth Tobacco Considerations, 2022.

10

Hooked On Nicotine Checklist (HONC)

(Winters et al., 2012)

11

Recommendations for the Provider- “ACT”- Ask, Counsel, Treat

Counsel: Advise all clients who use tobacco/ENDS to quit and set a quit date within two weeks.

SAMPLE COUNSELING STATEMENTS

- “As your doctor, I care about you and I want to help you stay as healthy as possible. Quitting smoking/vaping is an important way to keep you healthy.”
- “Quitting is hard, but I believe you can do it.”
- “It sounds like you’re using smoking/vaping to deal with stress. May I offer some suggestions about other ways to cope with stress?”
- “On a scale of 1-10, how important is it for you to quit smoking/vaping? What made you choose that number? What might it take to get you to a higher number?”
- “Are you interested in quitting today?”

Centers for Disease Control and Prevention (CDC) Office on Smoking and Health, Youth Tobacco Considerations, 2022.

12

TREAT: Link youth to appropriate behavioral support and prescribe pharmacologic support

Elements of a Successful Quit Plan

- Quit completely on the quit date; avoid relapse triggers
- Identify and avoid triggers and stressors; practice and rehearse as tobacco products and paraphernalia
- Triggers: identify people, places, feelings, or situations that may cause people to want to use tobacco and develop a plan to manage their triggers
- Withdrawal symptoms: identify symptoms of nicotine withdrawal (eg, craving, irritability, nervousness, and drowsiness) and develop strategies to manage them

Social support: Identify friends and family who can encourage success

Self-care: Consider supportive behaviors such as healthy eating, exercise, meditation

Centers for Disease Control and Prevention (CDC) Office on Smoking and Health, Youth Tobacco Coalitions, 2022

13

Treatment: Pharmacologic Cessation Support for moderately to severely dependent students.

Drug Name	Treatment
Nicotine Transdermal Patch (OTC)	<p>Dosage: • 21mg, 14mg, 7mg Use</p> <p>Instructions:</p> <ul style="list-style-type: none"> - Apply patch to clean skin, change patch every 24 hours - 8-10 week treatment regimen - Use first dose for 6 weeks, then "step down" to lower dose o Use lower dose for 2 weeks, then "step down" to lowest dose for 2 more weeks <p>Side Effects:</p> <ul style="list-style-type: none"> • Skin irritation, sleep disturbance <p>Advantages:</p> <ul style="list-style-type: none"> • Sustained blood levels of nicotine, compliance is relatively easy
Nicotine Gum (OTC)	<p>Dosage: 4mg, 2mg</p> <p>Use Instructions:</p> <ul style="list-style-type: none"> - "Chew and park" method: - 12-week treatment regimen <p>Side Effects:</p> <ul style="list-style-type: none"> • Jaw soreness, mouth irritation, indigestion, nausea, hiccups <p>Advantages:</p> <ul style="list-style-type: none"> • Flexible dosing, rapid delivery of nicotine into blood stream
Nicotine Lozenge (OTC)	<p>Dosage: 4mg, 2mg</p> <p>Use Instructions:</p> <ul style="list-style-type: none"> • Dissolving method • 12-week treatment regimen <p>Side Effects:</p> <ul style="list-style-type: none"> • Oral irritation, nausea, hiccups <p>Advantages:</p> <ul style="list-style-type: none"> • Possible dosing, rapid delivery of nicotine into blood stream, no chewing (discrete)

14

Drug Name	Treatment
Nicotine Inhaler (Not OTC)	<p>Dosage:</p> <ul style="list-style-type: none"> • 10mg per cartridge as needed every one to two hours <p>Instructions:</p> <ul style="list-style-type: none"> - Maximum 16 cartridges per day - 8-10 week treatment regimen <p>Side Effects:</p> <ul style="list-style-type: none"> • Use caution to reactive airway disease <p>Advantages:</p> <ul style="list-style-type: none"> • User controls nicotine dose, oral substitute for vape or cigarette, device visible when being used, frequent puffing required to obtain adequate nicotine delivery
Nicotine Nasal Spray (Not OTC)	<p>Dosage: 0.5 mg per spray (10 mg/ml). Apply 1 spray to each nostril every 1 to 2 hours as needed</p> <p>Use Instructions: Maximum 10 sprays/hour, 80 sprays/day</p> <p>Side Effects: Nasal and throat irritation, rhinitis, sneezing, cough, or teary eyes. (Local irritation to the mucosa is difficult for many to tolerate)</p> <p>Advantages: User controls nicotine dose; most rapid delivery of nicotine among nicotine-replacement products</p>
Varenicline (Not OTC)	<p>Dosage: • 0.5 mg pill to start, then titrate up to 1 mg pill/0.5 mg/day for 3 days, then 0.5 mg twice a day for 4 days, then 1 mg twice a day</p> <p>Use Instructions: Abruptly quitting smoking is preferred. Gradual smoking reduction is an alternative: reduce smoking by 50% by week 4, another 50% by week 8, quit by week 8, quit by week 8, quit by 1 to 2 weeks after quit date. May be started up to 5 weeks prior to quit date</p>

15

Drug Name	Treatment
Bupropion Sustained release (Not OTC)	<p>Dosage: 150 mg/day for 3 days, then 150 mg twice a day</p> <p>Instructions: Abruptly quitting smoking is preferred. Gradual smoking reduction is an alternative: reduce smoking by 50% by week 4, another 50% by week 8, quit by week 8</p> <p>Side Effects: Insomnia, agitation, dry mouth, headache, blunts post-cessation weight gain while being used</p> <p>Advantages: oral agent</p> <p>Precautions: Monitor for neuropsychiatric symptoms. Contraindicated in patients with seizure disorder or predisposition</p>

All pharmacologic agents may be extended for an additional 12 weeks (or even longer, up to 1 year) if the patient has quit smoking but still feels at risk for relapse based upon experience with prior quit attempts. NRT may be continued indefinitely.

† Neuropsychiatric symptoms include: behavioral changes, hostility, agitation, depressed mood, suicidal ideation and attempts.

© 2023 UpToDate, Inc. and/or its affiliates. All Rights Reserved.

16

TIPS for Success

- Be mindful of personal biases and systemic barriers.
- FOLLOW-UP is essential. Quitting is a process.
- Successful intervention often requires repeated intervention.
- Suggest adding additional support during follow-up.

17

References

Buckner, T. D., Arnold, M. K., Rao, V., Martin, L., & Rice, T. R. (2020). Systematic review of electronic cigarette use (vaping) and mental health comorbidity among adolescents and young adults. *Nicotine & Tobacco Research, 22*(3), 415-421. <https://doi.org/10.1093/ntr/ktaa014>

Brownson, J. L., & Hancock, L. C. (2019). Using electronic audience response technology to track e-cigarette habits among college freshmen. *Addictive Behaviors, 95*, 26-27. <https://doi.org/10.1016/j.addbeh.2018.11.014>

Cano Rodriguez, C., Chen, Y., Nardi, J. H., & Rosecrance-Peters, T. (2020). Vaping: Impact of improving screening questioning in adolescent population. A quality improvement initiative. *Public Health & Reports, 61*(1), e170. <https://doi.org/10.1093/phr/cgaa007>

Centers for Tobacco Products. (2022, March 10). *Results from the annual national youth tobacco survey (nyts)*. U.S. Food and Drug Administration. Retrieved July 6, 2022, from <https://www.fda.gov/tobacco-products/annual-national-youth-tobacco-survey-nyts>

Centers for Disease Control and Prevention. (2022a, March 11). *Smell e-cigarette use remains serious public health concern amid Covid-19 pandemic*. CDC newsroom. Retrieved July 6, 2022, from <https://www.cdc.gov/media/releases/2021/s0711-smell.html>

Centers for Disease Control and Prevention. (2022b, June 28). *Check facts on the risks of e-cigarettes for young people: Smoking & tobacco use*. Retrieved July 6, 2022, from <https://www.cdc.gov/youngpeople/2022/06/28/e-cigarettes-for-young-people/>

Deering, J. W., & Cox, J. G. (2018). Diffusion of innovation theory, principles, and practice. *Health Affairs, 37*(2), 181-190. <https://doi.org/10.1371/journal.pone.0211399>

Dresching, L. L., & Spore, S. E. (2012). Rhetoric use of screening and brief intervention for college students in a university counseling center. *Journal of Psychoactive Drugs, 44*(4), 312-318. <https://doi.org/10.1177/0898010112468444>

18

References continued

Drug Enforcement Agency (2019). Flipping & switching conventional 'flat or regular' [PDF]. <https://www.deadillicit.com/2019/03/20/2019-03-20-flipping-switching/>

El-Shahawi, O., Bawa, R., & Elhadi, L. (2016). Primary care physicians' beliefs and practices regarding e-cigarette use by patients who smoke: A qualitative assessment. *International Journal of Environmental Research and Public Health*, 13(5), 445. <https://doi.org/10.3390/ijerph13050445>

Felding-Steg, P., Brown Johnson, C., Oppens, M., Dai, S., Jankis, R., & Prochaska, J. J. (2019). E-cigarettes: Harmful or harm-reducing? Evaluation of a novel online care program for health care providers. *Journal of General Internal Medicine*, 33(3), 356-361. <https://doi.org/10.1007/s11961-018-0248-8>

Hahn, N., Ambrose, C., Stauder, P., Coyne, L., Mrazek, M., Krasner, C. M., Friedman, L., & Niv, M. (2020). Improving e-cigarette and vaping use screening among adolescents. *Academy of Pediatrics*, 125(1), e11. <https://doi.org/10.1542/pep2019-0044>

Hart, S., & Conway, M. (2018). Exploring physician attitudes regarding electronic dissemination of e-cigarettes use: A qualitative study. *Tobacco Use Insights*, 1(1), 119175231878202. <https://doi.org/10.1177/119175231878202>

Jafarzai, T. C., White, J. L., Kalkreuth, S., Siegel, D. A., Koppaka, R., Monevski, M., Adkins, N., Weinman, D. N., Krasner, E. H., O'Hagan, M., O'Neil, M., C. Bickley, M. D., Charlton-Thomas, K., Krasner, E. A., Lape, M., Bagan-Belton, S., Legha, J. K., Shady, K., King, B. A., Smith, L. S. (2019). Update: Interim guidance for health care providers for managing patients with suspected e-cigarette or vaping product use-associated lung injury—United States, November 2018. *MMWR Morbidity and Mortality Weekly Report*, 68(46), 1581-1586. <https://doi.org/10.1093/mmwr.mm6846a1>

Jung, A. M., Robinson, A. J., Gendall, D., Pappas, A., Chik, C., Cecchetti, P. M., Fu, S., Graham, A. L., Lindgren, B. R., Miller, A. C., Gossell, J. S., Swann, E. L., Taylor, K. L., Tall, B. A., Zlotnik, S. B., & Yank, D. M. (2019). Lung cancer screening and smoking cessation clinical trials: Aids (smoking cessation within the context of lung cancer screening) collaboration. *Journal of Respiratory and Critical Care Medicine*, 193(2), 172-182. <https://doi.org/10.1164/rccm.2018-08-1504>

19

References continued

Karamali, J. (2011). Diffusion of innovation theory. *Canadian Journal of Nursing Informatics*, 6(2). <https://doi.org/10.5540/cjn.v6i2.144>

Kinoshita, K. A., Peterson, R., Bharati, R., Han, K., & Moore, M. (2021). Co-creating opportunities to increase cessation for electronic nicotine-delivery systems in family medicine—A qualitative program evaluation. *BMC Family Practice*, 22(1). <https://doi.org/10.1186/s12874-021-01203-4>

Lafont, J. H., Diaz, R. P., Thompson, L. A., Tan, A. L., Young-Wolff, K. C., Carter-Harris, L., Solomon, C. A., & Bellamy, R. G. (2019). Tobacco-related counseling and documentation in adolescent primary care practice: Challenge and opportunity. *Journal of Tobacco Research*, 23(1), 103-107. <https://doi.org/10.1093/jtr/abz004>

Livingston, C. J., Freeman, R. J., Conklin, Y. C., Washburn, J. L., Caplan, L. S., Brown, K. M., & Nohria, D. W. (2019). Electronic nicotine delivery systems or e-cigarettes: American college of preventive medicine's practice statement. *American Journal of Preventive Medicine*, 65(3), 367-378. <https://doi.org/10.1016/j.amepre.2018.10.010>

Patterson, E. H., Fisher, C. L., & Zhou, X. (2015). Pediatric primary healthcare providers' preferences, experiences and perceived barriers to discussing electronic cigarettes with adolescent patients. *Journal of Communication in Healthcare*, 1(4), 204-214. <https://doi.org/10.1080/20927753.2015.1040000>

Richard, T. B., Swann, A., Thomas, C. C., VanFrank, B., Haskins, S., Callaway, M., & Richardson, L. C. (2020). Screening for lung cancer—11 states, 2017. *MMWR Morbidity and Mortality Weekly Report*, 69(9), 240-246. <https://doi.org/10.1093/mmwr.mm6909a1>

Rogals, K. M. (2005). *Application of innovation theory*. New York: Free Press.

Songkai, G. G., Chatur, J. E., Fisher, B., Ali, B., Chen, C., & Hodges, L. (2019). Evaluation of the effects of a brief educational module about electronic cigarette on endodontic health professional students' knowledge, attitude, and self-efficacy: A pilot study. *Respirology Care Education Journal*, 28, 55-57.

20

Appendix E

Hooked on Nicotine Checklist (HONC)

The HONC checklist assesses loss of control or autonomy over nicotine use (Tobacco/E-cigarettes) in adolescents.

Questions

1. Have you ever tried to quit, but couldn't?
 YES NO
2. Do you smoke/vape now because it is really hard to quit?
 YES NO
3. Have you ever felt like you were addicted to tobacco/e-cigarettes?
 YES NO
4. Do you ever have strong cravings to smoke/vape?
 YES NO
5. Have you ever felt like you really needed a cigarette/vape?
 YES NO
6. Is it hard to keep from smoking/vaping in places where you are not supposed to, like school?
 YES NO

When you tried to stop smoking/vaping... (OR, when you haven't used tobacco/e-cigarettes for a while...)

7. Did you find it hard to concentrate because you couldn't smoke/vape?
 YES NO
8. Did you feel more irritable because you couldn't smoke/vape?
 YES NO
9. Did you feel a strong need or urge to smoke/vape?
 YES NO
10. Did you feel nervous, restless or anxious because you couldn't smoke/vape?
 YES NO

The HONC is scored by counting the number of YES responses. Smokers/vapers who have scores above zero can be told that they are already hooked. Many youths become hooked before they even consider themselves to be smokers/vapers. This is because the loss of autonomy can start after the first few cigarettes/vapes.

Appendix F

10/22/23, 8:48 PM

Qualtrics Survey Software

Healthcare Provider Screening Pre-Survey

What color was your first car?

What was the name of your elementary school?

What licensure do you currently hold?

- Physician
- Nurse Practitioner
- Physician's Assistant
- Registered Nurse
- Licensed Practical Nurse
- Certified Nursing Assistant
- Certified Medical Assistant
- Other, please state _____

What is your level of educational preparation?

- Associate's degree
- Bachelor's degree
- Master's degree
- Doctoral degree
- other, please specify _____

What is your current age?

- 18-30 years old
- 31-40 years old
- 41-50 years old
- 51-60 years old
- 61-70 years old
- Older than 71 years

10/22/23, 8:48 PM

Qualtrics Survey Software

How many years have you been in practice?

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26-30 years
- Greater than 30 years of practice

What is your primary area of practice?

- College health
- Family practice
- Primary care
- Pediatrics
- Internal Medicine
- Other, please specify _____

Please rank the following Electronic Nicotine Delivery Systems (ENDS) topics from 1-4, with 1 being the topic you most desire to learn more about, and 4 being the topic you least desire to learn more about.

Potential health effects of e-cigarette use

Effectiveness of e-cigarettes as a smoking cessation tool

Link between e-cigarettes and future traditional cigarette use

Effects of second-hand e-cigarette smoke

How often do you screen college students for smoking cigarettes?

- 0% of visits
- 25% of visits

10/22/23, 8:48 PM

Qualtrics Survey Software

- 50% of visits
- 75% of visits
- 100% of visits

How often do you screen college students for ENDS use?

- 0% of visits
- 25% of visits
- 50% of visits
- 75% of visits
- 100% of visits

How knowledgeable are you with evidenced-based ENDS information?

- Not knowledgeable
- Somewhat knowledgeable
- Very knowledgeable
- Unsure

How much of a health risk do you feel ENDS pose to your patients, especially college students?

- No risk
- Small risk
- Great risk
- Unsure

How likely are you to recommend ENDS to college students as a smoking cessation tool?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

10/22/23, 8:48 PM

Qualtrics Survey Software

If asked, how likely are you to tell your patients that ENDS are less harmful than regular cigarettes?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How likely are you to counsel college students about avoiding cigarette use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How likely are you to counsel students about avoiding ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How likely are you to provide students with educational material regarding ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

Powered by Qualtrics

Appendix G

10/22/23, 9:12 PM

Qualtrics Survey Software

Healthcare Provider Screening Post Survey

Q1. What was the color of your first car?

Q2. What was the name of your elementary school?

Q3. How often do you screen college students for smoking cigarettes?

- 0% of visits
- 25% of visits
- 50% of visits
- 75% of visits
- 100% of visits

Q4. How often do you screen college students for ENDS use?

- 0% of visits
- 25% of visits
- 50% of visits
- 75% of visits
- 100% of visits

Q5. How knowledgeable are you with your evidence-based ENDS information?

- Not knowledgeable at all
- Somewhat knowledgeable
- Very knowledgeable
- Unsure

Q6. How much of a health risk do you feel ENDS pose to your patients, especially college students?

- No risk

10/22/23, 9:12 PM

Qualtrics Survey Software

- Small risk
- Great risk
- Unsure

Q7. How likely are you to recommend ENDS to college students as a smoking cessation tool?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

Q8. If asked, how likely are you to tell your patients that ENDS are less harmful than traditional cigarettes?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

Q9. How likely are you to counsel college students about avoiding cigarette use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

Q10. How likely are you to counsel students about avoiding ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely

10/22/23, 9:12 PM

Qualtrics Survey Software

- Somewhat likely
- Extremely likely

Q11. How likely are you to provide college students with educational material regarding ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

Q12. Comments and/or suggestions?

Powered by Qualtrics

Appendix H

10/22/23, 9:20 PM

Qualtrics Survey Software

Post HONC Screening Implementation Survey

What was the color of your first car?

What was the name of your elementary school?

How often do you screen college students for smoking cigarettes?

- 0% of visits
- 25% of visits
- 50% of visits
- 75% of visits
- 100% of visits

How often do you screen college students for ENDS use?

- 0% of visits
- 25% of visits
- 50% of visits
- 75% of visits
- 100% of visits

How knowledgeable are you with your evidence-based ENDS information?

- Not knowledgeable at all
- Somewhat knowledgeable
- Very knowledgeable
- Unsure

How much of a health risk do you feel ENDS pose to your patients, especially college students?

- No risk

10/22/23, 9:20 PM

Qualtrics Survey Software

- Small risk
- Great risk
- Unsure

How likely are you to recommend ENDS to college students as a smoking cessation tool?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

If asked, how likely are you to tell your patients that ENDS are less harmful than traditional cigarettes?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How likely are you to counsel college students about avoiding cigarette use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How likely are you to counsel students about avoiding ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely

10/22/23, 9:20 PM

Qualtrics Survey Software

 Extremely likely

How likely are you to provide college students with educational material regarding ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How likely are you to continue screening college students for ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How likely are you to continue using the Hooked-On Nicotine Checklist (HONC) to screen college students for ENDS use?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely

How easy was it to implement the HONC into your practice?

- Extremely difficult
- Somewhat difficult
- Neither easy nor difficult
- Somewhat easy
- Extremely easy

10/22/23, 9:20 PM

Qualtrics Survey Software

How often did the use of the HONC screening tool lead to patient education or treatment?

- 0% of visits
- 25% of visits
- 50% of visits
- 75% of visits
- 100% of visits

What barriers did you face to using the HONC screening tool?

Powered by Qualtrics

References

- Alzahrani, T., Pena, I., Temesgen, N., & Glantz, S. A. (2018). Association between electronic cigarette use and myocardial infarction. *American Journal of Preventive Medicine*, 55(4), 455–461. <https://doi.org/10.1016/j.amepre.2018.05.004>
- Becker, T. D., Arnold, M. K., Ro, V., Martin, L., & Rice, T. R. (2020). Systematic review of electronic cigarette use (vaping) and mental health comorbidity among adolescents and young adults. *Nicotine & Tobacco Research*, 23(3), 415–425. <https://doi.org/10.1093/ntr/ntaa171>
- Bourdon, J. L., & Hancock, L. C. (2019). Using electronic audience response technology to track e-cigarette habits among college freshmen. *Addictive Behaviors*, 95, 24–27. <https://doi.org/10.1016/j.addbeh.2019.02.019>
- Camenga, D. R., & Chadi, N. (2021). Recommendations for prevention and treatment of e-cigarette use among youth in the clinical setting. In *Electronic cigarettes and vape devices* (pp. 75–90). Springer International Publishing. https://doi.org/10.1007/978-3-030-78672-4_6
- Cano Rodriguez, Z., Chen, Y., Siegel, J. H., & Rousseau-Pierre, T. (2020). Vaping: Impact of improving screening questioning in adolescent population: A quality improvement initiative. *Pediatric Quality & Safety*, 6(1), e370. <https://doi.org/10.1097/pq9.0000000000000370>
- Center for Tobacco Products. (2022a, June 29). *Think e-cigs can't harm teens' health?* U.S. Food and Drug Administration. <https://www.fda.gov/tobacco-products/public-health-education/think-e-cigs-cant-harm-teens-health>

- Center for Tobacco Products. (2022b, December 20). *Results from the annual national youth tobacco survey (nyts)*. U.S. Food and Drug Administration. <https://www.fda.gov/tobacco-products/youth-and-tobacco/results-annual-national-youth-tobacco-survey>
- Centers for Disease Control and Prevention. (2021, July 9). *Cigarette smoking among U.S. adults hits all-time low*. CDC Newsroom. Retrieved October 21, 2023, from <https://www.cdc.gov/media/releases/2019/p1114-smoking-low.html>
- Centers for Disease Control and Prevention. (2022a, June 28). *Quick facts on the risks of e-cigarettes for young people*. Smoking and tobacco use. Retrieved October 21, 2023, from https://www.cdc.gov/tobacco/basic_information/e-cigarettes/Quick-Facts-on-the-Risks-of-E-cigarettes-for-Kids-Teens-and-Young-Adults.html
- Centers for Disease Control and Prevention. (2022b, November 17). *Cdc newsroom*. [https://www.cdc.gov/media/releases/2021/p0930-e-cigarette.html#:~:text=A%20study%20released%20today%20\(attached,those%20youth%20using%20flavored%20e%2D](https://www.cdc.gov/media/releases/2021/p0930-e-cigarette.html#:~:text=A%20study%20released%20today%20(attached,those%20youth%20using%20flavored%20e%2D)
- Centers for Disease Control and Prevention. (2022c, November 17). *Youth e-cigarette use remains serious public health concern amid covid 19 pandemic*. CDC newsroom. [https://www.cdc.gov/media/releases/2021/p0930-e-cigarette.html#:~:text=A%20study%20released%20today%20\(attached,those%20youth%20using%20flavored%20e%2D](https://www.cdc.gov/media/releases/2021/p0930-e-cigarette.html#:~:text=A%20study%20released%20today%20(attached,those%20youth%20using%20flavored%20e%2D)
- Centers for Disease Control and Prevention. (2022d, December 5). *Surgeon general's advisory on e-cigarette use among youth*. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/surgeon-general-advisory/index.html

- Crowfoot, D., & Prasad, V. (2017). Using the plan–do–study–act (pdsa) cycle to make change in general practice. *InnovAiT: Education and inspiration for general practice*, 10(7), 425–430. <https://doi.org/10.1177/1755738017704472>
- Dearing, J. W., & Cox, J. G. (2018). Diffusion of innovations theory, principles, and practice. *Health Affairs*, 37(2), 183–190. <https://doi.org/10.1377/hlthaff.2017.1104>
- Deming, W. E. (1982). *Out of the crisis*. Massachusetts Inst Technology.
- Denering, L. L., & Spear, S. E. (2012). Routine use of screening and brief intervention for college students in a university counseling center. *Journal of Psychoactive Drugs*, 44(4), 318–324. <https://doi.org/10.1080/02791072.2012.718647>
- Dermody, S. (2021, March 18). E-Cigarettes: The first step in treating addiction is recognizing a problem exists in the first place. *Addiction Science*.
<https://addictionscience.blog.torontomu.ca/2021/03/18/e-cigarettes-the-first-step-in-treating-addiction-is-recognizing-a-problem-exists-in-the-first-place/>
- DiFranza, J. R., Savageau, J. A., Fletcher, K., Ockene, J. K., Rigotti, N. A., McNeill, A. D., Coleman, M., & Wood, C. (2002). Measuring the loss of autonomy over nicotine use in adolescents. *Archives of Pediatrics & Adolescent Medicine*, 156(4), 397.
<https://doi.org/10.1001/archpedi.156.4.397>
- Drope, J., Cahn, Z., Kennedy, R., Liber, A. C., Stoklosa, M., Henson, R., Douglas, C. E., & Drope, J. (2017). Key issues surrounding the health impacts of electronic nicotine delivery systems (ends) and other sources of nicotine. *CA: A Cancer Journal for Clinicians*, 67(6), 449–471. <https://doi.org/10.3322/caac.21413>

- Drug Enforcement Agency. (2019). *Vaping & marijuana concentrates. What is vaping?* [PDF].
https://www.dea.gov/sites/default/files/2019-10/VapingMarijuana_Brochure_2019_508.pdf
- El-Shahawy, O., Brown, R., & Elston Lafata, J. (2016). Primary care physicians' beliefs and practices regarding e-cigarette use by patients who smoke: A qualitative assessment. *International Journal of Environmental Research and Public Health*, 13(5), 445.
<https://doi.org/10.3390/ijerph13050445>
- Fielding-Singh, P., Brown-Johnson, C., Oppezzo, M., Das, S., Jackler, R., & Prochaska, J. J. (2019). E-cigarettes: Harmful or harm-reducing? evaluation of a novel online cme program for health care providers. *Journal of General Internal Medicine*, 35(1), 336–340.
<https://doi.org/10.1007/s11606-019-05388-7>
- Giovacchini, C. X., Crotty Alexander, L. E., & Que, L. G. (2022). Electronic cigarettes: A pro-con review of the current literature. *The Journal of Allergy and Clinical Immunology: In Practice*, 10(11), 2843–2851. <https://doi.org/10.1016/j.jaip.2022.07.009>
- Gorzkowski. (2021). *Aap_youth_tobacco_cessation_considerations_for_clinicians* [PDF].
https://downloads.aap.org/AAP/PDF/AAP_Youth_Tobacco_Cessation_Considerations_for_Clinicians.pdf
- Hein, N., Matheus, C., Narahari, P., Gwynn, L., Mauer, M., Kienstra, C. M., Friedman, L., & Nur, M. (2020). 110. improving e-cigarette and vaping use screening among adolescents. *Academic Pediatrics*, 20(7), e52. <https://doi.org/10.1016/j.acap.2020.06.131>
- Hurst, S., & Conway, M. (2018). Exploring physician attitudes regarding electronic documentation of e-cigarette use: A qualitative study. *Tobacco Use Insights*, 11, 1179173X1878287. <https://doi.org/10.1177/1179173x18782879>

- Jatlaoui, T. C., Wiltz, J. L., Kabbani, S., Siegel, D. A., Koppaka, R., Montandon, M., Adkins, S., Weissman, D. N., Koumans, E. H., O’Hegarty, M., O’Sullivan, M. C., Ritchey, M. D., Chatham-Stephens, K., Kiernan, E. A., Layer, M., Reagan-Steiner, S., Legha, J. K., Shealy, K., King, B. A.,...Smith, L. S. (2019). Update: Interim guidance for health care providers for managing patients with suspected e-cigarette, or vaping, product use–associated lung injury — united states, november 2019. *MMWR. Morbidity and Mortality Weekly Report*, 68(46), 1081–1086. <https://doi.org/10.15585/mmwr.mm6846e2>
- Joseph, A. M., Rothman, A. J., Almirall, D., Begnaud, A., Chiles, C., Cinciripini, P. M., Fu, S. S., Graham, A. L., Lindgren, B. R., Melzer, A. C., Ostroff, J. S., Seaman, E. L., Taylor, K. L., Toll, B. A., Zeliadt, S. B., & Vock, D. M. (2018). Lung cancer screening and smoking cessation clinical trials. scale (smoking cessation within the context of lung cancer screening) collaboration. *American Journal of Respiratory and Critical Care Medicine*, 197(2), 172–182. <https://doi.org/10.1164/rccm.201705-0909ci>
- Kaminiski, J. (2011). *Diffusion of innovation theory*. Canadian Journal of Nursing Informatics. <https://tinyurl.com/y6zwh615>
- Knudtson. (2023). *Nrt_and_adolescents_pediatrician_guidance_factsheet* [PDF]. https://downloads.aap.org/AAP/PDF/NRT_and_Adolescents_Pediatrician_Guidance_factsheet.pdf
- Kovach, K. A., Peterson, R., Bharati, R., Ista, K., & Monroe, M. (2021). Co-creating opportunities to incorporate cessation for electronic nicotine delivery systems in family medicine – a qualitative program evaluation. *BMC Family Practice*, 22(1). <https://doi.org/10.1186/s12875-021-01520-x>

- LeLaurin, J. H., Theis, R. P., Thompson, L. A., Tan, A. L., Young-Wolff, K. C., Carter-Harris, L., Shenkman, E. A., & Salloum, R. G. (2019). Tobacco-related counseling and documentation in adolescent primary care practice: Challenges and opportunities. *Nicotine & Tobacco Research*, 22(6), 1023–1029. <https://doi.org/10.1093/ntr/ntz076>
- Liu, J., Gaiha, S., & Halpern-Felsher, B. (2020). A breath of knowledge: Overview of current adolescent e-cigarette prevention and cessation programs. *Current Addiction Reports*, 7(4), 520–532. <https://doi.org/10.1007/s40429-020-00345-5>
- Livingston, C. J., Freeman, R. J., Costales, V. C., Westhoff, J. L., Caplan, L. S., Sherin, K. M., & Niebuhr, D. W. (2019). Electronic nicotine delivery systems or e-cigarettes: American college of preventive medicine's practice statement. *American Journal of Preventive Medicine*, 56(1), 167–178. <https://doi.org/10.1016/j.amepre.2018.09.010>
- Metcalf, M., Rossie, K., Stokes, K., & Tanner, B. (2022). Health care professionals' clinical skills to address vaping and e-cigarette use by patients: Needs and interest questionnaire study. *JMIR Formative Research*, 6(4), e32242. <https://doi.org/10.2196/32242>
- Moen, R. D., & Norman, C. L. (2010, November). *Circling back: Clearing up myths about the Deming cycle and seeing how it keeps evolving*. Quality Progress. Retrieved October 10, 2022, from <https://www.qualityprogress.com>
- Mohammadi, L., Han, D. D., Xu, F., Huang, A., Derakhshandeh, R., Rao, P., Whitlatch, A., Cheng, J., Keith, R. J., Hamburg, N. M., Ganz, P., Hellman, J., Schick, S. F., & Springer, M. L. (2022). Chronic e-cigarette use impairs endothelial function on the physiological and cellular levels. *Arteriosclerosis, Thrombosis, and Vascular Biology*, 42(11), 1333–1350. <https://doi.org/10.1161/atvbaha.121.317749>

- National Cancer Institute Division of Cancer Control & Population Sciences. (2020, September 24). *Hooked on nicotine checklist (honc)*. National Institutes of Health. Retrieved March 13, 2023, from <https://cancercontrol.cancer.gov/brp/tcrb/measures-guide/hooked-on-nicotine-checklist>
- Ofei-Dodoo, S., Kellerman, R., Nilsen, K., Nutting, R., & Lewis, D. (2017). Family physicians' perceptions of electronic cigarettes in tobacco use counseling. *The Journal of the American Board of Family Medicine*, 30(4), 448–459.
<https://doi.org/10.3122/jabfm.2017.04.170084>
- Owotomo, O., & Walley, S. (2022). The youth e-cigarette epidemic: Updates and review of devices, epidemiology and regulation. *Current Problems in Pediatric and Adolescent Health Care*, 52(6), 101200. <https://doi.org/10.1016/j.cppeds.2022.101200>
- Patten, S. B. (2021). Vaping and mental health. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 30(1), 3–5.
- 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>
- Peterson, E. B., Fisher, C. L., & Zhao, X. (2018). Pediatric primary healthcare providers' preferences, experiences and perceived barriers to discussing electronic cigarettes with adolescent patients. *Journal of Communication in Healthcare*, 11(4), 245–251.
<https://doi.org/10.1080/17538068.2018.1460960>
- Prochaska, J., & Benowitz, N. (2019). Current advances in research in treatment and recovery: Nicotine addiction. *Science Advances*, 5(Eaay9763).
<https://doi.org/10.1126/sciadv.aay9763>

Rayman, L., & Kessler, T. A. (2021). E-cigarettes in college-age students: Roles of the nurse practitioner. *The Journal for Nurse Practitioners*, *17*(10), 1237–1242.

<https://doi.org/10.1016/j.nurpra.2021.08.007>

Richards, T. B., Soman, A., Thomas, C. C., VanFrank, B., Henley, S., Gallaway, M., & Richardson, L. C. (2020). Screening for lung cancer — 10 states, 2017. *MMWR. Morbidity and Mortality Weekly Report*, *69*(8), 201–206.

<https://doi.org/10.15585/mmwr.mm6908a1>

Riehm, K. E., Young, A. S., Feder, K. A., Krawczyk, N., Tormohlen, K. N., Pacek, L. R., Mojtabai, R., & Crum, R. M. (2019). Mental health problems and initiation of e-cigarette and combustible cigarette use. *Pediatrics*, *144*(1). <https://doi.org/10.1542/peds.2018-2935>

Rogers, E. M. (2003). *Diffusion of innovation* (5th ed.). Free Press.

Ruszkiewicz, J. A., Zhang, Z., Gonçalves, F., Tizabi, Y., Zelikoff, J. T., & Aschner, M. (2020). Neurotoxicity of e-cigarettes. *Food and Chemical Toxicology*, *138*, 111245.

<https://doi.org/10.1016/j.fct.2020.111245>

Samson, K. (2019). Add seizures to the risks associated with e-cigarettes/vaping. *Neurology Today*, *19*(20), 33–34,39.

Sergakis, G. G., Clutter, J. E., Edler, B., Ali, B., Choro, C., & Hodgson, L. (2019). Evaluation of the effects of a brief educational module about electronic cigarettes on undergraduate health professional students' knowledge, attitudes, and self-efficacy: A pilot study. *Respiratory Care Education Annual*, *28*, 53–57.

Surgeon general's advisory on e-cigarette use among youth [PDF]. (2018). <https://e-cigarettes.surgeongeneral.gov/documents/surgeon-generals-advisory-on-e-cigarette-use-among-youth-2018.pdf>

- Taylor, M. J., McNicholas, C., Nicolay, C., Darzi, A., Bell, D., & Reed, J. E. (2013). Systematic review of the application of the plan–do–study–act method to improve quality in healthcare. *BMJ Quality & Safety*, 23(4), 290–298. <https://doi.org/10.1136/bmjqs-2013-001862>
- The W. Edwards Deming Institute. (2019, June 3). *Deming on management: PDSA cycle*. Retrieved October 10, 2022, from <https://deming.org/deming-on-management-pdsa-cycle/>
- Trucco, E. M., Fallah-Sohy, N., Hartmann, S. A., & Cristello, J. V. (2020). Electronic cigarette use among youth: Understanding unique risks in a vulnerable population. *Current Addiction Reports*, 7(4), 497–508. <https://doi.org/10.1007/s40429-020-00340-w>
- U.S. Federal Drug Administration. (2022). *Resources for professionals about vaping & e-cigarettes: A toolkit for working with youth* [PDF]. Center for Tobacco Products. <https://digitalmedia.hhs.gov/tobacco/hosted/Vaping-ECigarettes-Youth-Toolkit.pdf>
- U.S. Preventive Services Task Force. (2021). *Recommendation: Tobacco smoking cessation in adults, including pregnant persons: Interventions*. Clinician Summary of USPSTF Recommendation. <https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/tobacco-use-in-adults-and-pregnant-women-counseling-and-interventions>
- Vincent, D., Potts, J., Durbin, J., Moore, J., & Eley, S. (2019). Mental health matters: Electronic nicotine delivery systems, adolescent use, and nicotine addiction. *The Nurse Practitioner*, 44(11), 9–12.

Walley, S. C., Wilson, K. M., Winickoff, J. P., & Groner, J. (2019). A public health crisis:

Electronic cigarettes, vape, and juul. *Pediatrics*, 143(6).

<https://doi.org/10.1542/peds.2018-2741>

Ward, N., Renteria, F., Riley, E., Hughes, M., Whited, T., & Binz, J. (2023). Current practice to address adolescent vaping in primary care. *The Journal for Nurse Practitioners*, 104751.

<https://doi.org/10.1016/j.nurpra.2023.104751>

Wheeler, K., Fletcher, K., Wellman, R., & Difranza, J. (2004). Screening adolescents for nicotine dependence: The hooked on nicotine checklist. *Journal of Adolescent Health*,

35(3), 225–230. [https://doi.org/10.1016/s1054-139x\(03\)00531-7](https://doi.org/10.1016/s1054-139x(03)00531-7)

Wold, L. E., Tarran, R., Crotty Alexander, L. E., Hamburg, N. M., Kheradmand, F., St. Helen, G., & Wu, J. C. (2022). Cardiopulmonary consequences of vaping in adolescents: A scientific statement from the american heart association. *Circulation Research*, 131(3).

<https://doi.org/10.1161/res.0000000000000544>