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Increasing Providers' Intent to Perform E-Cigarette Screening in the Adolescent Population

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INCREASING PROVIDERS' INTENT TO PERFORM E-CIGARETTE SCREENING IN THE ADOLESCENT POPULATION

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An Abstract of the Scholarly Project by
Andrea Hight

Youth e-cigarette use has increased significantly in recent years. E-cigarette use has many negative health effects which are supported by the literature. For example, youth e-cigarette use is linked to future traditional cigarette use, e-cigarette use promotes nicotine addiction, and increases the risk of respiratory infections, COPD, asthma, and cancer. E-cigarette screening creates an opportunity for patient education and counseling, as well as potentially decreases e-cigarette use. However, healthcare providers do not regularly screen adolescents for e-cigarette use. According to previous studies, the main barrier to e-cigarette screening is healthcare providers' knowledge regarding e-cigarette health effects. This project sought to increase healthcare providers' intent to screen for e-cigarette use in the adolescent population, through the provision of an educational offering which highlighted the literature to date regarding e-cigarette health effects. Healthcare providers were recruited in collaboration with the University of Kansas Area Health Education Center. Participants' e-cigarette screening practices were measured before, after, and six-weeks following the educational offering. According to the findings, the study indicated that improving providers' e-cigarette knowledge led to an increased provider intent to screen for e-cigarette use, increased provider willingness to provide patient educational materials, and increased provider inclination to counsel against e-cigarette use, which could ultimately lead to decreased e-cigarette use in the adolescent population.

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CHAPTER I

Introduction

Description of the Clinical Problem

Electronic cigarettes (e-cigarettes) have been increasingly used by the public in recent years, with the most marked increase among the youth population. In fact, the use of e-cigarettes has increased a staggering 900% between 2011 and 2015 (US Department of Health and Human Services, 2016). E-cigarette use has even surpassed traditional cigarette use in the youth population for the first time in United States history (Knopf, 2016). Research has also linked e-cigarette use to traditional cigarette use. Additionally, the nicotine found in e-cigarettes may have an enhanced negative effect specifically in the adolescent brain as opposed to the adult brain, and research is mounting regarding the negative health effects of e-cigarette use (US Department of Health and Human Services, 2016).

E-cigarettes are widely used as a smoking cessation tool in the adult population. They are marketed as "safer" than conventional cigarettes, yet the long-term effects of their use are not well known. The electronic cigarette was patented by Herbert Gilbert in 1965 (Marcham & Springston, 2017). Since that time, the patent has been referenced numerous times, and evolved into the e-cigarette that entered the United States market in 2007. As of 2014, there were 460 e-cigarette brands accounting for nearly 2.2 billion

dollars in sales (Marcham & Springston, 2017). There are currently no industry standards regarding the manufacturing of e-cigarettes. However, no matter the brand, the basic components of the e-cigarettes are similar. E-cigarettes mimic their combustible counterparts in form, but not in function. They are a handheld device that delivers a vapor mist when the user "puffs" on the mouthpiece. Instead of combustion as in traditional cigarettes, they work by heating a liquid filled cartridge via battery operation. The heating of the liquid aerosolizes the contents thus producing a vapor, which the user then inhales. The e-liquid may contain nicotine, flavorings, and other chemicals. According to Marcham & Springston (2017), the goal of e-cigarettes is for the user to obtain nicotine "without the cancer risks associated with traditional tobacco cigarette use because the devices have no combustion source or tobacco, which forms cancer-causing by-products when burned" (p. 47). Studies have shown however, that most e-cigarettes do contain propylene glycol, glycerin, flavorings, and heavy metals (Marcham & Springston, 2017). Since the use of e-cigarettes is a new concept, there are few completed longitudinal studies on the safety of their use.

As previously stated, the use of electronic cigarettes has increased in recent years. The most alarming increase in e-cigarette use has been among the youth, particularly high school students. This is demonstrated by data from the 2016 Youth Tobacco Survey, which finds that e-cigarette use among students in grades 6 through 12 has increased from just 3.3 percent in 2011 to 27 percent in 2016 (US Department of Health and Human Services, 2016). In fact, e-cigarettes are now the most commonly used tobacco product among US youth, even surpassing the use of conventional cigarettes. Several contributing factors have been identified to an increase in youth e-cigarette use including:

youth perceptions, easy access, marketing schemes, and lack of regulations surrounding e-cigarettes (US Department of Health and Human Services, 2016).

The increasing prevalence of e-cigarette use among youth creates a concern for future conventional cigarette use. A study by Primack et al. (2015) revealed a link between e-cigarette use and future cigarette use. In addition to increasing the risk of smoking, a national study linked e-cigarettes to other substance abuse. This study showed that teens who use e-cigarettes were nine times more likely to use alcohol and three and half times more likely to use marijuana than non-users (US Department of Health and Human Services, 2016). The health effects of nicotine may have an enhanced effect in the adolescent brain versus the adult's (US Department of Health and Human Services, 2016). Additionally, recent research has indicated that e-cigarettes may have the potential to create a lung environment prone to chronic airway disease and cancer (Lerner, et al., 2015, Wu, et al., 2014, Yu, et al., 2016, Cho & Paik, 2016).

These health effects have not gone unnoticed by the Food and Drug Administration (FDA). The Food and Drug Administration (FDA) has taken a stance on the situation and is creating an action plan to curtail the teen use of e-cigarettes. Prior to August of 2016, e-cigarettes were not categorized as tobacco products by the FDA. Since coming under FDA control, e-cigarettes have been under fire. In September of 2018, FDA Commissioner Scott Gottlieb discussed his concerns with the youth e-cigarette epidemic in an official statement. He stated, "the disturbing and accelerating trajectory of use we're seeing in youth, and the resulting path to addiction, must end" (U.S. Food & Drug Administration, 2018a, para. 18). The FDA purports that e-cigarette companies are marketing to youth as demonstrated by the manufacturing of "e-liquids resembling kid

friendly foods like juice boxes, candy, cookies", as well as kid-friendly flavorings (U.S. Food & Drug Administration, 2018a, para. 22). In recent months the FDA has issued warning letters and monetary penalties to a variety of e-cigarette manufacturers citing their part in illegally marketing, and even selling, their products to youth. In addition to requiring e-cigarette manufactures to change marketing practices, the FDA has also discussed the possibility of immediately removing flavored e-liquids from the market. (U.S. Food & Drug Administration, 2018a).

Lastly, the FDA released a national campaign in September of 2018 focusing on warning youth of the dangers of e-cigarette use. The goal of the campaign is "to reach the more than 10 million youth ages 12-17 who have used e-cigarettes or are open to trying them" (U.S. Food & Drug Administration, 2018b). This campaign titled "The Real Cost Youth E-cigarette Prevention Campaign" will be found on sites such as Facebook, YouTube, Spotify, Hulu, and Instagram. Additionally, since many students use e-cigarettes at school, the FDA will also place campaign ads in public school bathrooms and school websites (U.S. Food & Drug Administration, 2018b). Gottlieb has called these measures the "largest single enforcement action in agency history" (U.S. Food & Drug Administration, 2018a, para. 25). Gottlieb also states that the "FDA won't tolerate a whole generation of young people becoming addicted to nicotine as a tradeoff for enabling adults to have unfettered access to these same products" (U.S. Food & Drug Administration, 2018a, para. 17).

In addition to the FDA, the surge of e-cigarette use among youth, as well the potential health effects of their use, should also be of great concern to health care providers. In a 2015 quantitative study, 776 pediatricians and family practice providers

were surveyed on their practices and views of e-cigarettes in youth. In the study, 89% of participants wished to have more education regarding e-cigarettes, and only 14% regularly screened for e-cigarette use in the youth population (Pepper, Gilkey, & Brewer, 2015). A study by El-Shahawy, Brown, and Lafata (2016) also indicated a lack of knowledge of e-cigarettes as well as a lack of an e-cigarette screening process. El-Shahaway, Brown, and Lafuta (2016) state that

> " existing clinic processes do not include mechanisms to screen for noncombustible tobacco products (such as e-cigarettes), PCPs report that e-cigarette discussions are becoming commonplace in practice with patients initiating the discussions and seeking physician guidance regarding e-cigarette use, and PCPs express a lack of knowledge regarding the potential harms and benefits of e-cigarettes, yet a willingness to support their patients' desire to use e-cigarettes" (El-Shahawy, Brown, & Lafata, 2016, p.4).

Gaining understanding of the contributing factors related to adolescent e-cigarette use, as well as their health effects, may arm health care providers to combat this alarming new trend. It is clear there is a gap in provider knowledge regarding e-cigarettes, as well as in screening adolescents for e-cigarette use. An appropriate screening tool, as well as information for patients, is greatly lacking regarding e-cigarette use.

Significance

As previously stated, the use of e-cigarettes has increased a staggering 900% between 2011 and 2015 (US Department of Health and Human Services, 2016). The health effects of e-cigarettes are not well known, but literature indicates that their use can increase the rates of chronic airway disease and cancer (Lerner, et al., 2015, Wu, et al.,

2014, Yu, et al., 2016, Cho & Paik, 2016). Additionally, nicotine containing e-liquids may have increased negative effects in the adolescent brain versus the adult brain (Musso, et al., 2007, Vieira-Brock, et al, 2013, Shram, et al., 2006). Lastly, literature clearly demonstrates a link between e-cigarette use and future traditional cigarette use, and the detrimental health effects of traditional cigarette use are well known (Primack, et al., 2015, Barrington-Trimus, et al., 2016, Conner, et al, 2017, Wills, et al., 2016). Increasing e-cigarette screening has the potential to halt the rapid escalation of their use in the adolescent population. Ceasing the increasing rates of e-cigarette use in youth could have many positive health effects by preventing the potential negative consequences of e-cigarette use mentioned above. Healthcare providers should make e-cigarette screening a priority to better ensure the health of our future generation.

Specific Aims and Purpose

The purpose of this scholarly project was to provide an educational offering highlighting the evidence-based literature regarding e-cigarette use in the youth population. After providers' e-cigarette knowledge base increases, there will ideally be an increase in the e-cigarette screening rates of adolescents by local and regional primary care providers. A process of a pre-education survey, educational offering, then post-education survey was initiated to accomplish that purpose. A pre-education survey addressed identifying current knowledge, awareness, and screening of e-cigarettes in the adolescent population. After the pre-education survey, an educational offering was provided in the form of a webinar. The presentation imparted key knowledge from the current research regarding e-cigarettes in the adolescent population. The following aims were sought to be achieved: 1) increased provider awareness of e-cigarette use in the

adolescent population, 2) provision of education to health care providers regarding contributing factors to adolescent e-cigarette use, health effects of their use, and highlight the need for e-cigarette use screening, and 3) creation of educational pamphlets regarding e-cigarette health effects to be distributed to health care provider's offices for patient use.

Theoretical Framework

E. M. Roger's Diffusion of Innovation Theory was used as the theoretical framework for this scholarly project. According to Kaminski (2011), the theory has significant importance as a model of change. The goal of this scholarly project was for providers to increase e-cigarette screening in the adolescent population. In order for this goal to be accomplished, a change must occur in the provider's daily clinical practice. It describes the process of how an idea, product, or process (innovation) spreads through a specific population and is eventually adopted by that population. The innovation in this project was e-cigarette screening for all adolescent patients.

The process of adopting the innovation occurs in five stages: 1) Knowledge or Awareness, 2) Persuasion or Interest, 3) Decision or Evaluation, 4) Implementation or Trial, and 5) Confirmation or Adoption (Kaminski, 2011). For this scholarly project, the knowledge/awareness stage occurred when healthcare providers completed the pre-educational survey. During the survey, providers were exposed to the topic of e-cigarettes but lacked complete information. In the persuasion/interest stage, providers sought additional information by participating in the educational offering regarding e-cigarettes and youth. In the decision/evaluation stage, the providers made a mental decision to increase e-cigarette screening in their practice. The implementation/trial stage occurred when providers implemented e-cigarette screening in their practice. When the e-cigarette

screening became a part of routine clinical practice, then the confirmation/adoption stage had occurred. And at this point, the innovation had been adopted. Figure 1 below demonstrates the stages of the Diffusion of Innovation Theory.

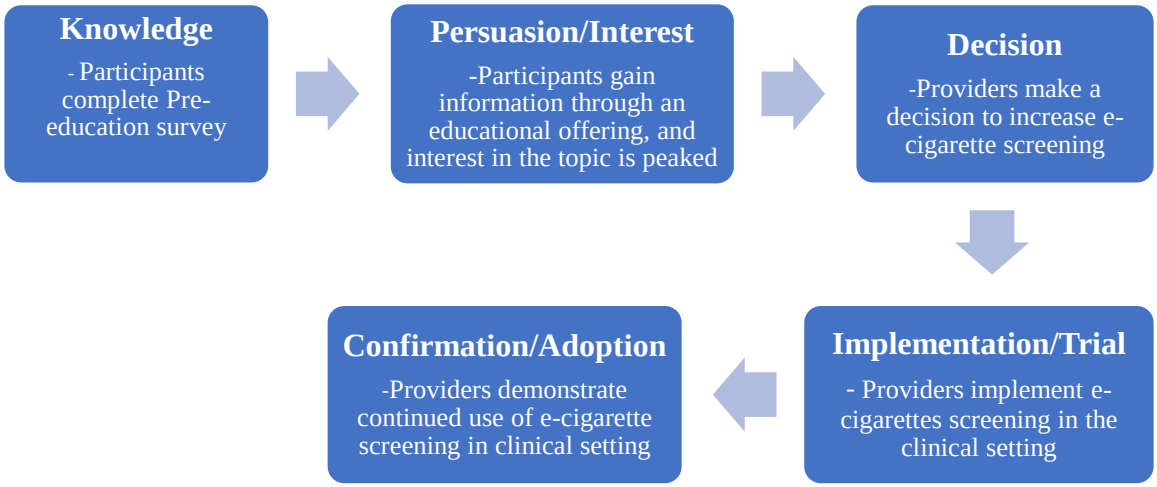

Figure 1. Diffusion of Innovations Theory

Roger's Diffusion of Innovation Theory also discusses that the innovation will be spread through various communication channels over time (Kaminski, 2011). Peer networks are very important in the theory, as peers influence the thinking of other peers leading to the spread of the innovation. Providers who receive the e-cigarette educational offering become peer leaders spreading the knowledge regarding a need for increased e-cigarette screening. Hopefully through their help, the adoption of e-cigarette screening in all youth patients will occur.

Project Questions

The research questions for the project were:

1. What percentage of healthcare providers regularly screen for traditional cigarette compared to e-cigarette use among adolescent patients?

2. Do healthcare providers feel they lack knowledge to counsel adolescents regarding e-cigarette use?
3. What percentage of the healthcare providers feel that e-cigarettes pose a health risk to the adolescent population?
4. How likely are the healthcare providers to counsel adolescents to avoid traditional cigarette use compared to e-cigarette use?
5. Will intent to screen for e-cigarette use in the adolescent population increase after an educational offering for healthcare providers?
6. Would healthcare providers be willing to provide educational materials to adolescents regarding e-cigarette use?

Definition of Key Terms/Variables

- Electronic cigarettes (e-cigarettes)- a electronic device that through heating of a liquid delivers a vapor for the user to inhale.
- E-liquid- the liquid component of the e-cigarette, often flavored, that may contain nicotine and is heated to create a vapor within the e-cigarette device.
- Adolescent/Youth- individuals between the ages of 10-19 year of age (World Health Organization, 2017).
- Traditional Cigarettes- tobacco, chemical additives, a filter wrapped in paper into a thin cylindrical shape that can be ignited and then the smoke inhaled (U.S. Food and Drug Administration, 2017).
- Healthcare providers-

> " 1) A doctor of medicine or osteopathy who is authorized to practice medicine or surgery (as appropriate) by the State in which the doctor practices; or 2) Any other person determined by the Secretary to be capable of providing health care services" (Code of Federal Regulations, n.d.).

Others that may be deemed capable of providing health care services may include: nurse practitioners, physician's assistants, midwifes, podiatrists, chiropractors, dentists, psychologists, and social workers (Code of Federal Regulations, n.d.).

Logic Model

A logic model (Figure 2) was created to visualize the scholarly project. The logic model identified the inputs and outputs utilized to create an intervention. It also identified the short-term, medium-term, and long-term goals of the scholarly project. Lastly, it denotes assumptions of the author, as well as external factors that could influence the project.

Short-term outcomes of the project included increasing provider knowledge of e-cigarette use in youth, adverse health effects of e-cigarette use, and the link between e-cigarette use and traditional cigarettes. After provider knowledge increased, the medium-term goals of the scholarly project included increasing providers' intent to screen adolescents for e-cigarette use. Another medium-term goal was that providers provide e-cigarette educational material to adolescent patients. Long-term goals of the project included a provider clinical practice change in which all patients were screened for e-cigarette use. A lofty goal would be decreased e-cigarette screening rates among

adolescents over the long-term related to consistent e-cigarette screening and appropriate patient education and counselling. This long-term goal was not assessed in this scholarly project. Assumptions included in the logic model were as follows: 1) providers desired increased knowledge regarding e-cigarettes in adolescents, 2) providers recognized the need for increased e-cigarette screening, and 3) providers were willing to adopt practice change. External factors that potentially affected the project outcomes included: 1) the number of willing participants**,** and 2) provider time constraints affecting ability to receive educational offering**.**

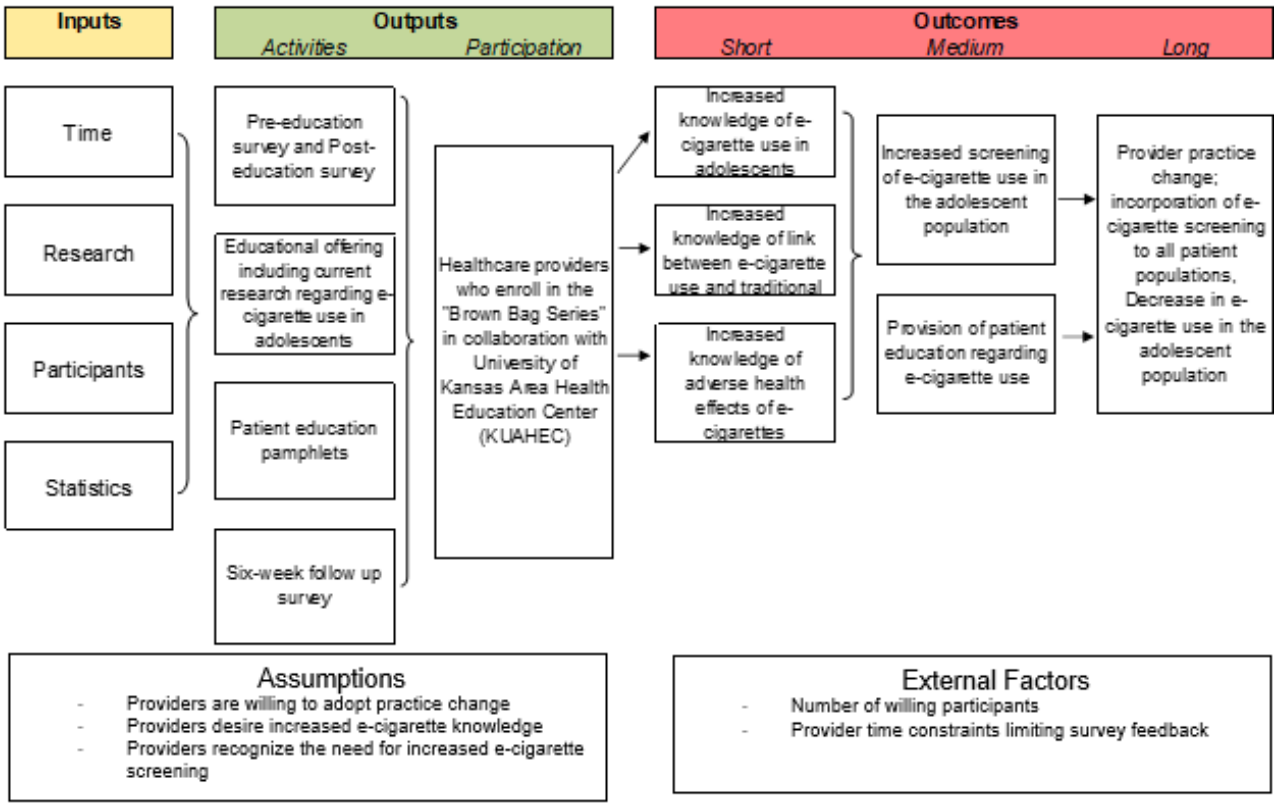

Figure 2. Logic Model: Increasing E-cigarette Screening in the Adolescent Population

Summary

The trend of adolescent e-cigarette use should be of concern to healthcare providers. An opportunity exists for providers to combat, and potentially reverse, this growing trend. What is a "trend" for these adolescents today could pose major health implications for these adolescents in the future. E-cigarettes have been linked with multiple health effects including interference with the maturation of the adolescent brain, increasing chronic airway diseases, increasing the risk of cancer, and the initiation of traditional cigarettes. Current e-cigarette screening rates are poor among healthcare providers, primarily due to a lack of e-cigarette knowledge. Chapter II disseminates a review of the literature regarding adolescent e-cigarette use and additionally demonstrates the need for increased e-cigarette screening in the youth population.

CHAPTER II

Integrated Review of the Literature

As stated in the introductory chapter, the use of e-cigarettes in the adolescent population has increased by a staggering 900% from 2011 to 2015 making it the most commonly used tobacco product among US youth (US Department of Health and Human Services, 2016). Recent research has linked e-cigarette use to future traditional cigarette use. Also, nicotine found in e-cigarettes may have an enhanced negative effect in the adolescent brain versus the adult brain. Lastly, research is mounting for the negative health effects of e-cigarette use (US Department of Health and Human Services, 2016). The surge of e-cigarette use among youth, as well the potential health effects of their use, should be of great concern to health care providers. A review of the literature is essential to gaining the current evidence-based research regarding e-cigarette use in the adolescent population.

A review of the literature was completed using CINHAL PLUS with full text and ProQuest electronic databases. Search terms that were utilized included “e-cigarette health effects”, “electronic cigarettes and youth”, “youth beliefs and e-cigarettes”, “e-cigarettes and respiratory”, “e-cigarettes and cigarettes”, “nicotine and adolescents”, and “e-cigarettes and smoking cessation”. Utilizing these terms, the articles were reviewed for relevance, and thirty-one articles were included in the literature review. Ancestral

research was also performed. By utilizing the reference lists of the articles obtained through the database search, ancestral research was performed and allowed for the identification of several new sources of information. The review of the literature shed light on youth beliefs regarding e-cigarette use, the link between e-cigarettes and future cigarette use, and the potential health effects of e-cigarette use. However, it is important to note that long-term research regarding the detrimental health effects of e-cigarette use is still emerging in both the adolescent, and the general, population.

Literature Review

The intent of the literature review was to gain specific knowledge on youth perceptions of e-cigarette use, how e-cigarettes impact smoking cessation, the link between e-cigarettes and future cigarette use, and the negative health effects associated with e-cigarette use. The knowledge gained in the literature review will be imparted to providers though an educational offering as part of the scholarly project. By increasing the e-cigarette knowledge of providers, perhaps the willingness to screen adolescents for e-cigarette use will increase in the provider population.

Youth Beliefs Regarding E-cigarette Use. As previously stated, e-cigarette use among youth increased by 900% between 2011 and 2015 (U.S. Department of Health and Human Services, 2016). What are the reasons that have contributed to this sharp increase? Research of youth cited reasons for e-cigarette use is both qualitative and quantitative in nature. Some of the youth cited reasons for using e-cigarettes include peer influence, the highly marketable e-liquid flavors, accessibility, price, and their use as a supposedly healthy alternative to traditional e-cigarette use.

Kong et al. (2015), developed a qualitative and quantitative design consisting of both small focus groups, and larger surveys that were given to middle and high school students in Connecticut. The results of the study showed three main reasons that youth use e-cigarettes which include: 1) curiosity, 2) availability of flavored products, and 3) influence of peers (Kong et al., 2015). A fourth item that was mentioned by many youths, is the ability to do "smoke tricks" with the e-cigarette vapor (Kong et al., 2015). Although the study had a large sample size of nearly 6,000 students, it was not without limitation. One major limitation included that it only focused on in-school youth, as well that it had a small demographic area.

Another quantitative study echoed the fact that curiosity was the main determinant in experimenting with e-cigarettes (Surís, Berchtoldb, & Akre, 2015). One major advantage to this study was is that is the only study reviewed that included out of school youth. In the study, 50% of e-cigarette users were also users of conventional cigarettes, which lead to another reason for e-cigarette use: the ability to "smoke where traditional cigarettes are not allowed" (Suris, Berchtoldb, & Akre, 2015, p.143). Another poignant piece of data in this study was that the majority of e-cigarette experimenters and at least one half of current e-cigarette users had never smoking traditional cigarettes (Suris, Berchtoldb, & Akre, 2015). This evidence suggests that e-cigarettes, which are marketed as smoking cessation tools, are instead attracting non-smokers.

Contrarily, a qualitative study from Hilton et al. (2016) found that "current e-cigarette users used nicotine in their e-cigarettes and were also current smokers" (p. 2). In the study, participants found e-cigarettes to be attractive due to the availability of a wide variety of flavors, and that they provided a "covert and safe way to rebel" (Hilton et al.,

2016). Additionally, the teenagers viewed e-cigarettes as tools for smoking cessation, that were less harmful than combustible counterparts (Hilton et al., 2016). The adolescent view that e-cigarettes are less harmful than their traditional counterparts was also demonstrated in a Hawaiian based longitudinal study. In this study, 68% of participants viewed e-cigarettes as safer than traditional cigarettes (Wills et al., 2016).

Lastly, a qualitative study by de Andrade, Angus, and Hastings (2016), found that students use of e-cigarettes was partly related to their ease of accessibility, their inexpensive price, and their view as being a healthy alternative to smoking. Respondents stated that e-cigarettes were easily obtained from the internet, especially Amazon and eBay (de Andrade et al., 2016). Students stated that comparatively, e-cigarettes are much less expensive than regular cigarettes. One participant even said that e-cigarettes were "pretty cheap" (de Andrade et al., 2016, p.291). Most students believed that e-cigarettes were less harmful than traditional cigarettes. When discussing the vapor produced by the e-cigarettes, pupils described it as "harmless" vapor, "just like flavoured smoke", "evaporated water", and "it's nothing bad in it" (de Andrade et al., 2016, p.291). Students were also enticed by the fact that e-cigarettes could be used indoors, and that they came in a variety of flavors such as watermelon, gummy bear, and toffee (de Andrade et al., 2016). The study highlighted, and reiterated, the fact that overall youth feel the e-cigarettes are safer than traditional cigarettes, and that the available flavors are very enticing to young people.

E-Cigarettes and Smoking Cessation. Although few studies indicate that e-cigarettes are utilized as a smoking cessation tool in the adolescent population, the study by Hilton et al. (2016) did indicate that teenagers viewed e-cigarettes as tools for

smoking cessation. Research has demonstrated however, that e-cigarettes are not effective smoking cessation tools. For example, a study titled "E-cigarette Use and Smoking Reduction or Cessation in the 2010/2011 TUS-CPS Longitudinal Cohort" by Shi et al. (2016) evaluated e-cigarettes as a smoking cessation tool for over 2400 smokers. In the study, 41.3% of e-cigarette users utilized e-cigarettes for smoking cessation. The study found that participants who used e-cigarettes for smoking cessation had a lower success rate that participants who used pharmaceutical interventions (Shi et al., 2016). Overall, the study showed that e-cigarettes were not more effective for smoking cessation than nicotine replacement therapy.

Ekanem, et al. (2017), studied the effectives of electronic nicotine delivery systems (ENDS) for smoking cessation using public surveillance data from the state of Arkansas. The state of Arkansas which has a higher than median prevalence of smoking. The study found that "respondents who had ever used ENDS reduced their chances of successfully quitting smoking by about 50%." (Ekanem et al.,2017, p. 215). ENDs use was greatest in smokers who had tried to quit, however greater than 80% ENDS users did not quit smoking. The authors suggest that ENDS use may "actually promote nicotine addiction and result in users simply adding ENDS use to cigarette smoking' (Ekanem et al., 2017, p.217).

Research indicates that e-cigarettes are not effective smoking cessation tools. In addition to their lack of success for smoking cessation, they may also put their users in harm's way. The health effects of e-cigarette use have not been fully researched, but evidence is mounting that suggest that e-cigarettes may be just as, or even more, harmful than traditional cigarettes.

Link between E-Cigarettes and Traditional Cigarettes. As previously stated, the research does not indicate that utilizing e-cigarettes for smoking cessation is a priority in the adolescent population. In fact, one theme that emerged in the literature review is e-cigarette use may potentiate future traditional cigarette use. One of the first studies to look at this link was a longitudinal study by Primack et al. (2015). The quantitative study evaluated nonsmokers who used e-cigarettes, and nonsmokers who did not use e-cigarettes. These individuals were given a survey that identified their intentions to smoke traditional cigarettes. The individuals were then re-evaluated one year later. The study found that even if these non-smoking adolescents did not have the intention to smoke cigarettes in the future, the use of e-cigarettes was a strong predictor for future cigarette use (Primack et al., 2015). Primack et al. (2015), stated that e-cigarettes "may contribute to the development of a new population of cigarette smokers" (p.1021). Although the results of the study were significant, the study was limited by a small sample size of e-cigarette users. These results were however echoed in study by Bunnell et al.(2015), which found that youth who used e-cigarettes were "two times more likely to have intentions to smoke conventional cigarettes that those who had never used e-cigarettes" (p. 233). These results were not limited by small sample size with nearly six thousand participants, however it was a cross-sectional analysis as well as self-reported data, therefore error cannot be excluded.

Another study, titled "E-Cigarettes and Future Cigarette Use" by Barrington-Trimus et al. (2016), showed a link between e-cigarette use and future cigarette use. In the study, the researchers compared a sample of e-cigarette users and never e-cigarette users. The study participants were 11th and 12th grade students in California. The study

was conducted over sixteen months, and the results were significant. Among never e-cigarette users, 10.5% reported cigarette use at the end of the study. Conversely, among e-cigarette users, 40.4% reported cigarette use at the end of the study. When an odds ratio was calculated, e-cigarette users had a 6.17 times higher odds of smoking cigarettes than those who did not use e-cigarettes (Barrington-Trimus et al., 2016). The study also grouped the students by those who has risk factors for smoking; such as parents who smoke and peers who smoke, from students who did not have smoking risk factors. Among individuals who were not considered susceptible to smoking, 5.7% of non-e-cigarette users initiated smoking, while 36.2% of e-cigarette users initiated smoking (Barrington-Trismus et al., 2016). Overall, the study demonstrated that a link may exist between e-cigarette smoking and future cigarette use. Additionally, the authors suggest that e-cigarettes may promote smoking, even in those considered to be at a lower risk because of personal or environmental factors.

A longitudinal study conducted by Conner et al. (2017), also discovered a relationship between e-cigarette use and future traditional cigarette use. Data was collected from nearly three thousand adolescents, aged thirteen to fourteen years old, in England. Students self-reported e-cigarette and cigarette use at baseline was verified by breath carbon monoxide levels. At twelve months, these parameters were re-evaluated. Upon re-evaluation, initiation of cigarettes was found to be 9.0% in never e-cigarette users versus 34.4% in e-cigarette users (Conner et al., 2017). Overall, the study found that e-cigarettes were associated with the initiation of cigarette use, even when the authors controlled for risk variables such as low economic status or having a parent that smoked (Conner et al, 2017).

Finally, another recent longitudinal study, demonstrated that a link did exist between e-cigarette use and future cigarette use. In the study, over 2300 ninth and tenth grade students were evaluated for e-cigarette use, as well as traditional cigarette use, at baseline. They were then re-evaluated twelve months later. The results of the study were alarming. In students who used e-cigarettes only at baseline, 20% had transitioned to traditional cigarette smoking in one year, while only 2% of never e-cigarette users were smoking at follow up (Wills et al., 2016). The authors suggest that the transition to cigarettes may be due to two factors: sensory experiences, and nicotine craving. E-cigarettes are very similar to traditional cigarettes as "the inhaling and exhaling an e-cigarette aerosol produces some of the same sensory experiences as smoking cigarettes" (Wills et al., 2016, p.38). Many adolescents use e-cigarette cartridges that contain nicotine, which might also contribute to the transition to traditional cigarettes. Wills et al. (2016) states "if adolescents begin to experience mild physiological effects from nicotine they may be inclined to shift to cigarettes in order to get a bigger 'kick'" (p. 38). Although the long- term health effects of e-cigarettes are still emerging in the literature, the health effects of traditional cigarettes are well known. This creates concern, as e-cigarettes are promoting future traditional cigarette use among youth.

Potential Health Effects of E-cigarettes. As longitudinal studies continue to be completed the health effects of e-cigarette use will become more well known. At this time, few longitudinal studies examining e-cigarette's health effects exist, however there is still compelling evidence to the potential negative health effects that e-cigarette users may face. One potential health effect of e-cigarettes that is concerning is the effect of nicotine in adolescents

Nicotine. A quantitative study by Kinnunen et al. (2014) found that 65.7% of youth e-cigarette users opt for nicotine containing e-liquids. Additionally, Hilton et al. (2016) found that "current e-cigarette users used nicotine in their e-cigarettes and were also current smokers" (p. 2). Demonstrating that many adolescents are "dual users" of both e-cigarettes and cigarettes, both of which may contain nicotine. Nicotine containing e-liquids may pose health concerns for the developing adolescent brain. A literature review by England et al. (2015) described the significance of adolescence on the developing brain. The adolescent brain undergoes remodeling, neuronal pruning, and maturation during this time. Additionally, significant cognitive maturation occurs, which may affect problem solving and other executive function later in life (England et al., 2015). As previously stated, many youth e-cigarette users opt for nicotine containing e-liquids (Kinnunen et al., 2014). This leads to the assumption that that the risk of nicotine exposure is high among youth e-cigarette users. Therefore, it is reasonable to consider the effects of nicotine on the adolescent brain.

Musso et al. (2007) provided evidence that nicotine in adolescence can alter the "attentional network function of the prefrontal cortex" (p.166). The quantitative study employed the use of magnetic resonance imaging (MRI) to compare the brain function of individuals who began smoking in adolescence, and those that did not. The overall finding suggests that nicotine negatively impacts the attentional network of the prefrontal cortex, the area of the brain that is responsible for an individual's attention span (Musso et al., 2007). The prefrontal cortex showed less activity in the MRI imaging of participants who smoked in adolescence, suggesting that smoking can lead to decreased attention span as an adult (Musso et al., 2007). One major limitation of this study

however, was that they could not "rule out the possibility that chronic smoking has a comparable effect on attentional network function in older people" (Musso et al., 2007, p.166).

Vieira-Brock et al. (2013) found that adolescent rats metabolize nicotine faster than adults, which increases the risk for developing nicotine addiction . The greater risk of addiction was also demonstrated in a quantitative study by Shram et al. (2006). In the study, rats of varying ages were given saccharin–nicotine solutions, and their subsequent behaviors were observed. Based on their behaviors, peri-adolescent rats were not only less sensitive to the "aversive effects" of nicotine but were also more sensitive to the rewarding effects of nicotine (Shram et al., 2006). Both effects increase the risk of nicotine addiction in adolescents. Neither study was without limitations. The limitation of both previously discussed studies were that there were completed in rats, not humans, which means researchers can extrapolate, but not definitively profess the accuracy of their claims.

Respiratory concerns. Many studies have voiced concerns for a variety of respiratory problems related to e-cigarette use from increased infections to chronic airway diseases such as asthma and chronic obstructive pulmonary disease (COPD). A study by Sussan et al. (2015), demonstrated that e-cigarette vapor may impair the body's natural ability to fight off bacterial and viral infections (Sussan et al., 2015). The researchers found that just two weeks of exposure to e-cigarette vapor increased susceptibility to bacterial and viral infections in mice. When the mice bronchial cells were exposed to free oxygen radicals in the e-cigarette vapor, inflammation increased. This inflammation "causes acute pulmonary effects, including increased airway

resistance" (Sussan et al., 2015, p. 10). This inflammation can also affect the function of white blood cells. In the study, white blood cells were impaired and unable to rid the bronchial secretions of viruses and bacteria in an effective manner in the mice exposed to e-cigarette vapor (Sussan et al., 2015). The inability to effectively clear the bacteria and viruses lead to increased infections in the mice who were exposed to e-cigarette vapor. The researchers suggest that e-cigarette use in the youth population "may lead to an emerging threat to public health with regards to recurrent bacterial or viral infections" (Sussan et al., 2015, p. 12).

Another study titled "Electronic Cigarette Liquid Increases Inflammation and Virus Infection in Primary Human Airway Epithelial Cells" demonstrated increased rates of respiratory infections with e-cigarette use (Wu, Jiang, Minor, Wie Chu, 2014). Utilizing human epithelial cells from healthy non-smokers, researchers found that e-cigarette vapor did influence the immune defense to human rhinovirus (HRV). The human epithelial cells were injected with HRV, then some cells were exposed to e-cigarette vapor. The results showed that cells exposed to e-cigarette vapor had significantly higher viral loads than un-exposed cells. According to Wu et al. (2014), "this suggests that e-cigarette use may promote respiratory viral infections and exaggerate airway inflammation in a similar manner to tobacco cigarette smoking" (p. 5). The study additionally looked at the development of inflammation in e-cigarette uses. The researchers found that even vapor that did not contain nicotine, enhanced both cytokines interleukin (IL)-6, and IL-8, which are known for their proinflammatory actions (Wu et al., 2014). Both factors promote a strong inflammatory response in the airway. Chronic inflammation, which would be expected with long-term e-cigarette use,

has “been implicated in the pathogenesis of diseases, such as chronic obstructive pulmonary disease (COPD) and lung cancer” (Lerner et al., 2015). The research suggests that e-cigarettes use can lead to the development of COPD in a similar manner to traditional cigarette use.

The inflammatory effects of e-cigarette vapor were also demonstrated in a study by Lerner et al. (2015). The study sought to determine if e-cigarette vapor could produce reactive oxygen species (ROS) or oxidants. Additionally, the effects these ROS would have on various cell types was also studied. Both ROS and oxidants, can create oxidative stress and inflammation which “are the key events in the pathogenesis of chronic airway diseases” such as COPD and asthma (Lerner et al., 2016, p.1). In the study, the researchers exposed human bronchial airway epithelial cells and lung fibroblasts to e-cigarette vapor and compared them to a control group that were not exposed to e-cigarette vapor. Additionally, the researchers also exposed eight-week-old mice to either room air or e-cigarette aerosol (Lerner et al., 2015). To determine if oxidative species were produced, e-cigarette vapor was pulled through an air flow pump loaded with a special dye. If oxidative species were present, the dye would fluoresce (Lerner et al., 2015).

The results of the experiment were intriguing. First, the experiment did demonstrate that ROS are created by e-cigarette devices “through activation of the heating element” (Lerner et al, 2015, p.12). Second, these ROS did influence the epithelial cells, lung fibroblasts, and the mouse derived lung cells. When exposed directly to the e-liquid, lung fibroblasts demonstrated morphology changes as well as an inflammatory response. Epithelial cells exposed to e-cigarette vapor showed an increase secretion of pro-inflammatory cytokines IL-6 and IL-8 as mentioned in the previous

study (Lerner, et al., 2015). Lastly, in mouse cells exposed to e-cigarette vapor, IL-6 and cytokine MCP-1 were both elevated compared to non-exposed mice. The cytokine production initiated by e-cigarette vapor leads to an inflammatory response in the bronchi and lungs. According to Lerner et al. (2015), the ROS generated by vaporizing e-liquids, affect lung cell morphology, and increase inflammatory markers within lung cells, which can lead to chronic pulmonary disease

In addition to COPD, asthma is another chronic pulmonary disease potentially initiated by e-cigarette use. A longitudinal study from South Korea looked at e-cigarette use and the development of asthma. The study divided the responses of nearly thirty-six thousand 10^{th} through 12^{th} grade students into two groups: e-cigarette users and non-e-cigarette users over the past thirty days. The groups were then further divided into students who were previously diagnosed with asthma, and those that were not. One year later, the students were re-evaluated for a new diagnosis of asthma, as well as the number of days of school missed due to asthma symptoms. The results of the study showed that e-cigarette use increased the odds of being diagnosed with asthma and increased the number of days missed from school due to asthma symptoms (Cho & Paik, 2016). Although the results of the study were significant, and the sample size was large, the data was still based on the student's self-report of a medical diagnosis of asthma. Research indicates that the development of chronic airway disease related to e-cigarette use is possible. Research also indicates that although e-cigarettes may contain carcinogens at smaller values than traditional cigarettes, the risk of carcinogen exposure and possible future cancer is still there.

Potential for cancer. Several studies have demonstrated that e-cigarette users are exposed to carcinogens while vaping. One source of carcinogens is the combustion of the flavoring compounds used in e-liquids. As previously mentioned, 81% of youth who try e-cigarettes start with a flavored e-liquid (Knopf, 2016). Flavored e-liquids are especially appealing to youth when flavors such "cotton candy, bubble gum, gummy bear, apple pie, piña colada, cherry and buttered popcorn are readily available" (Markham & Springston, 2017, p.48). Although the flavorings used in e-cigarettes have been approved by the FDA for ingestion, the effects of aerosolizing these compounds has not been thoroughly tested. In a quantitative research study by Khlystov and Samburova (2016), common flavorings were heated, as in an e-cigarette device, and their vapors evaluated for toxins. It has previously been identified that when heated, the propylene glycol in e-liquids did produce small quantities of toxic aldehydes (Khlystov & Samburova, 2016). In this study the authors suspected that the addition of flavoring compounds could increase the quantity of toxic aldehyde production. After measuring the concentrations of 12 flavorings, they found that the range of aldehyde production was higher than previously completed studies (Khlystov & Samburova, 2016). When comparing flavored e-liquids to non-flavored liquids, the flavored liquids produced "large amounts of formaldehyde" (Khlystov & Samburova, 2016). The American Conference of Governmental Industrial Hygienists has set a ceiling value for formaldehyde that "should not be exceeded during any part of the working exposure" (Khlystov & Samburova, 2016, p.13084). In the study, all but two of the twelve samples exceeded the formaldehyde ceiling limit "by factors of 190-270" (Khlystov & Samburova, 2016, p. 13084). Overall, the study showed that the flavoring compounds in e-liquids produce a large quantity of formaldehyde, which poses

a health risk to e-cigarette users who favor flavored products. Formaldehyde exposure can cause watery eyes, burning in the nose and throat, coughing, wheezing, nausea and vomiting, and has been linked to cancer ("Formaldehyde and Cancer Risk", 2011). Formaldehyde, which is found in e-cigarette vapor, can therefore pose a real health risk to e-cigarette users.

In addition to formaldehyde, the Goniewicz et al. (2013), demonstrated the presence of acetaldehyde, nitrosamines, toluene, and acrolein. Although these substances were found in much smaller amounts than those found in traditional cigarettes, these carcinogenic substances are still present creating a risk for cancer in teens. According to Goniewicz et al. (2013), acetaldehyde and acrolein are both carcinogenic and are airway irritants therefore increasing the risk of both cancer and chronic lung disease. Toluene and nitrosamines are also known carcinogens (Goniewicz et al., 2013). Carcinogens such as these can contribute to the development of lung cancer, bladder cancer, and throat and mouth cancer in e-cigarette users, just as it can in traditional cigarette use. In addition to these carcinogenic substances, e-cigarette vapor also contained trace amounts of the toxic metals, cadmium, nickel, and lead (Goniewicz et al., 2013).

A study conducted by Olmedo et al. (2018), measured the concentration of toxic metals in e-cigarette vapor. They found that every e-cigarette sample used exceeded the minimum risk level of toxic metal exposure set by the Agency for Toxic Substances and Disease Registry, a subdivision of the U.S. Department of Health and Human Services. According to the Agency, a minimal risk level is defined as "an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure" (Agency for

Toxic Substances & Disease Registry, 2018). The researchers believe these toxic metals are introduced by the heating coil used in the ENDS device. Although nine metals were discovered in the e-cigarette vapor, the most alarming values were for nickel, chromium, and lead. Fifty seven percent of e-cigarette samples exceeded the minimum risk level (MRL) for nickel values, 68% exceeded the MRL for chromium values, and 48% exceeded the MRL for lead values (Olmedo et al., 2018). Nickel and chromium are known to cause lung cancer when inhaled. Lead is a neurotoxin, even at low exposure levels, and is unable to be excreted by the body making it especially dangerous (Olmedo et al., 2018). These metals pose a real concern to the health of e-cigarette users.

The carcinogenic substances previously mentioned can contribute to the development of cancer. These carcinogens can directly affect DNA therefore contributing to cancer formation. A study titled "Electronic Cigarettes Induce DNA Strand Breaks and Cell Death Independently of Nicotine in Cell Lines" (Yu et al., 2016). In this experimental study, human cells were treated with e-cigarette vapor under strict laboratory controls. The experiments were performed both in normal and cancer epithelial cells to assess the effects of e-cigarettes on healthy cells as well as existing cancerous cells. One-third of both groups were treated with nicotine containing e-cigarette vapor, one-third were treated with non-nicotine containing e-cigarette vapor, and one-third received no treatment and were left as a control group. The results showed that the groups treated with e-cigarette vapor demonstrated a statistically significant 1.5 times increase in DNA strand breaks as compared to the untreated control (Yu et al., 2016). Additionally, all cells treated with e-cigarette vapor, even those treated without nicotine containing vapor, demonstrated DNA strand breaks. These DNA breaks were

seen even after only one week of e-cigarette vapor treatment. DNA strand breakage is highly associated with the formation of cancer. The author's state "repeated introduction of DNA strand breaks due to long-term e-cig exposure, accompanied by successive rounds of dysfunctional DNA repair, would generate accumulated mutations and other genomic alterations in an inevitable progression towards cancer" (Yu et al., 2016). This study generates real concern for the development of cancer in e-cigarette users.

Another research study, titled "Electronic Cigarette Aerosols Suppress Cellular Antioxidant Defenses and Induce Significant Oxidative DNA Damage" (Ganapathy et al., 2017), also discussed the concern of developing cancer related to e-cigarette use. In the study, lung epithelial cells were exposed to various e-cigarette vapors. The epithelial cells were divided into two groups for the study: those exposed to e-cigarette vapor for one hour, those exposed to ten puffs of e-cigarette vapor daily for two weeks (Ganapathy et al., 2017). The study sought to determine not only if DNA changes occurred in the cells when exposed to e-cigarette vapor, but if the long-term exposure over two weeks created a difference in the degree of the DNA changes. The results of the study show that DNA damage occurred with both short-term and long-term exposure to e-cigarette vapor. As expected, the cells that were exposed to long-term e-cigarette exposure had more substantial DNA damage (Ganapathy et al., 2017). Although the results show that the rate of DNA mutation is less in e-cigarette use than traditional cigarette use, the DNA mutations are still occurring. Ganapathy et al. (2017), states that "DNA damage is the main initiator of cancer and plays a key role in the pathogenesis of aging, neurodegenerative, pulmonary, and cardiovascular diseases" (p. 7). Therefore, whether

traditional cigarettes, or e-cigarettes are used, there is still a significant risk of cancer development.

Conclusion

The review of the literature revealed several reasons why adolescents may initiate e-cigarette use. A potential reason could be for smoking cessation, although research indicates that e-cigarettes are not effective smoking cessation tools. In fact, the opposite trend regularly occurs in which adolescents who use e-cigarettes transition to traditional cigarette use or become dual users of both e-cigarettes and traditional cigarettes. The detrimental health effects of traditional cigarettes are well known. Current research indicates that e-cigarettes may have similar health effects of traditional cigarettes including increased risk of chronic airway diseases and even cancer. The effects of the nicotine on the adolescent brain is also a large concern, which can occur with traditional cigarette or e-cigarette use.

As stated in the introductory chapter, 89% of providers in the Pepper et al. (2015) study wished to have more education regarding e-cigarettes. The overall goal of the research project was to utilize the information obtained through a review of the literature to provide this desired education. With proper provider education, consistent screening practices, and effective communication with patients, health care providers will possess the tools necessary to halt the sharp incline of e-cigarette use among youth. This scholarly project identified current e-cigarette knowledge and screening rates among healthcare providers. Then an educational offering was provided with the intent of increasing e-cigarette knowledge among providers, increasing patient screening for e-cigarette use, and providing e-cigarette education to patients.

CHAPTER III

Methodology

The increasing rates of e-cigarette use in the youth population should be concerning to all healthcare providers. Healthcare providers are in a position to halt this sharp incline through appropriate patient screening and effective patient education. Previous studies have indicated providers feel a lack of knowledge regarding e-cigarette potential health effects poses a major barrier to appropriate screening practices. The goal of this project was to increase providers' intent to screen for e-cigarette use, especially in the adolescent population. Through education, providers became more comfortable with their own e-cigarette knowledge thus empowering them to screen adolescents for e-cigarette use more frequently, and to provide effective patient education. This chapter details the design of the scholarly project. The sampling process is outlined, and the sample's demographics are described. The instrument to be used, as well as potential statistical analysis methods, are also delineated.

Project Design

The study was designed to determine if providers' intent to screen for e-cigarette use in the adolescent population increased after an educational offering was provided. The educational offering was provided in a lecture format and included a pre-test/post-test survey, as well as a follow-up survey that occurred six weeks later. The focus of the

study was increasing e-cigarette screening rates in the clinical setting. E-cigarette screening practices were determined before education, immediately after education, and at six weeks post-education. Other quantitative measurements were measured, including the providers' patient education practices and the providers' comfort level with their current e-cigarette knowledge. Quantitative data was analyzed to determine if the educational intervention influenced the provider's e-cigarette screening practices both immediately after, and six weeks after, the educational offering. The use of quantitative data also allow for descriptive statistical analysis to be performed.

The educational offering was provided in collaboration with the University of Kansas Area Health Education Center (KU AHEC) branch located in Pittsburg, Kansas. Healthcare providers utilize the Center to gain continuing education credits, enhance their knowledge, and collaborate with other providers. A "Brown Bag Series" is offered by the KU AHEC each month of the year. This series consists of multiple webinars, presented in hour long presentations, to total five educational offerings each month (University of Kansas Medical Center, 2017). Health care providers, including physicians, physician assistants, nurse practitioners, registered nurses, and other healthcare professionals, register for the Brown Bag Series and then pay a fee to KU AHEC on a voluntary basis. The usual audience for these offerings includes healthcare providers from the state of Kansas as well as surrounding states.

Prior to the educational offering, a pre-test survey was provided to participants to determine their current knowledge of e-cigarettes, current e-cigarette screening practices, and basic demographics. The post-test and six-week follow-up test asked the same questions but did not include demographic questions. The purpose of the six week

follow- up was to determine if a clinical practice change occurred, which was indicated by increased e-cigarette screening rates. A diagram detailing the study design can be found below.

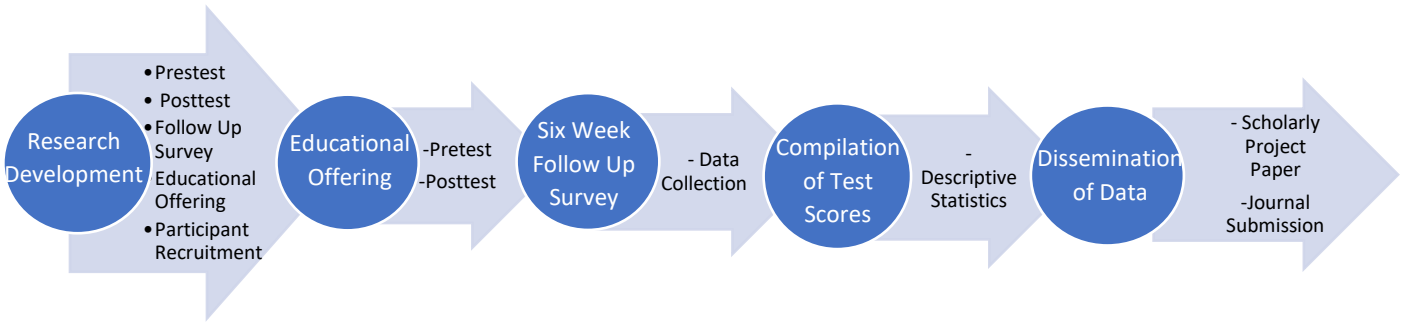

Figure 3. Study Design

Setting and Participants

Healthcare providers, including physicians, nurse practitioners, physician assistants, registered nurses, and other healthcare providers, were included in the target population. The participants were able to access a web-based distance learning program to gain knowledge regarding e-cigarettes. The target population was recruited from the pool of health care professionals that utilize the KU AHEC "Brown Bag Series" for continuing education. A convenience sampling of Registered Nurses (RNs), Advanced Practice Registered Nurses (APRN), Physicians (MD/DO) and other healthcare professionals was utilized as the sample. A second group of survey participants were obtained by accessing a cohort of BSN-DNP students at Pittsburg State University, who are also practicing registered nurses. All participants who viewed the educational offering received the pre-test, post-test, and follow-up survey. One inclusion criterion for the study included that participants hold a valid RN license, APRN license, Physician Assistant certification, medical license, or other professional license in a healthcare field.

Other inclusion criteria included that participants be at least eighteen years of age, and utilize English as their primary language. Participants meeting inclusion criteria were then provided the educational offering in collaboration with KU AHEC.

Protection of Human Subjects

Upon review of the checklist for human subjects, the study qualified for exempt status. An Institutional Review Board (IRB) application was submitted to the Pittsburg State University Committee for the Protection of Human Research Subjects (CPHRS) for review and approval. The target population included adult subjects over the age of 18. The study did not include vulnerable subjects; children, prisoners, or specific populations of race, religion or ethnicity. All surveys were answered confidentially, and confidentiality was maintained during the data coding process. Great care was taken to ensure participants did not feel harassment or discomfort during the research study. There were no risks associated with the pretest and posttest. The responses of the subjects remained confidential to prevent any risk of criminal or civil liability or to cause damage to their financial standing, employability or reputation.

After providing informed consent, participant data was obtained through the participants' completion of the surveys. The educational offering was voluntary, and no monetary compensation was provided. However, the participants did receive continuing education credit through KU AHEC. The data obtained from the surveys was analyzed using descriptive statistics to determine if e-cigarette screening practices increased after providers obtained increased knowledge of evidence-based e-cigarette research. To ensure confidentiality, the collected information did not contain any participant identifiers and was anonymously provided through the use of KU AHEC's Qualtrics

software. Additionally, data from completed questionnaires was coded by KU AHEC and submitted online to the researcher only.

Ethical Considerations

There were few ethical considerations to consider for the study. Participation in the study was purely voluntary. Due to the nature of the study, which focused on a pretest, educational offering, and then a posttest, the main ethical concern was the potential identification of participants due to survey response answers. Therefore, anonymity was essential within the study to avoid identification of participants. Information was recorded and stored without any identifiers in order to maintain nameless participants. Another concern was the provision of false information by the participants. False information, such as the fabrication of answers by participants, would lead to contamination of the data. Lastly, a concern existed regarding the validity and reliability of the surveyor developed instrument. Potential pretest/posttest survey alterations would lead to more encouraging results and therefore falsely increase the data's statistical significance.

Instruments

The study utilized three online surveys to obtain data; a pre-test survey, a post-test survey, and then a follow-up survey six weeks after the educational offering. All surveys were administered in an online format using Qualtrics software provided by KU AHEC. The initial survey contained demographic data including: age of participants, years of practice, type of license held, and area of practice. Additionally, information regarding the provider's current e-cigarette screening practices, e-cigarette patient counseling

practices, and personal perception of e-cigarette harm, was assessed. In total a 17-item survey, consisting primarily of Likert-scale questions, was used as the instrument in the study (see Appendix A: Pre-Test). The post-test and follow-up survey did not include questions regarding demographic information and had the addition of an open-ended comments section (see Appendix B: Post-Test and Follow Up Survey). The quantitative data obtained from the surveys was analyzed using descriptive statistics to determine if adolescent e-cigarette screening rates increased among providers.

A survey tool was developed for the study, as a specific instrument for the study could not be found. However, the instrument was based on a previous study conducted by Pepper et al. (2015). In this study, current e-cigarette screening rates were assessed in a sample of primary care physicians. Using the Pepper et al. (2015) survey as a model, modifications were made and a new expanded survey was created for this research study. The first several questions on the pretest addressed demographic information. The next questions assessed the providers' current comfort level with their own e-cigarette knowledge, e-cigarette screening practices, perception of e-cigarettes risk to health, and e-cigarettes counseling and patient education practices. The providers' desire to gain e-cigarette knowledge was also evaluated. The pre-test included close ended questions, such as dichotomous questions, Likert scale questions, and rating scale questions. The post-test and follow-up survey include identical questions, although demographic information questions were excluded. The post-test and follow-up survey also included an open-ended comment section.

The study focused on the following research questions:

1. What percentage of healthcare providers regularly screen for traditional cigarette use compared to e-cigarette use among adolescent patients?
2. Do healthcare providers feel they lack knowledge to counsel adolescents regarding e-cigarette use?
3. What percentage of the healthcare providers feel that e-cigarettes pose a health risk to the adolescent population?
4. How likely are healthcare providers to counsel adolescents to avoid traditional cigarette use compared to e-cigarette use?
5. Will intent to screen for e-cigarette use in the adolescent population increase after the educational offering for healthcare providers?
6. Are healthcare providers willing to provide educational materials to adolescents regarding e-cigarette use?

Content Validity

The survey instrument was developed by the researcher; therefore instrument validity needed to be determined. To determine content validity, the survey instrument was reviewed by several Pittsburg State University Nursing Faculty members. Faculty members were provided the survey and asked to provide feedback utilizing their expertise in the nursing field. Minor changes to question wording was made based on this feedback.

Procedure

The timeline of the project was as follows: The proposal defense took place on September 17th, 2018 with the project committee consisting of two PSU IRB School of Nursing faculty members and one Department of Psychology and Counseling faculty member. Upon proposal approval, the proposal was sent to Pittsburg State University's IRB committed for approval, which was obtained October 22nd, 2018. The educational offering then took place on November 6th, 2018 in collaboration with KU AHEC. The offering presented evidence-based e-cigarette research to date via a voice-over PowerPoint presentation (See Appendix C: Educational). At the end of the presentation, participants were able to ask questions to the researcher if desired. Prior to the educational offering, participants completed a pre-test with both demographic questions as well as questions related to e-cigarette knowledge and screening practices. A post-test was administered immediately after the educational offering. Participants were also provided a copy of the e-cigarette educational pamphlet for download (See Appendix D-Educational Pamphlet). This pamphlet could be used in clinical practice when counseling adolescents against e-cigarette use. All surveys were administered through KU AHEC utilizing Qualtrics software. Six weeks after the educational offering, the follow-up survey was sent to participants. The survey data was then complied by KU AHEC and sent to the researcher without participant identifiers. The data was disseminated, statistically analyzed, and the findings were reported.

The project consists of a pre-test, an educational offering, an immediate post-test, and a six week follow up survey to assess current knowledge, screening practices, desire for knowledge, and comfort level with e-cigarettes. Consent was obtained from

participants who signed up for the "Brown Bag Series" offered by KU AHEC. The pre-test was developed and administered using Qualtrics, a questionnaire creating software supplied by KU AHEC. The Qualtrics program allows for online delivery of the assessment tools for participant convenience. Qualtrics data obtained by the researcher did not contain any participant identifiers, allowing for participant anonymity. The pre-test was sent by KU AHEC to all participants who enrolled in the "Brown Bag Series". Data from this online pre-test was reviewed and analyzed by the researcher using descriptive statistical analysis. After completion of the online pre-test, participants engaged in the educational offering.

As previously mentioned, the educational offering was provided through web-based distance learning utilizing ZOOM software offered by KU AHEC. The equipment to provide this offering, as well as the production of the offering, occurred at the KU AHEC building located on Pittsburg State University's campus in Shirk Hall. Additionally, one staff member from KU AHEC was present during the educational offering to assist in utilizing the audiovisual equipment to its full potential. The web-based distance learning consisted of a live voice-over PowerPoint presentation that was forty-five minutes in length. Participants were able to ask questions and interact with the researcher through the web-based learning equipment. Review of evidence-based e-cigarette knowledge was provided during the educational offering. As previously mentioned, a post-test was administered immediately following the educational offering. Additionally, a follow-up survey was administered six weeks later to determine if a practice change regarding e-cigarette screening occurred in the participant' clinical setting. The data from all three surveys was analyzed using descriptive statistics and is

reported in further chapters. All participants completing the educational offering were provided Continuing Education Credit from KU AHEC.

Summary

The increasing rates of e-cigarette use in the youth population should be concerning to all healthcare providers. Healthcare providers are in a key position to halt, and potentially reverse, this sharp incline through the use of appropriate patient screening and effective patient education. Providers have stated in previous studies that the main barrier to appropriate e-cigarette screening practices is a lack of provider knowledge regarding e-cigarette safety. The goal of this project was to increase providers' intent to screen for e-cigarette use in the adolescent population. It was proposed that through the provision of an educational offering, providers would become more comfortable with evidence-based e-cigarette knowledge. This knowledge would then encourage providers to screen adolescents for e-cigarette use more frequently. Providers would also feel more comfortable providing e-cigarette education to their adolescent patients due to increased knowledge on the subject. The results of this study were statistically analyzed to determine if increasing e-cigarette knowledge among providers did indeed increase e-cigarette screening practices as proposed. The results of the study are discussed in Chapter IV.

CHAPTER IV

Evaluation of Results

Restatement of Purpose

This project was designed to increase healthcare providers' intent to perform e-cigarette screening in the adolescent population. A pre-education survey was given to healthcare providers to identify current knowledge, awareness, and screening of e-cigarettes in the adolescent population. Following a pre-education survey, the researcher provided an educational offering in the form of a voice over PowerPoint. The presentation imparted key knowledge from current research regarding e-cigarette use in the adolescent population. After viewing the educational offering, healthcare providers completed a post-education survey, and then a six-week follow up survey to determine if e-cigarette knowledge and screening rates had increased after gaining education on the topic.

Description of Population

A convenience sampling of healthcare providers, which included physicians, nurse practitioners, physician assistants, registered nurses and other healthcare professionals, was included in the research study. Participants were recruited from the KU AHEC "Brown Bag Series" for continuing education, as well as a cohort of students in the BSN-DNP program at Pittsburg State University. The participants were at least

eighteen years of age and utilized English as their primary language. KU AHEC recruited participants received the survey via Qualtrics Survey software and was administered via internet by KU AHEC staff. The cohort of BSN-DNP students received an identical survey via survey monkey. After survey completion, the data was aggregated to form a total sample population of forty participants. Both surveys took place in the month of November, 2018. After survey completion, KU AHEC participants watched a live PowerPoint presentation covering evidence-based e-cigarette knowledge. BSN-DNP cohort students viewed this recorded presentation via a YouTube link. Immediately following the educational offering, respondents were given a post-education survey, which had identical questions to the pre-education survey but excluded questions regarding demographic data. In total, thirty five respondents completed the post-education survey. Six weeks after education, participants were sent an email with the follow-up survey by KU AHEC staff, which was identical to the post-education survey. In total, fifty-three post education surveys were emailed and seven responses were received.

All survey respondents were from the Midwest, with the majority (77.5%) residing in Kansas. Seven participants (17.5%) lived in Missouri, and two respondents (5%) lived in Oklahoma (Figure 4).

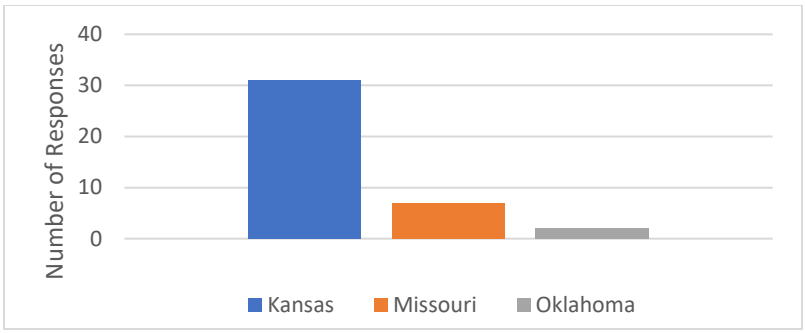

Figure 4. State Residence of Respondents

Of the forty total participants, seventeen (42.5%) held a Registered Nurse license, four were Nurse Practitioners, three were Physicians, one was a Physician Assistant, and fifteen (37.5%) selected "other" as their license/certification (Figure 5). Of the respondents who selected "other", 53.3% (n=8) were Physical Therapy Assistants. Additional other responses included Physical Therapist (n=3), Occupational Therapist (n=1), LPN (n=1), Exercise Physiologist (n=1), and Registered Dietician (n=1).

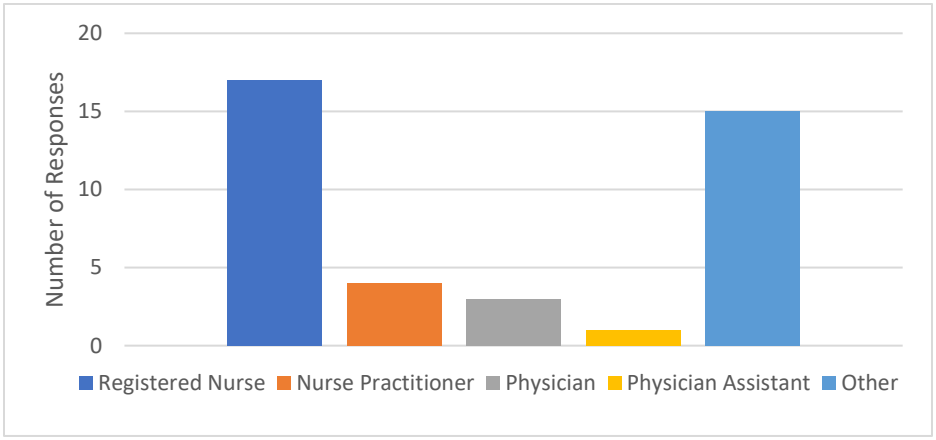

Figure 5. License/Certification Held by Respondents

Respondents were also asked to identify their level of educational preparation. Of the respondents, 15% (n=6) had attained an Associate degree, 37.5% (n=15) had attained a bachelor's degree, 20% (n=8) had attained a Master's Degree, and 27.5% (n=11) had attained a Doctoral Degree (Figure 6).

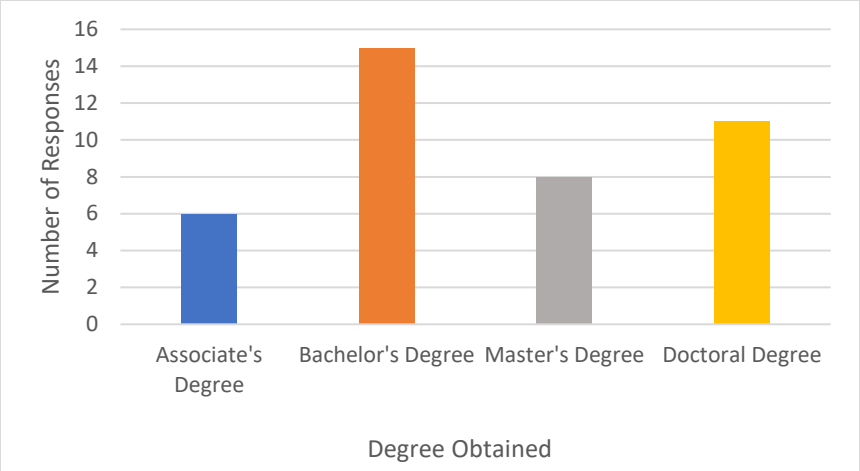

Figure 6. Level of Educational Preparation.

The respondent's years of practice, and areas of practice, were varied. The majority of respondents had practiced either 11-15 years (22.5%) or greater than thirty years (22.5%) (Figure 7). These two categories were followed by respondents who had been in practice for 6-10 years (17.5%), 26-30 years (12.5%), and 16-20 years (10%). The fewest number of participants had practiced either 0-5 years (7.5%) or 21-25 years (7.5%). Seven respondents reported practicing in the Family Medicine setting, four were in Pediatrics, one was in Internal Medicine, and the majority of respondents (n=28) selected "other" as the primary practice setting (Figure 7).

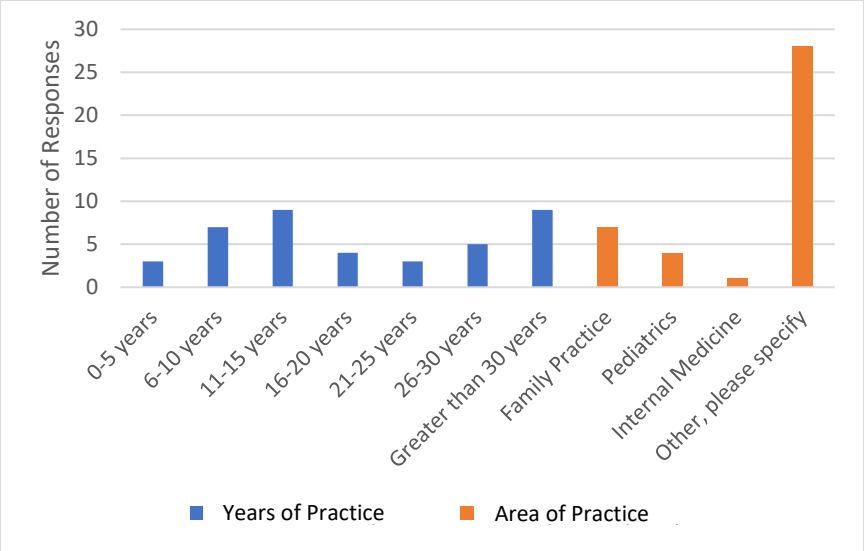

Figure 7. Respondents Years of Practice and Area of Practice.

Respondents that designated "other" on the survey had varied practice areas. The majority of the "other" responses identified as practicing in the acute care setting (n=8), followed by Home Health (n=5). Other practice responses are included in Table 1 below. Three respondents opted out of answering.

Table 1. Responses to "Other Area of Practice".

Response Given	n
Acute Care	8
Cardio-Pulmonary Rehab	1
Education	1
Fitness	1
Home Health	5
Post-Surgical Oncology	1
Oncology	2
Occupational Therapy	1
Orthopedics	1
Physical therapy	2
Pulmonology	1
Women's Services	1
No Response	3
Total Responses	28

Application of Data to Research Questions

1. What percentage of healthcare providers regularly screen for traditional cigarette compared to e-cigarette use among adolescent patients?

Respondents were asked to identify how often adolescent patients were screened for both cigarette and e-cigarette use. Healthcare providers could indicate that adolescents were screened at 0%, 25%, 50% 75% or 100% of visits. Of the forty pre-education survey responses, 22.5% of respondents screened for cigarette use at 100% of visits, while only 7.5% screened for e-cigarette use. Additionally, 41% (n=17) of respondents reported never screening adolescents for cigarette use, while 65% (n=26) of pre-education respondents reported never screening adolescents for e-cigarette use (Figure 8).

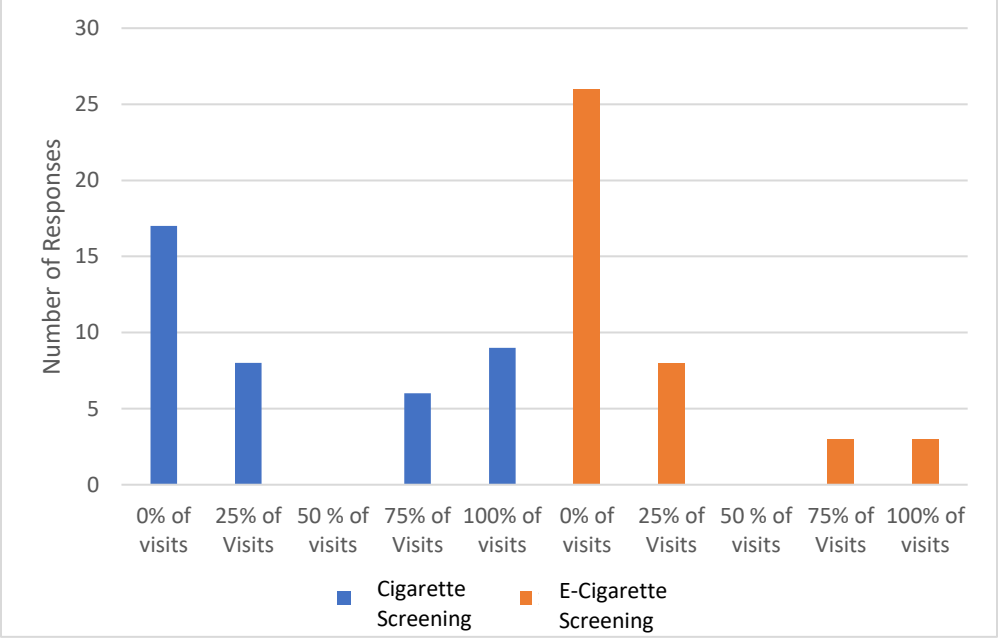

Figure 8. Healthcare provider cigarette vs. e-cigarette screening practices prior to education.

2. Do healthcare providers feel they lack knowledge to counsel adolescents regarding e-cigarette use?

Study participants were asked to rate their evidence-based e-cigarette knowledge. Participant response choices included “very knowledgeable”, “somewhat knowledgeable”, “not knowledgeable” or “unsure”. Participant responses were taken prior to education, immediately after the educational offering, and six weeks post-education. Twenty-one participants, nearly 53%, indicated that they were not knowledgeable about evidence-based e-cigarette knowledge during the pre-education survey. Eighteen participants, or 45% , selected they were “somewhat knowledgeable” of evidence-based e-cigarette knowledge, while one respondent indicated that they were “very knowledgeable” (Figure 9).

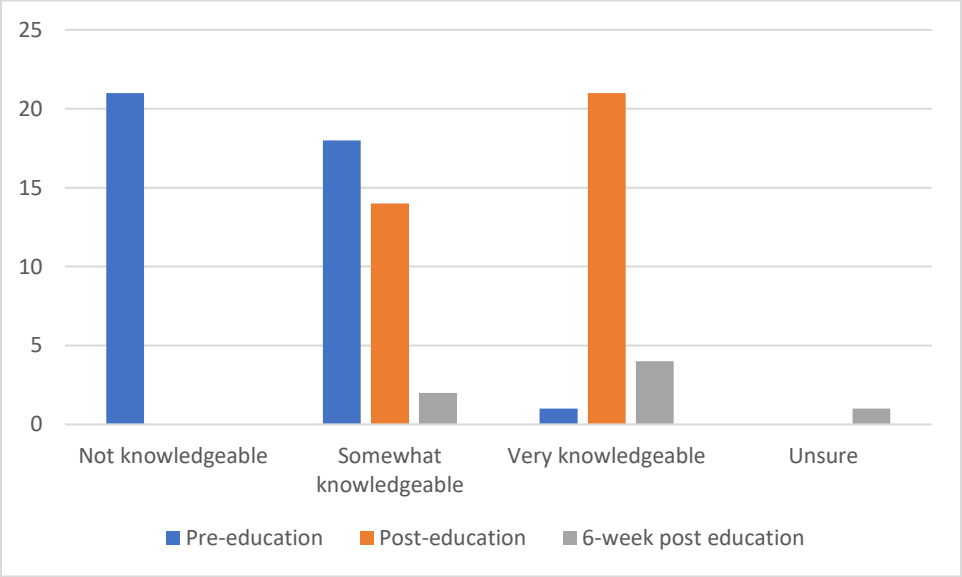

Figure 9. Healthcare provider level of evidence-based e-cigarette knowledge.

The post-education survey revealed that 60% of participants (n=21) felt they were “very knowledgeable” regarding evidence-based e-cigarette knowledge. Additionally, 40% (n= 14) indicated they were “somewhat knowledgeable”. In the six-

week follow up survey included a sample size of seven participants. Of these participants, 57% (n=4) felt “very knowledgeable”, 28.5% (n=2) were “somewhat knowledgeable”, and one participant was “unsure” about their current evidence-based e-cigarette knowledge (Figure 9).

3. What percentage of the healthcare providers feel that e-cigarettes pose a health risk to the adolescent population?

The majority, or 65%, of healthcare providers felt that e-cigarettes posed a great health risk to adolescent patients when asked prior to the educational offering (Figure 10). Zero percent of providers indicated that e-cigarettes posed no risk, while 15% indicated that e-cigarette posed a small risk to patients. Eight participants, or 20% of the study group, responded that they were unsure of the risks that e-cigarettes posed to patients. Post-education and six week follow-up responses demonstrated that 100% of survey participants believed e-cigarettes pose a great risk to patients.

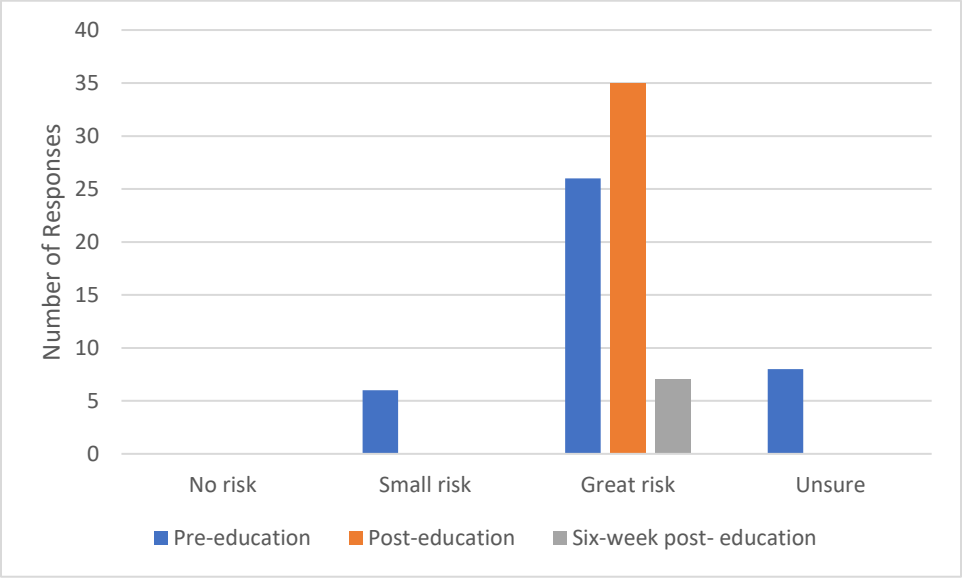

Figure 10. Healthcare provider view of e-cigarette patient risk.

4. How likely are the healthcare providers to counsel adolescents to avoid traditional cigarette use compared to e-cigarette use?

Of the forty pre-education survey participants, 77.5% (n=31) indicated they were "very likely" to counsel adolescents against traditional cigarette use, while 44.5 % (n=19) indicated that they were "very likely" to counsel adolescents to avoid e-cigarette use. Following education, 87.5% (n=30) of healthcare providers were "very likely" to counsel adolescent against traditional cigarette use, and 88.5% (n=31) were "very likely" to counsel against e-cigarette use. Six-weeks after education, 85.7% of the seven respondents indicated that they would counsel adolescents against both traditional cigarettes and e-cigarettes (Figure 11).

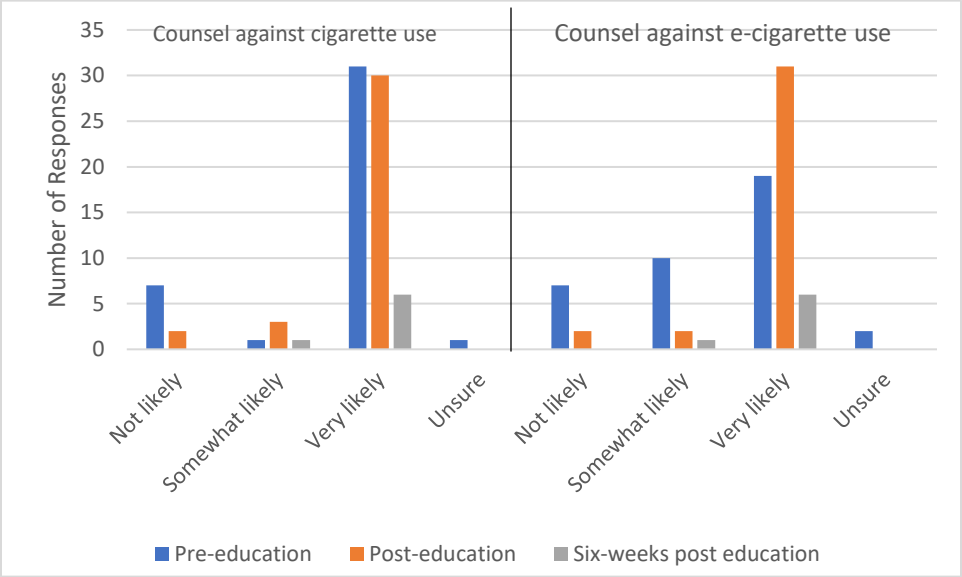

Figure 11. Healthcare provider counseling cigarette use vs. e-cigarette use

5. Will intent to screen for e-cigarette use in the adolescent population increase after an educational offering for healthcare providers?

Participants intent to screen for e-cigarette use was determined immediately following the educational offering. Directly following the educational offering, 83% (n= 29) of thirty-five responding participants indicated they planned on screening adolescents for e-cigarette use at 100% of visits. One respondent indicated an intent to screen at 25%, and one respondent indicated an intent to screen at 75% of visits. Lastly, four respondents (11.4%) indicated no intent to screen adolescents for e-cigarette use (Figure 12).

Only seven participants completed the six-week follow up survey. The six-week follow up survey sought to determine if a practice change regarding e-cigarette screening had occurred. Two respondents (28.5%) indicated screening adolescents at 100% of visits since the educational offering, two reported screening at 50% of visits, one reported screening at 25% of visits, and two reported screening at 0% of visits (Figure 12).

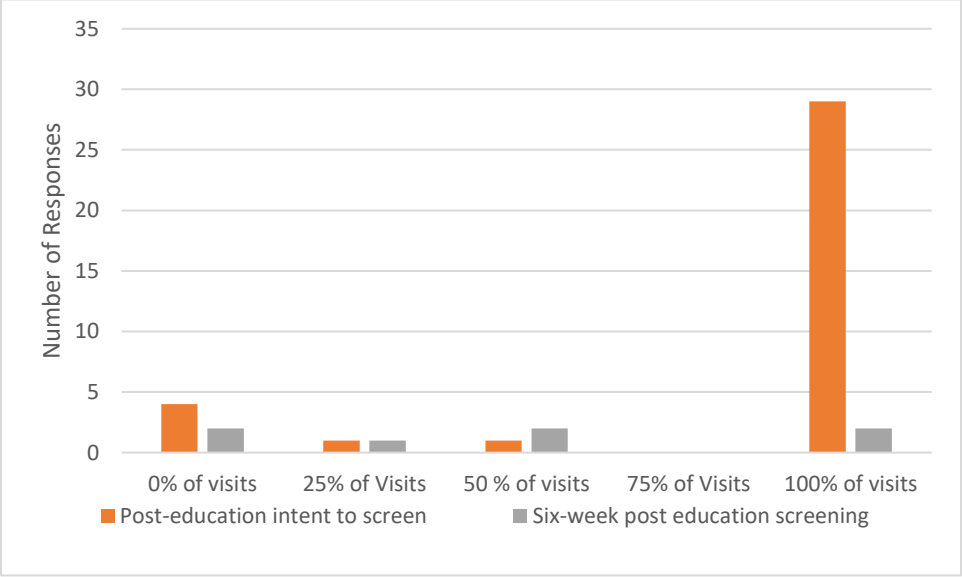

Figure 12. Participant e-cigarette screening practices; post-education, six-week post education.

6. Would healthcare providers be willing to provide educational materials to adolescents regarding e-cigarette use?

Respondent willingness to provide e-cigarette educational materials to adolescents was assessed. Thirty-eight respondents replied to the pre-education survey question. Of the thirty-eight respondents, seven (18.4%) indicated that there were "very likely" to supply e-cigarette educational materials to adolescents, while thirteen respondents (34.2%) indicated they were "not likely" to provide educational materials. Fifteen providers (39.4%) indicated they were "somewhat likely", and three providers answered that they were "unsure" if they would provide e-cigarette educational materials to adolescent patients (Figure 13).

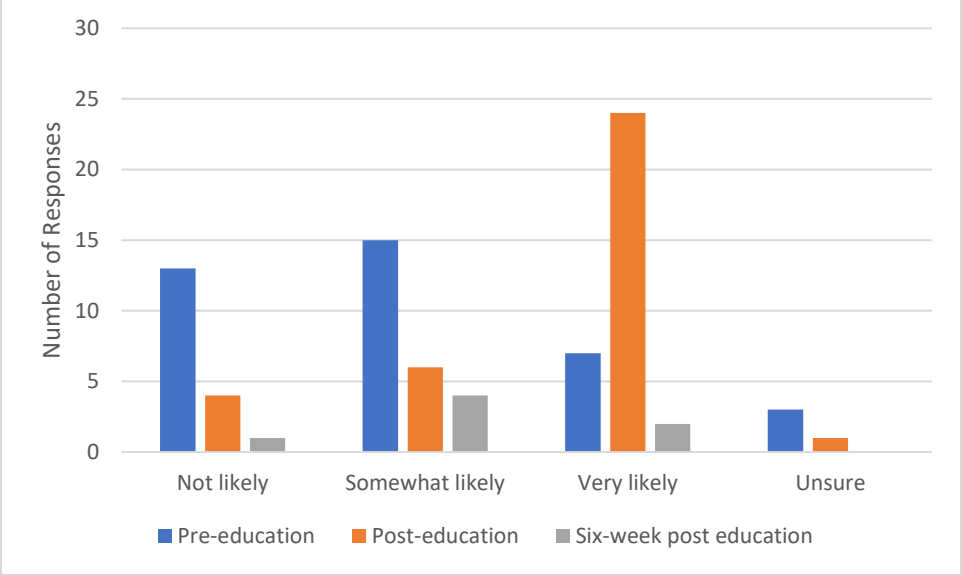

Figure 13. Respondent's likeliness to provide e-cigarette educational materials.

Following education, nearly sixty-nine percent (n=24) of the thirty-five respondents indicated they were "very likely" to provide e-cigarette educational materials to adolescent patients. Seventeen percent of respondents indicated they were "somewhat likely", 11% indicated they were "not likely", and one respondent indicated they were

"unsure" if they would provide e-cigarette educational materials to adolescent patients (Figure 14).

The six-week post education survey resulted in seven responses. Two respondents indicated they were "very likely" to provide e-cigarette educational material, while four respondents indicated they were "somewhat likely" and one respondent indicated they were "not likely" (Figure 13).

Additional Results

Information was gained from participants to determine where learning interests lied regarding e-cigarettes and youth. The purpose of gaining this information was to guide future educational offerings. Healthcare providers were asked to rank e-cigarette learning topics from 1-4 with choice one being the most desirable. Learning topic choices included: the potential health effects of e-cigarette use, effectiveness of e-cigarettes as a smoking cessation tool, the link between e-cigarettes and future traditional cigarette use, and the effects of second-hand e-cigarette smoke. Sixty-seven percent (n=20) indicated "potential health effects of e-cigarette use" to be the most desirable learning topic (Table 2).

Table 2. Participant ranked e-cigarette learning topics

Ranked 1-4 with 1 being the most desirable, 4 being the least desirable	1	2	3	4
Potential health effects of e-cigarette use	20	2	2	2
Effectiveness of e-cigarettes as a smoking cessation tool	6	5	8	9
Link between e-cigarettes and future traditional cigarette use	3	7	11	7
Effects of second-hand e-cigarette smoke	1	13	7	11

Many teens view e-cigarettes as a less harmful alternative to traditional cigarette smoking (Hilton, et al., 2016, Wills, et al., 2016, de Andrade, 2016). To

determine the respondent's perception on the safety of traditional cigarettes versus e-cigarettes, healthcare providers were asked how likely they were to tell patients that e-cigarettes were less harmful than traditional cigarettes both before and after the educational offering. Prior to the educational offering, 24% (n=24) of the forty respondents indicated they were "not likely", while 27.5% (n=11) indicated they were "somewhat likely" to tell patients e-cigarettes were less harmful than traditional cigarettes (Figure 11). After the educational offering, 94.2% (n=33) of the thirty-five respondents indicated they were "not likely" to tell patients that e-cigarettes were less harmful than traditional cigarettes. The remaining two respondents indicated "somewhat likely" and "unsure" respectively. Seven responses were received to the six-week post-education survey. Six of the seven respondents indicated they were "not likely" to tell patient e-cigarettes were less harmful than traditional cigarettes, while one participant indicated they were "very likely" (Figure 14).

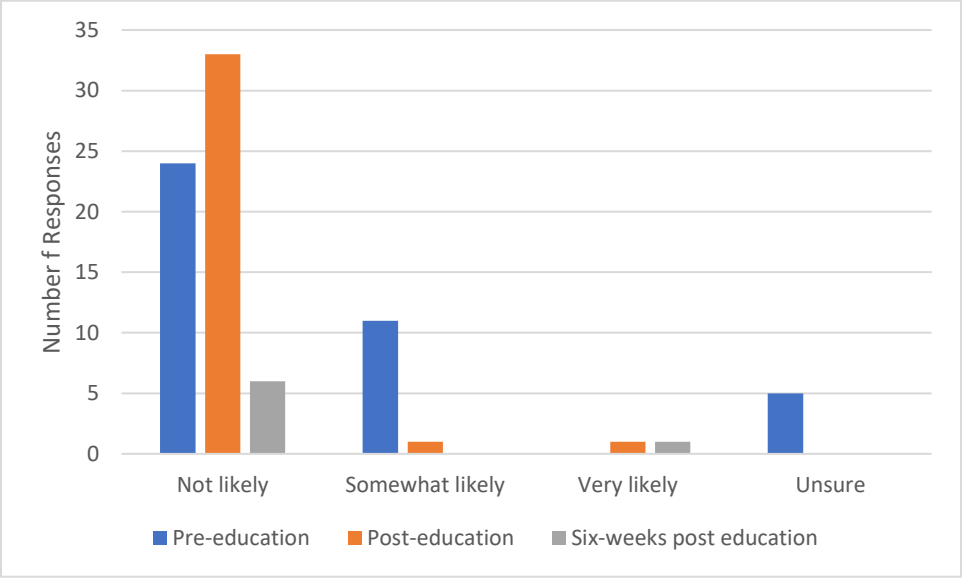

Figure 14. Respondent's likeliness to tell patients e-cigarettes are less harmful than traditional cigarettes.

Participating healthcare providers were asked how likely they were to recommend e-cigarettes as a smoking cessation tool both before and after the educational offering. Prior to the educational offering, 82.5% (n=32) of respondents indicated they were "not likely" to recommend e-cigarettes as a smoking cessation tool, while 10% (n=4) indicated they were "somewhat likely", and 7.5 (n=3) indicated they were "unsure". Following the educational offering, 91.4% (n=32) of respondents indicated they were "not likely" to recommend e-cigarettes as a smoking cessation tool. One post-education respondent indicated they were "somewhat likely", and two respondents indicated they were "very likely" to recommend e-cigarettes as a smoking cessation tool (Figure 15).

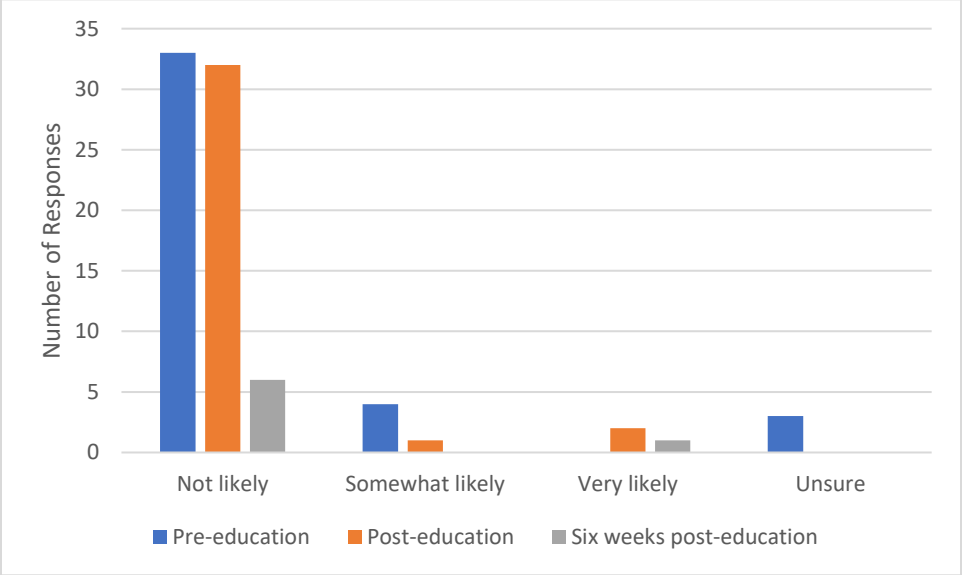

Figure 15. Respondent likeliness to recommend e-cigarettes as a smoking cessation tool.

Summary

Prior to education, survey respondents indicated that they lacked knowledge regarding evidence-based e-cigarette knowledge. Although knowledge was lacking, the majority of healthcare providers indicated that e-cigarettes posed a great health risk to adolescent patients. Providers were more likely to screen for cigarette use versus e-

cigarette use prior to the educational offering, with 65% of respondents indicating never screening adolescents for e-cigarette use versus 41% never screening for cigarette use. Additionally, participants were more likely to counsel adolescents against traditional cigarette use (77.5%) than e-cigarette use (44.5%). Lastly, few participants indicated they would be likely to provide an educational pamphlet which cautioned against e-cigarette use to adolescent patients.

After the educational offering, providers indicated their evidence-based knowledge regarding e-cigarettes had increased. One hundred percent of the survey respondents indicated that e-cigarettes posed a great health risk to adolescents following the educational offering. The majority of respondents also indicated that they would be willing to provide adolescents with educational pamphlets regarding evidence based e-cigarette knowledge. Providers' willingness to counsel against e-cigarette use also increased after education from 44.5% to 88.5%. Lastly, providers' willingness to provide e-cigarette educational materials also increased after the educational offering from 18.4% prior to education to 69% after education.

The goal of the project was to increase providers' intent to screen for e-cigarette use. The intent to screen question indicated that 83% of surveyed healthcare providers planned to screen adolescents for e-cigarette use at every visit. The six week follow-up survey, however showed that only 28.5% of survey respondents were completing e-cigarette for the adolescent population at every visit. However, there was low response rate to the six-week post education survey. Only seven healthcare providers responded to the six-week post education survey, therefore these survey results lacked significance.

CHAPTER V

Discussion

Relationship of Outcomes to Research and Observations

The overall purpose of the research project was to increase providers' intent to screen for e-cigarette use in the adolescent population. Secondary goals included increasing providers' evidence-based e-cigarette knowledge, increasing providers' willingness to council against e-cigarette use, increasing providers' willingness to provide e-cigarette educational information to adolescents, and lastly was to determine if intent to screen actually resulted in a change of providers' screening practices.

Demographics. The research project sample size was forty participants. Of these participants, 62.5% (n=25) were registered nurses, physician assistants, nurse practitioners, or physicians. The remaining participants were in other healthcare fields. When assessing the respondent's area of clinical practice, the responses were varied. The majority of respondents indicated they worked in the acute care setting, followed by Family Medicine. There were also areas of clinical practice such as home health, physical therapy, and occupational therapy. The Pepper et al. (2015) study results indicated that Family Medicine physicians were the most likely to screen for e-cigarette use. It may be probable that some areas of clinical practice may not regularly perform cigarette or e-cigarette screening or often interact with adolescent patients.

Screening for traditional cigarette compared to e-cigarette use among adolescent patients. The study found that participants were not regularly screening for either cigarette use or e-cigarette use in daily clinical practice. Forty-one percent of participants stated never screening adolescents for cigarette use, while 65% indicated never screening for e-cigarette use. It was disconcerting that 41% of providers never screened adolescent patients for cigarette use when the potential health risks of cigarette use are widely known. Although the screening rates were low, surveyed providers still screened for cigarettes more regularly than e-cigarettes.

When further assessing screening rates, the data showed only 22.5% of providers surveyed screened adolescents for cigarette use at every visit, while only 7.5% screened for e-cigarette use at every visit. The Pepper et al. (2015) study also demonstrated that healthcare providers were more likely to screen adolescents for traditional cigarette use versus e-cigarette use. In that study, 86% of providers regularly screened for cigarette use, while only 14% regularly screened for e-cigarette use. The researcher speculates that healthcare providers may have been more likely to screen for cigarettes versus e-cigarettes due to their knowledge base on the topic.

Participant knowledge base regarding e-cigarettes. In the Pepper et al. (2015) study, 89% of providers indicated they needed additional knowledge on e-cigarettes. In this study, the majority of healthcare providers surveyed indicated they needed more knowledge regarding evidence-based e-cigarette information. Fifty-three percent of participants selected that they were “not knowledgeable”, and 45% indicated they were “somewhat knowledgeable” of the literature to date regarding e-cigarettes and youth. One outlier selected “very knowledgeable” of evidence-based e-cigarette knowledge. After a

forty-five minute presentation highlighting the literature to date regarding e-cigarettes, results indicated that knowledge attainment had occurred. The immediate post-education survey did indicate that participants gained knowledge about e-cigarettes with 60% of participants selecting "very knowledgeable" and 40% selecting "somewhat knowledgeable". Six-week follow up survey data showed a drop from 98% to 85% of healthcare providers that still felt "very knowledgeable" or "somewhat knowledgeable" on evidence-base e-cigarette knowledge. One provider selected they were "unsure" of their e-cigarette knowledge on the six-weeks post survey. It may be possible that the information presented was not fully retained by survey participants.

E-cigarette health risk. Prior to education, 65% of healthcare providers surveyed indicated that e-cigarettes posed a "great" risk to adolescent health. However, 15% of participants indicated e-cigarettes posed a "small risk" to adolescent health, and 20% were "unsure" if e-cigarettes posed a risk at all. This uncertainty is most likely due to lack of evidence-based knowledge of the subject. The literature indicates e-cigarette use can increase the rates of chronic airway disease and cancer (Lerner, et al., 2015, Wu, et al., 2014, Yu, et al., 2016, Cho & Paik, 2016). Additionally, nicotine containing e-liquids may have increased negative effects in the adolescent brain versus the adult brain (Musso, et al., 2007, Vieira-Brock, et al, 2013, Shram, et al., 2006). Lastly, literature clearly demonstrates a link between e-cigarette use and future traditional cigarette use, and the detrimental health effects of traditional cigarette use are well known (Primack, et al., 2015, Barrington-Trimus, et al., 2016, Conner, et al, 2017, Wills, et al., 2016). After a presentation of this literature, all of the survey respondents (100%) selected that e-cigarettes pose a "great risk" to the health of adolescent patients. This opinion was also

carried into the six-week follow up survey, in which all respondents still indicated that e-cigarettes pose a "great" health risk.

Counseling against cigarette use versus e-cigarette use. The Pepper et al. (2015) study indicated that healthcare providers were more likely to counsel against cigarette use versus e-cigarette use, with 79% of providers counseling against cigarette use while only 18% counseling against e-cigarette use. This study also demonstrated that healthcare providers were more likely to counsel against cigarette use versus e-cigarette use. The majority (77.5%) of healthcare providers indicated they were "very likely" to counsel adolescents against traditional cigarette use, while only 44.5% indicated they were "very likely" to counsel adolescents against e-cigarette use. Since the majority of study participants indicated they lacked e-cigarette knowledge, it was not surprising that many did not counsel against e-cigarette use.

After the educational offering however, 88.5% of surveyed providers responded they were "very likely" to counsel against e-cigarette use. This may indicate that increasing provider awareness and knowledge on e-cigarettes can lead to increased intent for patient counseling against their use. At the six week follow-up survey, 85.7% of providers still indicated their intent to counsel adolescents against e-cigarette use. The small drop in percentage from the immediate post-education survey may be attributed to a smaller sample size.

Intent to screen for e-cigarette use. As previously mentioned, only 7.5% of surveyed providers screened adolescents for e-cigarette use at every visit prior to the educational offering. Immediately following the educational offering, 83% of respondents indicated they intended to screen adolescents for e-cigarette use at every

visit. This indicated that increasing provider knowledge did lead to increased screening intent. Four respondents (11.4%) indicated no intent to screen adolescents for e-cigarette use in clinical practice. The demographic information found that participants area of clinical practice greatly varied. It is reasonable that respondents practicing in home health, physical therapy, and occupational therapy may not have frequent interactions with adolescent patients, therefore would answer the question with no intent to screen for e-cigarette use in that population.

As previously discussed, only seven six-week follow up survey responses were received. Those responses indicated that practice change had not occurred. Only 28.5% of respondents were screening for e-cigarette use at 100% of visits. A practice change may have been more likely to occur if clinical guidelines existed regarding e-cigarette screening or if a clinical screening tool was developed for provider use.

Willingness to provide educational materials. Prior to the educational offering, only 18.4% of respondents indicated they were "very likely", and 34.2% indicated they were "not likely", to provide e-cigarette educational materials to adolescents. At the time, this may have been attributed to lack of evidence-based knowledge regarding e-cigarette safety. Following the educational offering, however, nearly 69% of respondents indicated they were "very likely" to provide e-cigarette educational materials to adolescents, suggesting that the educational offering changed the providers' mind on the matter. However, there were still 11% of respondents who indicated they were "not likely" to provide educational material to adolescents regarding e-cigarette use. As previously mentioned, the clinical practice areas of respondents were varied. It is reasonable that some respondents may not have regular interactions with adolescent patients and

therefore responded that they were “not likely” to provide e-cigarette educational material.

The data from the six-week follow up survey indicated that many providers were only “somewhat likely” to provide e-cigarette educational material to adolescent patients. Again, this data could be contributed to the practice areas of the surveyed healthcare providers. It is possible that of the seven six-week follow up responses, all were home health nurses who do not have regular interactions with adolescents. Demographic data was not included in the six-week follow up survey, so it is difficult to know for certain.

Respondents perception on the safety of traditional cigarettes versus e-cigarettes. Providers were asked how likely they were to tell patients that e-cigarettes were less harmful than traditional cigarettes. Prior to the educational offering, 27.5% of respondents indicated they were “somewhat likely” to tell patients that e-cigarettes were safer than traditional cigarettes. Current research indicates that e-cigarettes may have similar health effects of traditional cigarettes, including increased risk of chronic airway diseases and even cancer. The effects of the nicotine on the adolescent brain is also a large concern, which can occur with traditional cigarette or e-cigarette use. After the educational offering, which expanded upon these statements, 94.2% of healthcare providers indicated they were “not likely” to tell patients e-cigarettes were less harmful than traditional cigarettes. Prior to education, only 24% of respondents indicated they were “not likely” to tell patients e-cigarettes were less harmful than traditional cigarettes, therefore a 70.2% increase occurred after the educational offering.

Data from the six-week follow up survey indicated that nearly 86% of respondents were still highly unlikely to tell patient e-cigarettes were less harmful than

traditional cigarettes. This was a decrease of 8.5% from the post-educational survey. As previously discussed with the apparent loss of participant e-cigarette knowledge base six-week post education, this data may indicate that information was not fully retained by participants.

E-cigarettes as a smoking cessation tool. E-cigarettes were originally marketed as smoking cessation devices for adults. Hilton et al. (2016) indicated that some adolescents do utilize e-cigarettes as smoking cessation tools. A review of the literature, however, indicated that e-cigarettes were not effective tools for smoking cessation (Shi, et al., 2016, Ekanem, et al., 2017). Prior to education, the clear majority (82.5%) of respondents indicated they were not likely to recommend e-cigarettes as a smoking cessation tool. There was an increase in providers who were not likely to recommend e-cigarettes as a smoking cessation tool after the educational offering to 91.4% (+8.9%). There was, however, two respondents who indicated they were "very likely" to recommend e-cigarettes as a smoking cessation tool, even after the educational offering. Possible reasons for this response include misreading the question, incorrectly answering, or personal views on the topic as this response is not backed by evidence-based research.

Evaluation of Theoretical Framework

E. M. Roger's Diffusion of Innovation Theory was used as the theoretical framework for this scholarly project. The short-term goal of the scholarly project was to increase providers' intent to perform e-cigarette screening through awareness and education of the evidence-based e-cigarette literature to date. The over-arching goal, however, was to create a clinical practice change in which providers regularly and consistently screen for e-cigarette use in the adolescent population. The theory describes

how an innovation spreads through a specific population and is eventually adopted by that population. The innovation in this scholarly project was e-cigarette screening for all adolescent patients.

Awareness occurred when healthcare providers completed the pre-educational survey. The survey piqued participant interest in the topic. Providers then sought additional information and participated in the educational offering, which increased provider knowledge regarding e-cigarette safety. After the educational offering, providers decided whether to increase their e-cigarette screening practices, and this intent was measured by the post-educational survey. The goal was that this intent to screen was later adopted by clinicians to become a clinical practice change in which all adolescents are screened for e-cigarette use at every visit. The innovation will be spread over time (Kaminski, 2011). Providers receiving the educational offering become peer leaders, who spread the knowledge regarding a need for increased e-cigarette screening to other healthcare providers. Screening rates continue to increase over time, and e-cigarette use in the adolescent population starts to decline.

Roger's Diffusion of Innovation Theory fits the project well. The project did show that once education had occurred, healthcare providers had an increased intent to screen for e-cigarette use in the adolescent population. The six week follow-up survey, which would indicate adoption of e-cigarette screening into clinical practice, did not show that the innovation was adopted. However, the sample size was small; including only seven people. Results may have differed if there had been a larger response to the six-week follow up survey.

Evaluation of Logic Model

The logic model identified the short-term, medium-term, and long-term goals of the project. The short-term goals focused on increasing provider awareness and knowledge of the e-cigarette epidemic and the potential health risk associated with e-cigarette use. The project was successful in increasing provider knowledge on e-cigarette health risks. The medium-term goal of the scholarly project including increasing providers' intent to screen adolescents for e-cigarette use, and increasing providers intent to provide e-cigarette educational materials to adolescent patients. Success was also reached for these medium-term goals. The long-term goal of the project included a provider clinical practice change in which all adolescent patients were screened for e-cigarette use. This goal was unable to be effectively evaluated due to poor response to the six-week post-education survey. The responses that were evaluated, however, did not indicate that a practice change occurred.

The logic model also allowed for identification of external factors that could have influenced the project. External factors that were identified included the number of willing participants and provider time constraints affecting the ability of healthcare providers to receive the educational offering. Although the participants were required to allot an hour of their time for the presentation, time constraints were not assessed in the participant surveys. Therefore, time constraints may need to be removed as an external factor on the logic model. The number of willing participants, however, was a significant external factor in the project. Only forty total participants were recruited for the project, and only seven participants responded to the six-week follow up survey.

Limitations

One limitation of the study was the relatively small sample size of forty participants. There was limited access to healthcare providers, which impacted the survey sample size. Another limitation of the study was the varied areas of clinical practice by surveyed healthcare providers. There may have been participant practice areas which precluded frequent interactions with adolescent patients, thus affecting survey responses. The instrument could have been modified for this issue by asking respondents on average how many adolescent patients they see in a week. Another limitation was the lack of post-education survey responses. The purpose of this survey was to determine if practice change occurred in the clinical setting. However, although fifty-three follow up surveys were sent, only seven responses were received, which greatly limited data collection and analysis.

A possible limitation to the instrument itself was the wording of some questions. Several survey questions were identical except for one word: “cigarette” or “e-cigarette”. These questions were asked back to back, which may have led to misreading of some questions. In fact, this issue was encountered when KU AHEC staff created the survey in Qualtrics software. KU AHEC staff thought that some of the survey questions were identical, when in fact one question asked about cigarettes, while the following questions asked about e-cigarettes.

Implications for Future Projects/Research

The study revealed several potential areas for future research. The literature indicates there is a great need for increased e-cigarette screening, especially in the

adolescent population. Although providers' intent to screen greatly increased after the educational offering, the study did not indicate that a long-term clinical practice change regarding e-cigarette screening occurred. A future area of research could include if the development of an e-cigarette screening tool could increase the rate of e-cigarette screening adoption in the clinical practice setting. Measurement of this adoption would require sufficient responses to follow-up surveys. In order to improve follow-up survey responses, it would be necessary to provide an incentive for healthcare providers responding to six-week follow up surveys.

Effective future research on the topic would require improvements to the survey instrument. As previously mentioned, it would be pertinent to know an average of how many adolescents surveyed healthcare providers see in order to have a better understanding of the data collected. Additionally, survey questions regarding cigarettes could be grouped together, while survey questions regarding e-cigarettes could also be grouped together. This would avoid any confusion regarding similarly worded questions and help to prevent erroneous data. Lastly, the study could be expanded to include screening for the adult population.

Implications for Practice/Health Policy/Education

The development of clinical practice guidelines is another area worthy of future research. The Food and Drug Administration has deemed e-cigarette use among youth to be at epidemic proportions. Therefore, it is reasonable that clinical practice guidelines need to be developed to guide e-cigarette screening and e-cigarette cessation in the adolescent population. As previously mentioned, the development of an e-cigarette screening tool may lead to increased adoption of the practice.

Survey results indicated that increasing provider e-cigarette education led to increased e-cigarette screening rates. In the future, more educational offerings should be offered to healthcare providers with the intent of increasing e-cigarette screening rates. Educational offerings could also be offered to parents, teachers, and even students to increase e-cigarette awareness and knowledge. Lastly, educational offerings could be offered to legislators. E-cigarette tax varies from state to state. However, Kansas has one of the lowest e-cigarette tax rates in the nation, with a rate of $0.05 per milliliter (S.B. 96, 2017). Provision of education to legislators may encourage an increase in e-cigarette tax rate, which may prevent some consumer from purchasing e-cigarettes.

Conclusion

Adolescents are using e-cigarettes at an alarming rate. In fact, the use of e-cigarettes has increased a staggering 900% between 2011 and 2015 (US Department of Health and Human Services, 2016). In 2018, the FDA stated that e-cigarette use among youth had reached epidemic proportions (U.S. Food & Drug Administration, 2018a). In addition to concern regarding the increased rate of use in youth, there is also concern regarding the health effects of e-cigarettes. As previously mentioned, the literature suggests that e-cigarettes do pose a significant health risk to adolescents. Studies have indicated that there is link between e-cigarette use and future traditional cigarette use (Primack, et al., 2015). Also, the health effects of nicotine may have an enhanced effect in the adolescent brain versus the adult (US Department of Health and Human Services, 2016). Lastly, recent research has indicated that e-cigarettes have the potential to create a lung environment prone to chronic airway disease, viral infections, and cancer (Lerner, et al., 2015, Wu, et al., 2014, Yu, et al., 2016, Cho & Paik, 2016).

Healthcare providers are poised to halt the sharp incline of e-cigarette use among youth through proper screening and effective patient education. E-cigarette screening practices among surveyed healthcare providers was poor. The intent to screen for e-cigarettes did increase following an educational offering. However, in the study, intent to screen did not indicate a practice change in which adolescents were routinely screened for e-cigarette use. The development of clinical practice guidelines and e-cigarette screening tools could potentially increase the rate of e-cigarette screening adoption and is an area of potential future research. E-cigarette education provided to parents and teens could also have an impact on the rate of e-cigarette use in the adolescent population and should be explored further. It is the researcher's hope that through effective education, we can see the rates of e-cigarette use decline.

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APPENDIX

Appendix A: Pre-Test

E-cigarette use among youth has increase significantly in the past five years. E-cigarettes are marketed as "safer" than conventional cigarettes, and are widely used as a smoking cessation tool in the adult population. The long-term health effects of e-cigarette use however, are not widely well-known. Health care providers are in a key position to halt, and potentially reverse, the sharp incline of e-cigarette use among youth. The goal of this survey is to identify current e-cigarette knowledge needs, provider views of e-cigarette use, and provider e-cigarette screening practices. This survey is voluntary, and your responses will remain confidential and anonymous.

1. What nursing licensure/certification do you currently hold?

_____ Registered Nurse
_____ Nurse Practitioner
_____ Physician's Assistant
_____ Physician
_____ Other, please state _____

---

2. What is your level of educational preparation?

_____ Associate's Degree
_____ Bachelor's Degree
_____ Master's Degree
_____ Doctoral Degree

---

3. 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

---

4. 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

---

5. What state do you primarily practice in?

_____ Kansas
_____ Missouri
_____ Nebraska
_____ North Dakota
_____ South Dakota
_____ Arkansas
_____ Oklahoma
_____ Colorado
_____ Other, please state _____

---

6. What is your primary area of practice?

_____ Family Practice
_____ Pediatrics
_____ Internal Medicine
_____ Other, please specify _____

---

7. Please rank the following e-cigarette 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

---

8. How often do you screen adolescents for smoking cigarettes?

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

---

9. How often do you screen adolescents for e-cigarette use?

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

---

10. How knowledgeable are you with your evidence-based e-cigarette knowledge?

☐Not knowledgeable ☐Somewhat knowledgeable ☐Very knowledgeable ☐Unsure

---

11. How much of a health risk do you feel e-cigarettes pose to your patients, especially adolescents?

☐No Risk ☐Small Risk ☐Great risk ☐Unsure

12. How likely are you to recommend e-cigarettes to adolescents as a smoking cessation tool?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

13. How likely are you to tell your patients that e-cigarettes are less harmful than traditional cigarettes if asked?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

14. How likely are you to counsel adolescents about avoiding cigarette use?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

15. How likely are you to counsel adolescents about avoiding e-cigarette use?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

16. How likely are you to provide adolescents with educational material regarding e-cigarette use?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

Thank you for taking the time to fill out this survey. Your feedback will help to complete DNP Scholarly Project requirements. Your input, and time, is greatly appreciated. Please direct any concerns, or questions to Andrea Hight at ahight@gus.pittstate.edu

Reference:

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. doi:10.1016/j.jadohealth.2015.06.017

Appendix B: Post-Test and Follow-Up Survey

E-cigarette use among youth has increase significantly in the past five years. E-cigarettes are marketed as "safer" than conventional cigarettes, and are widely used as a smoking cessation tool in the adult population. The long-term health effects of e-cigarette use however, are not widely well-known. Health care providers are in a key position to halt, and potentially reverse, the sharp incline of e-cigarette use among youth. The goal of this survey is to identify current e-cigarette knowledge needs, provider views of e-cigarette use, and provider e-cigarette screening practices. This survey is voluntary, and your responses will remain confidential and anonymous.

1. How often do you screen adolescents for smoking cigarettes?

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

---

2. How often do you screen adolescents for e-cigarette use?

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

---

3. How knowledgeable are you with your evidence-based e-cigarette knowledge?

☐Not knowledgeable ☐Somewhat knowledgeable ☐Very knowledgeable ☐Unsure

4. How much of a health risk do you feel e-cigarettes pose to your patients, especially adolescents?

☐No Risk ☐Small Risk ☐Great risk ☐Unsure

5. How likely are you to recommend e-cigarettes to adolescents as a smoking cessation tool?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

6. How likely are you to tell your patients that e-cigarettes are less harmful than traditional cigarettes if asked?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

7. How likely are you to counsel adolescents about avoiding cigarette use?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

8. How likely are you to counsel adolescents about avoiding e-cigarette use?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

9. How likely are you to provide adolescents with educational material regarding e-cigarette use?

☐Not likely ☐Somewhat likely ☐Very likely ☐Unsure

Comments and/or suggestions

Thank you for taking the time to fill out this survey. Your feedback will help to complete Scholarly Project requirements. Your input, and time, is greatly appreciated. Please direct any concerns, or questions to Andrea Hight at ahight@gus.pittstate.edu

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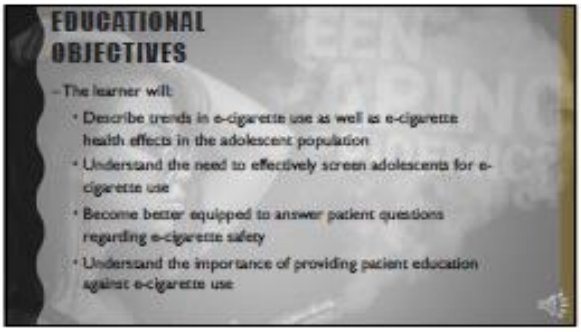
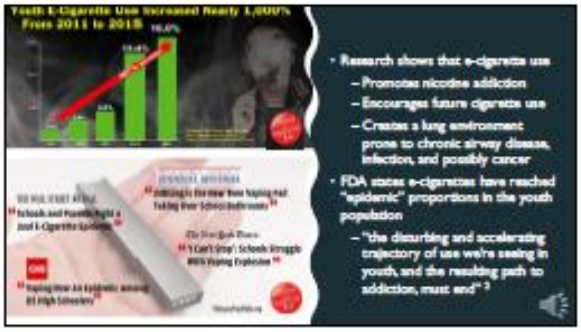
Reference:

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. doi:10.1016/j.jadohealth.2015.06.017

Appendix C: Educational Offering

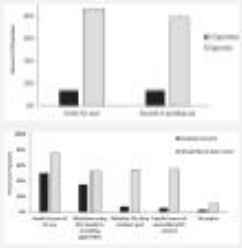
Recording of the Presentation: https://youtu.be/p661WVQq7B4

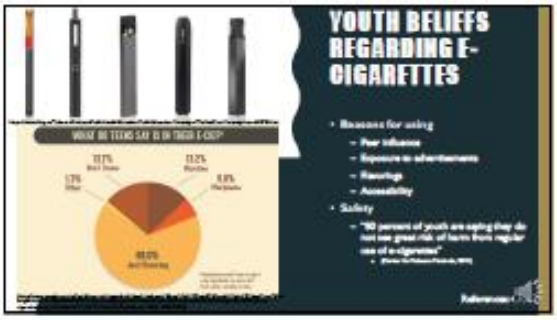




NEED FOR ACTION BY PROVIDERS

- Current clinical practices
  - Only 14% of providers regularly screened for e-cigarette use
  - 89% of providers surveyed wished to have more education regarding e-cigarette safety
    - Pepper, Gilkey, & Brewer, 2015[5]
- Topics Covered
  - Youth perceptions of e-cigarettes
  - Link between e-cigarettes and future cigarette use
  - Negative health effects associated with e-cigarette use





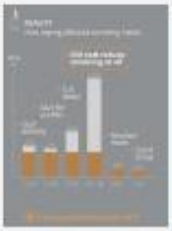
YOUTH BELIEFS REGARDING E-CIGARETTES

- Reasons for using
  - Peer influence
  - Exposure to advertisements
  - Flavorings
  - Accessibility
- Safety
  - "90 percent of youth are saying they do not see great risk of harm from regular use of e-cigarettes"

YOUTH AND E-CIGARETTES

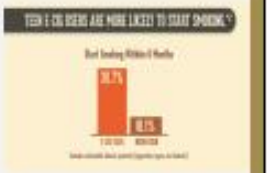
E-CIGARETTES AND SMOKING CESSATION

- E-cigarettes attract non-smokers
  - Among youth, 2/3 of e-cigarette experimenters and 1/3 of e-cigarette users had NEVER smoked a cigarette
- Overall, the verdict is still out
  - Few Randomized Control Trials available
- E-cigarettes may help to reduce the amount of traditional cigarettes smoked for some
- Those trying to quit with e-cigarettes become dual users of e-cigarettes and traditional cigarettes
  - 80% of e-cigarette users never fully quit smoking cigarettes
- Overall,
  - Not enough information available for healthcare providers to recommend e-cigarettes as a smoking cessation aide



E-CIGARETTES LINK TO TRADITIONAL CIGARETTES

- E-cigarette use is a predictor of future traditional cigarette use
  - Study in California showed that 40.4% of e-cigarette users were smoking cigarettes at the end of the 14 month study
- Even when controlling for factors that predispose to smoking, e-cigarette use is associated with future cigarette use
  - 34% of e-cigarette users initiated traditional cigarette use, while only 3.7% of non-e-cigarette users initiated use
- Two very large studies demonstrated that anywhere from 20- 34% of e-cigarette users will initiate traditional cigarette use within a year vs. 3% of non-users

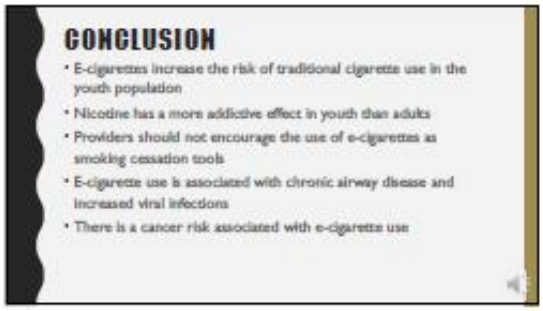


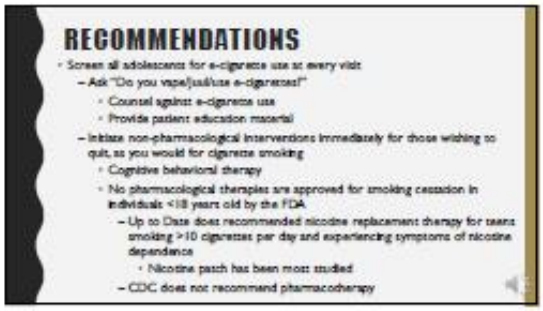
HEALTH EFFECTS

- Nicotine
  - 45.7% of youth e-cigarette users opt for nicotine containing e-liquids[14]
  - Effect on adolescent brain vs. adult brain
    - Enhanced metabolism of adolescents' more rewarding and less aversive effects of nicotine
    - Adolescent brains undergoing remodeling, neuronal pruning, and maturation which can be affected by nicotine
      - Risk for lasting effects on attention span and problem solving
  - Risk for dual users
    - Nearly 80% of e-cigarette users also smoke cigarettes


HEALTH EFFECTS
Respiratory Concerns
– Effect on natural airway immunity
Impaired WBC function
– Inflammatory properties
Production of interleukin-6 and interleukin-8
– Chronic airway disease
Asthma, COPD
WHAT DOES VAPING DO TO YOUR LUNGS?


HEALTH EFFECTS
WHAT'S IN A "VAPE" CLOUD?


CONCLUSION
E-cigarettes increase the risk of traditional cigarette use in the youth population
Nicotine has a more addictive effect in youth than adults
Providers should not encourage the use of e-cigarettes as smoking cessation tools
E-cigarette use is associated with chronic airway disease and increased viral infections
There is a cancer risk associated with e-cigarette use


RECOMMENDATIONS
Screen all adolescents for e-cigarette use at every visit
– Ask "Do you vape/juul/use e-cigarettes?"
Counsel against e-cigarette use
Provide patient education material
– Initiate non-pharmacological interventions immediately for those wishing to quit, as you would for cigarette smoking
Cognitive behavioral therapy
No pharmacological therapies are approved for smoking cessation in individuals <18 years old by the FDA
– Up to Date does recommended nicotine replacement therapy for teens smoking >10 cigarettes per day and experiencing symptoms of nicotine dependance
Nicotine patch has been most studied
– CDC does not recommend pharmacotherapy


COUNSELING
Cognitive Behavioral Therapy Interventions
– Group counseling
– Quit lines
– Mobile Apps
SmokefreeTXT
quitSTART
Tobacco Free Teens
Get Rich or Die Smoking
qs


THANK YOU!
QUESTIONS? CONTACT ME

REFERENCES

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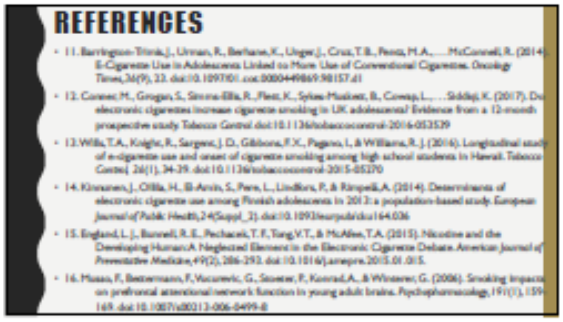

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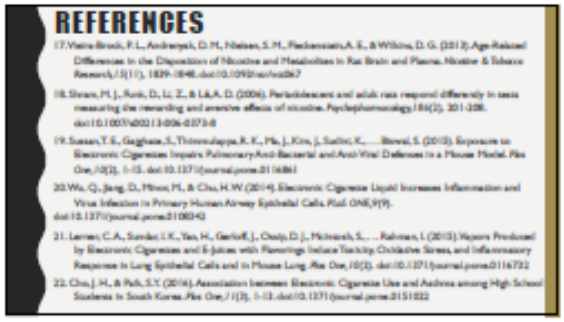

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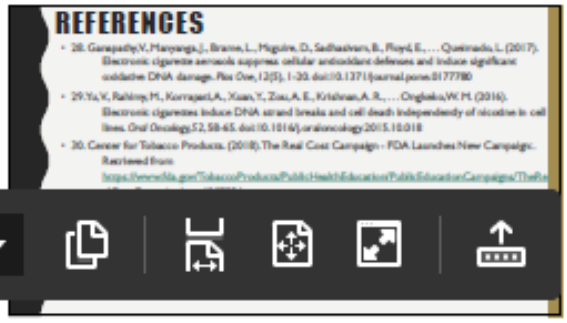

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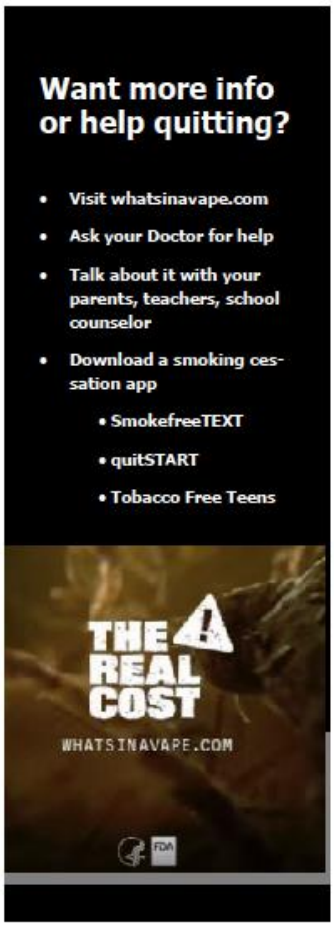
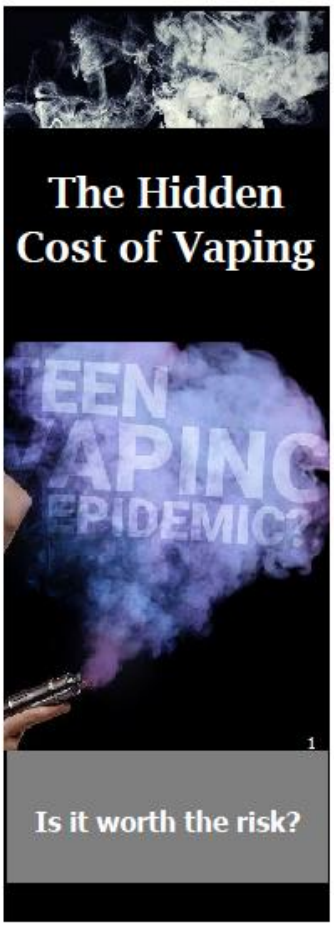
Appendix D: E-Cigarette Educational Pamphlet





Appendix D: E-Cigarette Educational Pamphlet Cont..

Vaping can "hack" your brain

Most e-cigarettes contain nicotine. Nicotine can affect your brain in as little as ten seconds. It causes changes in your brain that can affect your maturity and your ability to problem solve. Because your brain is still growing, you are more likely to become addicted to nicotine and to smoke cigarettes in the future. In fact, vaping makes you twice as likely to smoke cigarettes in the future compared to those who don't vape [3]

What else is in a vape?

It's not just harmless vapor.

- Flavorings found in e-cigarettes release formaldehyde when heated. Formaldehyde is known to cause cancer. [4]
- Other cancer causing chemicals such as acetaldehyde, nitrosamines, toluene, and acrolein are found in e-cigarette vapor. [5]
- E-cigarettes also release ultra-fine particles of toxic metals such as lead which is a brain toxin
- What other products are these chemicals found in?

6

7

This is what COPD looks like.

- You are young now, but you won't be young forever. E-cigarettes create life-long changes in your lungs and increase your risk of developing COPD and asthma. [8]
- Asthma can affect your ability to play sports, play a musical instrument, sing, and even talk.

9

  - You may even use an inhaler the rest of your life
- E-cigarettes also increase the number of lung infections you get meaning you miss out on more time from school, work, and friends [10]

Want to avoid cancer ,COPD, asthma, and constant lung infections?
STOP VAPING

11