

Vaping: Impact of Improving Screening Questioning in Adolescent Population: A Quality Improvement Initiative

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Abstract

Introduction: The use of Electronic Nicotine Delivery Systems (ENDS) increased dramatically over the past decade, making them the most common tobacco product used among youth. While physicians often screen for the use of tobacco, very few screen for vaping product usage. This quality improvement project aimed to increase the screening rate of ENDS use among adolescents to 85% to match the Healthy People 2020 screening target of 83.3% for smoking. **Method:** We collected data from weekly chart reviews of all adolescent visits with a primary care provider by using keywords such as “vapor,” “e-cigs,” and “vaping” to document screening for ENDS use. The project consisted of 4 PDSA cycles: (1) education of the Adolescent Clinic staff about screening; (2) the addition of the specific question for e-cigarette use in the facility’s Electronic Health Record; (3) house staff lecture about the importance of screening; and (4) reinforcement about screening to adolescent physicians. **Results:** The percentage of screening for traditional tobacco use was consistently higher than ENDS use in all months. ENDS use assessment increased since the first intervention, going from 0% at baseline to 90% at the end. The addition of a specific question for ENDS use in EPIC was the most significant intervention and increased the screening percentage to 78%. **Conclusions:** To adequately assess for the use of ENDS, the nonspecific question, “do you smoke?” is not sufficient. A direct approach is necessary. A specific question in the EHR is the most significant way to increase screening for ENDS use. (*Pediatr Qual Saf* 2021;6:e370; doi: 10.1097/pq9.000000000000370; Published online December 28, 2020.)

INTRODUCTION

Problem

National guidelines strongly recommend that tobacco screening in healthcare settings be expanded to include Electronic Nicotine Delivery Systems (ENDS) as part of the health examination.^{1,2} In 2019, over 5 million US middle and high school students used e-cigarettes in the past 30 days, including 10.5% of middle school students and 27.5% of high school students.³

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In our Adolescent Clinic, healthcare providers did not consistently screen for or identify adolescents who are current or former ENDS users, as the facility’s Electronic Health Record (EHR) only had a specific field for smoking cigarettes. In analyzing the overall rate of smoking, it is impossible to determine who was smoking cigarettes versus who was vaping. The baseline data for this project showed a screening rate for vapor product use of 0.48%. We were motivated by recent information regarding the increase in ENDS use among adolescents, and its association with specific health outcomes to develop a quality improvement (QI) project to increase the screening rate of ENDS use in our clinical population.

Background

ENDS, including electronic cigarettes also known as “electronic vaping product,” “e-cigarettes,” “e-hookahs,” “mods,” “vape pens,” “vapes,” “tank systems,” and “JUUL,” are handheld devices that produce an aerosol from a solution typically containing nicotine, flavoring chemicals, and carrier solvents such as propylene glycol and vegetable glycerin (glycerol) for inhalation by the user.⁴ They can also contain tetrahydrocannabinol and cannabinoid oils. Since its release to the international market in 2006, “ENDS vaping” has increased in popularity, especially among adolescents.

Several studies reported that early exposure to nicotine on a developing brain (before 25 years of age) is linked to poor concentration, cognitive changes, and effects in brain areas associated with attention, memory, and learning.^{5,6} Additionally, the developing brain is more vulnerable to nicotine dependence.⁵ Concern about health risks with ENDS use has arisen in the past year with the emerging association between the use of vaping products and lung disease and death.⁷ The Center for Disease Control and Prevention (CDC) reported over 2,500 cases of E-cigarette, or Vaping, Product-use Associated Lung Injury (EVALI). As of February 18, 2020, 68 EVALI deaths had been confirmed to the CDC.⁸ Among the hospitalized EVALI cases or deaths reported to the CDC, 15% were under 18 years old, and 37% were 18–24 years old.⁸

ENDS manufacturers continue to develop new teen-friendly devices, packaging designs, and “e-liquid” flavors that appeal to a younger crowd. Furthermore, marketing strategies, social media, and advertising from these companies seem to target the adolescent population specifically. These factors have likely resulted in the rising popularity and use of ENDS by teenagers. The use of e-cigarettes increased dramatically over the past decade, making them the most common tobacco product used among youth.¹ As per the National Surveys of the United States, 27.5%, of high school students reported current use of e-cigarettes in 2019, up from 20.8% in 2018.³

This new trend warrants public health intervention, mainly to protect adolescents, a particularly vulnerable population. The first step towards prevention is adequate screening during adolescent health visits. Although screening for tobacco use is routinely done by most providers, and the “do you smoke?” question is readily available in most EHR, screening accurately for vaping use has not been equally implemented. In a study from 2015, only one-third (34%) of physicians reported ever having discussed ENDS use during an adolescent visit,⁹ and few physicians routinely screened for ENDS use compared to cigarette smoking (14% versus 86% often or always screened, $P < 0.001$).⁹

This QI project strived to increase the screening for ENDS use among adolescents attending our clinic. We aimed to increase the screening to at least 85% to match the Healthy People 2020 screening target for tobacco use of 83.3%.¹⁰

METHODS

Setting

Elmhurst Hospital Center (EHC) is a large urban hospital that is part of the New York City Health and Hospital Corporation system. It is a major health care provider for nearly 900,000 residents of Western Queens. The EHC population is mostly Hispanic and South Asian individuals. The Adolescent Clinic, the site of the QI project, provides medical care to about 3,000 adolescent patients per year. Two full-time adolescent medicine physicians staff the clinic, a nurse practitioner, 2 nurses, 2 patients care

associates, and 2 social workers. Also, 2 general pediatricians see patients for 2 sessions a week. Our hospital uses the EHR software EPIC (Epic Systems, Verona, Wis.), which allows patient registration, full medical chart documentation, editing and review of all healthcare processes.

QI Team

The primary QI team consisted of a pediatric resident, a medical student, and an attending physician. Other Adolescent Clinic staff who participated in the project included 2 nurses, 1 patient care associate, 2 attending physicians, and 1 social worker. The adolescent team met daily to review clinical flow, discuss the QI project, and review each plan-do-study-act (PDSA) cycle of the project. The entire team and staff designed, implemented, and evaluated each PDSA cycle.

Measurements

The primary outcome measure was the percentage of patients screened for ENDS use at the Adolescent Clinic. The team gathered data through a weekly chart review of all medical visits from September 2019 to December 2019. We searched evidence of documentation of screening for ENDS use on physician and nurse practitioner notes by using keywords such as “vapor,” “e-cigs,” “vaping,” “e-cigarette,” and “vape.” The data did not include specifics about the types of ENDS used, as the goal of the project at this stage was mainly focused on the screening rate.

Intervention

The QI project consisted of 4 PDSA cycles within the 4 months. During the first PDSA cycle, the QI team educated the Adolescent Clinic staff about the importance of directly screening for ENDS and the proper interventions for positive and negative responses. Over the study period, patients also completed a confidential paper screening questionnaire at the beginning of the adolescent visit, with 2 “yes or no” questions on current and past use: (1) During the past 12 months, have you used an electronic vapor product? (2) During the past 30 days, have you used an electronic vapor product?

During the second PDSA cycle starting mid-October 2019, the facilities EHR began including a specific question and answers regarding ENDS use. Possible responses included “current everyday user,” “current someday user,” “former user,” “never user,” and “unknown if ever user” (Fig. 1).

For the third cycle, a noon-conference was conducted with the house staff and Adolescent Clinic staff to review the baseline findings, raise awareness of the harmful health implications of e-cigarettes use in adolescents, and the importance of screening specifically for ENDS use.

Finally, for the last PDSA cycle, there was an initial analysis of the data trend for October and early November, which showed that some providers did not screen for ENDS use on specific days (Mondays and Fridays). The physicians received targeted training regarding the proper fields to document adolescent risk behaviors.

The screenshot displays the 'Intake' section of an EHR, specifically the 'SOGI' (Social Determinants of Health) tab. The 'E-Cigarette/Vaping Use' section is highlighted with a red circle. It features a 'Mark as Reviewed' button with a date of 10/30/2017. Below this, there are several radio button options for user status: 'Current Everyday User', 'Current Some Day User', 'Former User', 'Never Assessed', 'Never User', 'User - Current Status Unknown', and 'Unknown if Ever Used'. At the bottom of the section, there are input fields for 'Start Date', 'Quit Date', and 'Cartridges/Day'.

Fig. 1. Sample of ENDS use screening question on EHR (EPIC) Elmhurst Hospital Center.

Data Analysis

Using Microsoft Excel version 16.30, the team plotted and monitored a weekly run chart with the percentage of patients screened for ENDS use when seen for any type of medical visit.

Six or more consecutive points above or below the median determined whether the variation in the data was nonrandom and attributable to the interventions. The Elmhurst Quality Department determined that this project was a QI and not human subject research. Therefore, it did not require review and approval by the institutional review board.

RESULTS

From the collected data, the baseline screening rate for cigarette smoking was close to 100% and remained consistently high during the 4 months of the intervention. However, screening for ENDS use started at 2 patients (0.48%) at baseline in September and progressively increased after the interventions to 243 patients (62%) in October, 320 patients (80%) in November, and 456 (90%) by the end of the study in December (Fig. 2).

There were 4 PDSA cycles implemented throughout the QI project. The weekly progression shows how each intervention affected the screening rate (Fig. 3). The first 5 weeks were the pre-intervention period. The baseline screening rate was 0% for week 1 through week 4, and 2% (1 of 62 patients screened) in week 5. At the beginning

of week 6, we implemented the first intervention: educating the adolescent staff on the importance of direct screening for ENDS use and the use of a paper screening questionnaire. These changes resulted in a screening rate increase to 17% (12 of 72 patients). In week 7, the next intervention was introducing the specific question for ENDS use in the facility's EHR. This intervention resulted in a screening rate of 95% (62 of 65 patients). Subsequent interventions, a conference with the pediatric residents (week 10) and a meeting with the Adolescent Clinic attendings to reinforce the importance of screening (week 11), resulted in screening rates of 74% (70 patients, N:95) and 91% (66 patients, N:72), respectively. After week 10, the percentage of screened patients was above the median for at least 6 consecutive data points. From then on, the goal was to maintain the screening percentage between the median of 82% and our project goal of 85% (Fig. 3).

Balancing Measures

For balancing measures, we evaluated whether the added screening step lengthened the duration of the medical visit if the patient screened positive. We reviewed 20 random patients who screened positive for ENDS use and compared the duration of each visit of 20 patients who screened negative for ENDS use. There was no significant difference in the time spent with those who screened positive versus those who screened negative. The average time difference in the visit length between the 2 groups in this sample was 4 minutes (47 minutes in the positive screeners versus 43 minutes in the negative screeners).

Percentage progression of the smoking and ENDS use assessment in the Adolescent Clinic of EHC in 2019

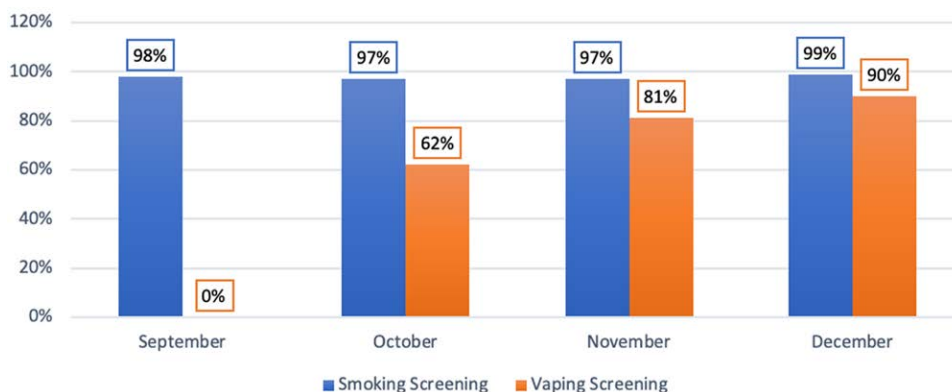


Fig. 2. Percentage progression of smoking assessment in the Adolescent Clinic of Elmhurst Hospital Center September to December 2019.

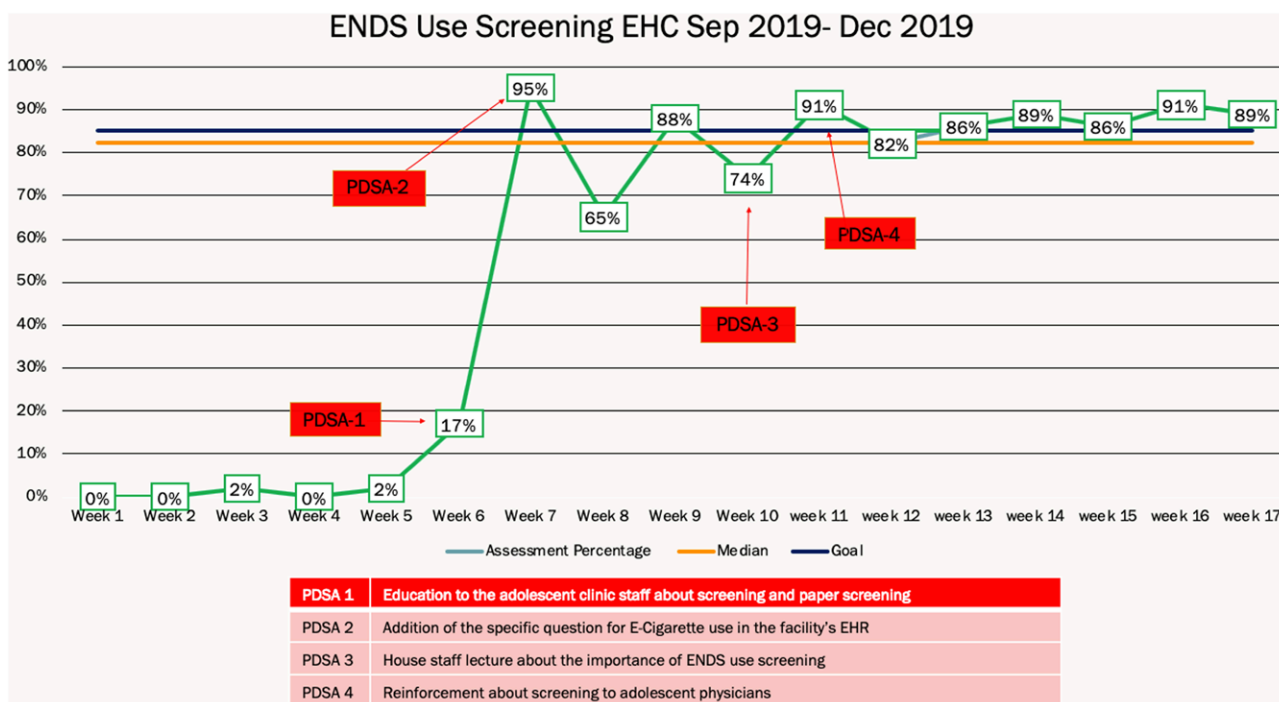


Fig. 3. Weekly progression of ENDS use among adolescent population seen at EHC Adolescent Clinic September to December 2019.

DISCUSSION

Comparing pre-intervention (September 2019) versus post-intervention (October, November, and December 2019), the percentage of screening for traditional tobacco use was consistently high in all months, and significantly higher than screening for ENDS use. However, the latter showed an upward trend after the first intervention, beginning with 0% at baseline and rising to 62%, then 80%, and finally 90% (Fig. 2). The week-by-week assessment identified possible causes or obstacles to ENDS use screening. As seen in Figure 3, after the first intervention,

the screening percentage increased by only 15% (from 2% to 17%), suggesting that education, training, and paper survey alone did not significantly impact the screening rate. Achieving the desired goal required weekly reinforcement and further intervention.

The most important part of the project was the addition of the specific question for ENDS use in the EHR by the facility's Central Office Optimization Group. This addition resulted in a substantial increase of 78% (95% from 17%) in the percentage of screening. A specific question in the EHR increases the likelihood of screening, by

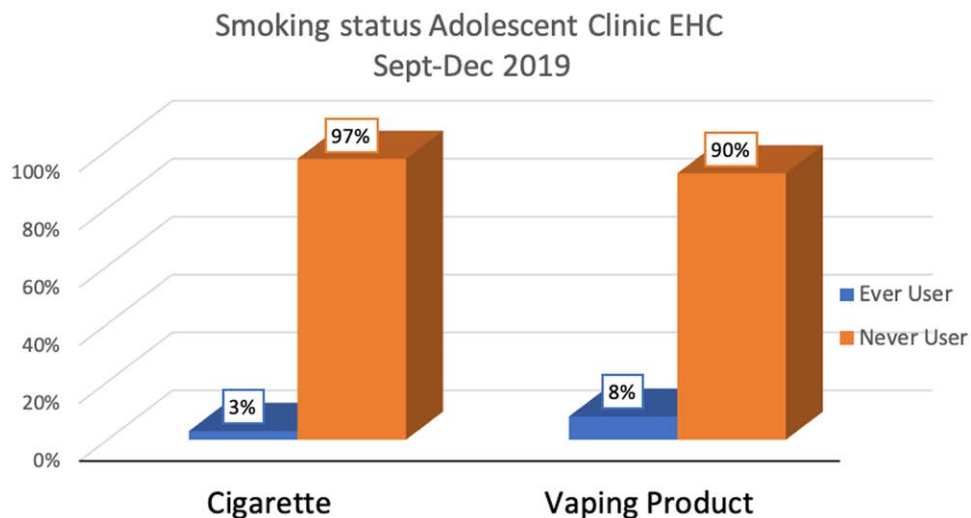


Fig. 4. Smoking status adolescent population that attended consult in Adolescent Clinic EHC September to December 2019.

reminding physicians to screen in each encounter; thus, making this question harder to miss in primary care visits. This intervention will increase the number of newly documented ENDS users, and the percentage of all adolescents counseled about ENDS use and its health implications.

Overall, there were 1,021 patients screened for ENDS use in this project. Findings showed that 8% (80 patients) used vaping products (Fig. 4), and 37.5% of the latter were current users. The percentage of patients at our clinic who have ever used an ENDS product is lower than that reported in the latest CDC National Youth Risk Behavior Survey, which states the percentage of ever-users of electronic vapor products among high school students is 42.2%.¹¹ Although our numbers are lower than the national data, this information demonstrates that our population is engaged in ENDS use, reinforcing the importance of screening specifically for ENDS early as the first step to proper intervention.

CONCLUSIONS

Screening for risky behaviors, such as smoking, is a critical element of the primary care visit in the adolescent population. The screening for cigarette and tobacco use in this project was consistently high and above the Healthy People 2020 goal of 83.3% for cigarette smoking. Screening for ENDS use should be equally implemented. The question of “do you smoke?” or only asking about “smoking” is not sufficient to assess ENDS use. Specific assessment for vapor product use is necessary for proper screening, as it is the only way to obtain an accurate answer from the patient. Results in this study suggest that the addition of the specific question for ENDS use in the EHR seems to be the most effective way to increase the screening rate in primary care visits. Screening for ENDS use is the first step toward preventing this risky behavior and is an excellent opportunity for counseling and intervention. We recommend screening specifically for ENDS

use in all EHR systems and conducted at each health care visit in the adolescent population.

This project can serve as a starting point for further investigation of ENDS use and its short- and long-term health effects in the adolescent population. It would be essential to analyze the contents of inhaled solutions used in ENDS, such as tetrahydrocannabinol and other substances that may have harmful effects on the developing brain. Further studies could also evaluate effective educational strategies and resources for health care providers and patients to promote ENDS use prevention and cessation.

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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REFERENCES

1. Jenssen BP, Walley SC; Section on Tobacco Control. E-cigarettes and similar devices. *Pediatrics*. 2019;143:e20183652.
2. Young-Wolff KC, Klebaner D, Folck B, et al. Do you vape? Leveraging electronic health records to assess clinician documentation of electronic nicotine delivery system use among adolescents and adults. *Prev Med*. 2017;105:32–36.
3. Cullen KA, Gentzke AS, Sawdey MD, et al. E-cigarette use among youth in the United States, 2019. *JAMA*. 2019;322:2095–2103.
4. Walley SC, Jenssen BP; Section on Tobacco Control. Electronic nicotine delivery systems. *Pediatrics*. 2015;136:1018–1026.

5. Chambers RA, Taylor JR, Potenza MN. Developmental neurocircuitry of motivation in adolescence: a critical period of addiction vulnerability. *Am J Psychiatry*. 2003;160:1041–1052.
6. Dao JM, McQuown SC, Loughlin SE, et al. Nicotine alters limbic function in adolescent rat by a 5-HT1A receptor mechanism. *Neuropsychopharmacology*. 2011;36:1319–1331.
7. Kalininskiy A, Bach CT, Nacca NE, et al. E-cigarette, or vaping product use associated lung injury (EVALI): case series and diagnostic approach. *Lancet Respir Med*. 2019;7:1017–1026.
8. Centers for Disease Control and Prevention. Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products: What We Know. February 25, 2020. Available at https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html#what-we-know. Accessed May 4, 2020.
9. Pepper JK, Gilkey MB, Brewer NT. Physicians' counseling of adolescents regarding e-cigarette use. *J Adolesc Health*. 2015;57:580–586.
10. Healthy people. Org. Increase tobacco screening in health care settings- TU-9.1. Available at <https://www.healthypeople.gov/2020/data-search/Search-the-Data#objid=5368>. Accessed October 29, 2019.
11. Centers for Disease Control and Prevention. Adolescent Youth health. July 17, 2018. Available at <https://www.cdc.gov/healthyyouth/data/yrbs/data.htm>. Accessed October 29, 2019.