Policy on Electronic Nicotine Delivery Systems (ENDS)

Latest Revision

2020

How to Cite: American Academy of Pediatric Dentistry. Policy on electronic nicotine delivery systems (ENDS). The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2023:150-3.

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes the increased use of electronic cigarettes (**e-cigarettes**) among children and adolescents. This policy intends to educate professionals, parents, and patients about electronic nicotine delivery systems (**ENDS**). Nicotine is highly addictive and has negative effects on brain development from the prenatal period into adolescence.[1] In order to reduce health risks caused by nicotine addiction, the AAPD supports routine screening for tobacco use, treating tobacco dependence, preventing tobacco use among children and adolescents, and educating the public on the health and societal costs of use of e-cigarettes/ENDS.

Methods

This policy was developed by the Council of Clinical Affairs and adopted in 2015.[2] This revision is based on a review of dental and medical literature and sources of recognized professional expertise and stature, including both the academic and practicing health care communities, related to ENDS use by the pediatric patient. In addition, a search of the PubMed®/MEDLINE database was performed using the terms: e-cigarette use in children, e-cigarette use in adolescents, ENDS use in children, ENDS use in adolescents, nicotine effects on health; fields: all; limits: within the last 10 years, humans, English, birth through age 18. Papers for review were chosen from this search and from references within selected articles. When data did not appear sufficient or were inconclusive, policies were based upon expert and/or consensus opinion by experienced researchers and clinicians.

Background

E-cigarettes, also called ENDS, are handheld devices that produce an aerosol from a solution typically containing nicotine, flavoring chemicals, and other additives to be inhaled by the user.[3-5] The act of using an e-cigarette/ENDS commonly is called vaping due to the vapors that are inhaled and exhaled; however, the emission from an ENDS is most accurately classified as an aerosol to which non-users also can be exposed.[3,4] E-cigarettes are marketed[6] as a less harmful alternative for tobacco smokers to consume nicotine.[7] They also are used as an aid to stop smoking tobacco-containing products,[8,9] although studies relating to the effectiveness of e-cigarettes as a smoking cessation tool have had mixed results, and the use of e-cigarettes for tobacco cessation is not clearly supported by scientific evidence.[10-12] There currently are no federally-approved e-cigarette products for adult smoking cessation.[13] E-cigarette solutions come in a variety of flavors and nicotine concentrations.[7,13]

The United States (**U.S.**) Preventive Services Task Force found that two of the strongest factors associated with initiation of smoking by children are parental smoking and parental nicotine dependence.[14] Studies have shown that exposure to nicotine has a deleterious effect on the brain of children and adolescents.[1,15] E-cigarette use is rising among adolescents at an alarming rate, and recent studies show that e-cigarette use among teens has surpassed tobacco cigarette use.[5,16] In 2019, 27 percent of high school students and 10.5 percent of middle school students reported current e-cigarette usage.[17] Since 90 percent of all adult tobacco smokers reported starting smoking as a teenager,[18] and almost 38 percent of habitual e-cigarette users never smoked tobacco products,[19,20] the potential for increased use of e-cigarettes is a public concern. E-cigarettes may serve as an entry point for use of nicotine, an addictive drug.[16] Adolescents and young adults who used e-cigarettes were found to be 3.5 times more likely to report using traditional cigarettes[21] despite having lower behavioral and social risk factors than those who smoked conventional cigarettes[22].

Due to lack of regulation in e-cigarette marketing, the sleek designs of the new products, and the appealing flavors, children who are impressionable and model the behavior of adults are at risk from marketing that normally is banned for tobacco-containing products.[3] ENDS solutions are available in a number of enticing and appealing flavors, including fruit, candy, and dessert flavors such as Belgian waffle and chocolate.[23] Although they have not been banned for e-cigarettes, these flavors have been banned in tobacco cigarettes due to their appeal to children, adolescents, and first-time users.[24] In 2016, 78.2 percent of middle and high school students were exposed to ENDS advertising from at least one source.[3]

In 2016, the Family Smoking Prevention and Tobacco Control Act[25] was expanded to include regulation of ENDS. Among the regulations set forth are a requirement that manufacturers submit an application for review to determine the

ABBREVIATIONS

AAPD: American Academy of Pediatric Dentistry. **E-cigarettes:** Electronic cigarettes. **ENDS:** Electronic nicotine delivery systems. **EVALI:** E-cigarette or vaping product use lung illness. **FDA:** U.S. Food and Drug Administration. **mg:** Milligram. **mL:** Milliliter. **THC:** Tetrahydrocannabinol. **U.S.:** United States.

safety of their products by 2020.[26] Previously, manufacturers were not required to disclose their ingredients.[27,28] The U.S. Food and Drug Administration (**FDA**)'s "deeming rule" also bans the sale of ENDS to anyone under 18 years old, requires producers to cease giving free samples, and requires warning labels stating that nicotine is addictive.[26] Unfortunately, the regulation does not address flavors or nicotine strength and does not appropriately restrict the advertising of ENDS.

The base solution contains propylene glycol which can cause eye, throat, and airway irritation and with long term exposure can cause asthma in children.[29] A five milliter (**mL**) vial of e-cigarette refill solution can contain a nicotine concentration of 20 milligrams (**mg**)/mL or 100 mg per vial.[30] The known lethal dose of nicotine has been estimated to be about 10 mg in children and between 30 and 60 mg in adults.[30] Recently, there has been a national outbreak of lung-associated injuries and deaths reported with e-cigarette use and vaping.[31] The liquid can contain nicotine, tetrahydrocannabinol (**THC**) and cannabinoid (**CBD**) oils, and other substances and additives.[31] The current chemical exposure causing lung injuries remains unknown; however, recent analyses of bronchoalveolar lavage fluid samples of those affected has shown vitamin E acetate to be associated with e-cigarette or vaping product use lung illness (**EVALI**).[31] THC is present in most of the samples tested by the FDA.[31] No one compound or ingredient has emerged to cause the illness to date, and many different product sources are being investigated at this time.[31] That the components of ENDS are not entirely disclosed and can vary according to manufacturer poses pressing concerns.[31]

As e-cigarettes have become popular as a substitute for tobacco smoking due to indoor smoking restrictions,[32] the effect of the exhaled vapors is also a concern. A number of toxic and potentially carcinogenic compounds have been found in the vapors of e-cigarettes.[33,34] Unrestricted access to smoking of e-cigarettes not only poses health risks to the user, but also may pose health risks to people nearby due to secondhand exposure of the vapors.[31] One study showed a similar effect on serum levels of cotinine (a biomarker for exposure to tobacco smoke) with an one-hour exposure to both secondhand cigarette smoke and e-cigarette vapors.[35]

Policy statement

The AAPD:

- recognizes the potential hazards associated with the use of electronic nicotine delivery systems.
- encourages all members to educate patients, parents, and guardians on the health consequences of e-cigarettes and other forms of nicotine delivery systems.
- encourages the enactment of FDA regulations on e-cigarette/ENDS distribution including, but not limited to, prohibiting sales to children under 21, banning the child-friendly flavoring of e-cigarettes, and limiting the use for smoking cessation purposes.
- supports more studies being done on the effects of the secondhand vapors and the compounds produced from e-cigarettes.
- supports the inclusion of e-cigarettes in the non-smoking laws in restaurants and public places.
- supports national, state, and local legislation that bans the sale of e-cigarettes to children and eliminates advertising and/or promotion of e-cigarettes that appeals to or influences children, adolescents, or special groups.
- opposes the use of all forms of unregulated nicotine delivery systems, such as tobacco lozenges, nicotine water, nicotine lollipops, and heated tobacco cigarette substitutes.

References

1. Dwyer J, McQuown S, Leslie F. The dynamic effects of nicotine on the developing brain. Pharmacol Ther 2009; 122(2):125-39.
2. American Academy of Pediatrics Dentistry. Policy on e-cigarettes. Pediatr Dent 2015;37(special issue):66-8.
3. Jenssen BP, Walley SC, AAP Section on Tobacco Control. E-cigarettes and similar devices. Pediatrics 2019;143(2): e20183652. Available at: "https://pediatrics.aappublications.org/content/pediatrics/143/2/e20183652.full.pdf". Accessed July 7, 2020.
4. Sutfin EL, McCoy TP, Morrell HER, Hoeppner BB, Wolfson M. Electronic cigarette use by college students. Drug and Alcohol Depend 2013;131(3):214-21.
5. U.S. Department of Health and Human Services E-Cigarette Use Among Youth and Young Adults. A Report of the Surgeon General. Atlanta, Ga.: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2016. Available at: "https://e-cigarettes.surgeongeneral.gov/documents/2016_SGR_Full_Report_non-508.pdf". Accessed July 7, 2020
6. Grana R, Ling P. Smoking revolution: A content analysis of electronic cigarette retail websites. Am J Prev Med 2014;46(4):395-403.
7. Taylor N, Choi K, Forster J. Snus use and smoking behaviors: Preliminary findings from a prospective cohort study among U.S. Midwest young adults. Am J Public Health 2015;105(4):683-5.
8. Ayers J, Ribisl K, Brownstein J. Tracking the rise in popularity of electronic nicotine delivery systems (electronic cigarettes) using search query surveillance. Am J Prev Med 2011;40(4):448-53.
9. Dawkins L, Turner J, Roberts A, Soar K. 'Vaping' profiles and preferences: An online survey of electronic cigarette users. Addiction 2013;108(6):1115-25.
10. Bullen C, Howe C, Laugesen M, et al. Electronic cigarettes for smoking cessation: A randomized controlled trial. Lancet 2013;382(9905):1629-37.

References continued on the next page.

11. Ghosh A, Coakley RC, Mascenik T, et al. Chronic e-cigarette exposure alters the human bronchial epithelial proteome. Am J Respir Crit Care Med 2018;198(1):67-76. Available at: "https://www.atsjournals.org/doi/10.1164/rccm.201710-2033OC". Accessed October 3, 2020.
12. National Academies of Sciences, Engineering, and Medicine. Public Health Consequences of E-Cigarettes. Washington, D.C.: The National Academies Press; 2018. Available at: "https://www.ncbi.nlm.nih.gov/books/NBK507171/pdf/Bookshelf_NBK507171.pdf". Accessed October 5, 2020.
13. Walley SC, Wilson KM, Winickoff JP, Groner J. A public health crisis: Electronic cigarettes, vape, and JUUL. Pediatrics 2019;143(6):e20182741.
14. Moyer VA, U.S. Preventive Task Force. Primary care interventions to prevent tobacco use in children and adolescents: U.S. Preventive Task Force recommendation statement. Ann Intern Med 2013;159(8):552-7.
15. Goriounova NA, Mansvelder HD. Nicotine exposure during adolescence alters the rules for prefrontal cortical synaptic plasticity during adulthood. Front Synaptic Neurosci 2012;4:3. Available at: "https://www.frontiersin.org/articles/10.3389/fnsyn.2012.00003/full". Accessed July 7, 2020.
16. Johnston LD, O'Malley PM, Miech RA, et al. Monitoring the future national results on adolescent drug use, 1975-2015. Overview, key findings on adolescent drug use. Ann Arbor, Mich.: Institute for Social Research, The University of Michigan; 2016. Available at: "https://files.eric.ed.gov/fulltext/ED578539.pdf". Accessed October 5, 2020.
17. Cullen KA, Gentzke AS, Sawdey MD, et al. E-cigarette use among youth in the United States, 2019. J Am Med Assoc 2019;322(21):2095-103. Available at: "https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6865299/". Accessed October 5, 2020.
18. U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults, Fact Sheet, U.S. Department of Health and Human Services, Washington, D.C. Available at: "https://www.hhs.gov/surgeongeneral/reports-and-publications/tobacco/preventing-tobacco-use-factsheet/index.html". Accessed October 5, 2020.
19. Kong G, Morean ME, Cavallo DA, Camenga DR, Krishnan-Sarin S. Reasons for electronic cigarette experimentation and its continuation among adolescents and young adults. Nicotine Tob Res 2015;17(7):847-54.
20. Wills T, Knight R, Williams R, Pagano I, Sargent J. Risk factors for exclusive e-cigarette use and dual e-cigarette use and tobacco use in adolescents. Pediatrics 2015;135(1):43-51.
21. Soneji S, Barrington-Trimis JL, Wills TA, et al. Association between initial use of e-cigarettes and subsequent cigarette smoking among adolescents and young adults: A systematic review and meta-analysis. JAMA Pediatr 2017;171(8):788-97. [published correction appears in JAMA Pediatr 2018;172(1):98].
22. Wills TA, Sargent JD, Gibbons FX, Pagano I, Schweitzer R. E-cigarette use is differentially related to smoking onset among lower risk adolescents. Tob Control 2016;26(5):534-9.
23. Walley SC, Jenssen BP, Section on Tobacco Control. Electronic nicotine delivery systems. Pediatrics 2015;136(5):1018-26. Available at: "https://pediatrics.aappublications.org/content/136/5/1018". Accessed October 31, 2020.
24. U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General. Atlanta, Ga.: U.S. Department of Health and Human Services, Centers for Disease Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2012. Available at: "https://www.ncbi.nlm.nih.gov/books/NBK99237/". Accessed October 3, 2020.
25. U.S. Congress. Family smoking prevention and tobacco control act. June 22, 2009. Available at: "https://www.govinfo.gov/content/pkg/PLAW-111publ31/pdf/PLAW-111publ31.pdf". Accessed July 7, 2020.
26. Sharpless N. FDA Voices: How FDA is regulating e-cigarettes. September 10, 2019. U.S. Food and Drug Administration. Available at: "https://www.fda.gov/news-events/fda-voices/how-fda-regulating-e-cigarettes". Accessed October 5, 2020.
27. Farsalinos KE, Spyrou A, Tsimopoulou K, Stefopoulos C, Romagna G, Voudris V. Nicotine absorption from electronic cigarette use: Comparison between first and new-generation devices. Sci Rep 2014;4:4133. Available at: "https://doi.org/10.1038/srep04133". Accessed July 7, 2020.
28. Cobb NK, Byron M, Abrams D, Sheilds P. Novel nicotine delivery systems and public health: The rise of the "e-cigarette". Am J Public Health 2010;100(12):2340-2.
29. Choi H, Schmidbauer N, Spengler J, Bornehag C. Sources of propylene glycol and glycol ethers in air at home. Int J Environ Res Public Health 2010;7(12):4213-37.
30. Cameron JM, Howell D, White J, Andrenyak D, Layton M, Roll M. Variable and potentially fatal amounts of nicotine in ENDS nicotine solutions. Tob Control 2014;23(1):77-8.
31. Centers for Disease Control and Prevention. Smoking and tobacco use: Outbreak of lung injury associated with the use of e-cigarette, or vaping, products. February 2020. Available at: "https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html". Accessed July 7, 2020.
32. Etter J, Bullen C. Electronic cigarette: Users profile, utilization, satisfaction and perceived efficacy. Addiction 2011;106(11):2017-28.

33. Talhout R, Schultz T, Florek E, van Benthem J, Wester P, Opperhuizen A. Hazardous compounds in tobacco smoke. Int J Environ Res Public Health 2011;8(2): 613-28.
34. Geiss O, Bianchi I, Barahona F, Barrero-Moreno J. Characterisation of mainstream and passive vapors emitted by selected electronic cigarettes. Int J Hyg Environ Health 2015;218(1):169-80. Available at: "https://www.sciencedirect.com/science/article/pii/S1438463914000972?via%3Dihub". Accessed October 5, 2020.
35. Flouris AD, Chorti M, Poulianiti K, Jamourtas A, Kostikas K, Tzatzarakis M. Acute impact of active and passive electronic cigarette smoking on serum cotinine and lung function. Inhalation Toxicol 2013;25(2):91-101.