BONUS DIGITAL CONTENT

Medicine by the Numbers

A Collaboration of TheNNT.com and AFP

Electronic Cigarettes for Smoking Cessation

Kento Sonoda, MD, AAHIVS, and Kaku Kuroda, MD

Details for This Review

Study Population: 22,052 adults who smoke combustible cigarettes

Efficacy End Points: Smoking cessation at six months to one year

Harm End Points: Adverse events or serious adverse events at one week or longer

THE NUMBERS

Benefits	Harms
1 in 25 was helped (quit smoking, compared with nicotine replacement therapy)	1 in 7 was harmed (experienced adverse events, compared with behavior therapy alone or no intervention)
1 in 15 was helped (quit smoking, compared with non-nicotine electronic cigarettes)	
1 in 50 was helped (quit smoking, compared with behavior therapy only or no intervention)	

Narrative: Cigarette smoking is the leading cause of preventable death in the United States.[1] More than 43 million people 12 years or older report smoking cigarettes in the previous month, with an estimated 480,000 deaths annually attributed to cigarette smoking in the United States.[1,2] Although behavior support and pharmacologic treatment such as nicotine replacement therapy (NRT) are available for smoking cessation treatment, long-term abstinence is challenging for people who are dependent on tobacco. An electronic cigarette (e-cigarette) is a mobile device for inhaling aerosol formed by heating a liquid through a battery-powered heating coil. e-Cigarettes may aid in smoking cessation because they uniquely offer the sensory, behavior, and social aspects of smoking while providing nicotine.

A 2022 Cochrane review evaluated nicotine e-cigarettes for smoking cessation.[3] This review included 78 studies (40 randomized controlled trials), with 22,052 participants in 14 countries (34 studies in the United States). All participants were adults who smoked. A total of 39 studies exclusively recruited participants who were motivated to quit smoking, and 22 studies exclusively recruited participants who were not motivated to quit smoking. Comparators included non-nicotine e-cigarettes, NRT, and behavior support. The primary outcomes were smoking cessation (six months to one year from the start of the intervention) and adverse events (one week or longer after treatment was initiated).

High-certainty evidence showed that, compared with NRT, nicotine e-cigarettes increase quit rates at six months or longer (risk ratio [RR] = 1.63; 95% CI, 1.30 to 2.04; absolute risk difference [ARD] = 4%; number needed to treat [NNT] = 25). There was no difference in rates of adverse events (moderate-certainty evidence) or serious adverse events (low-certainty evidence) between nicotine e-cigarettes and NRT.

Moderate-certainty evidence showed that, compared with non-nicotine e-cigarettes, nicotine e-cigarettes increase quit rates (RR = 1.94; 95% CI, 1.21 to 3.13; ARD = 7%; NNT = 15). There was no difference in rates of adverse events (moderate-certainty evidence) or serious adverse events (low-certainty evidence) between nicotine and non-nicotine e-cigarettes.

Very low-certainty evidence showed that nicotine e-cigarettes might provide a benefit vs. behavior support alone or no support (RR = 2.66; 95% CI, 1.52 to 4.65; ARD = 2%; NNT = 50). Although very low-certainty evidence demonstrated no difference in serious adverse events, low-certainty evidence demonstrated an increase in adverse events in those using nicotine e-cigarettes (RR = 1.22; 95% CI, 1.12 to 1.32; number needed to harm = 7).

Caveats: The Cochrane review had several limitations, including significant heterogeneity among study design and outcomes, impacting validity. Only 32 out of 78 studies assessed abstinence as the primary outcome, and any secondary outcomes described were disease-oriented outcomes such as carbon monoxide levels. There were 18 studies that received funding or support from the e-cigarette industry. The effectiveness of interventions may have been impacted by including

The NNT Group Rating System

Green	Benefits greater than harms
Yellow	Unclear benefits
Red	No benefits
Black	Harms greater than benefits

populations with significant comorbidities that could affect quit rates (e.g., people who were not motivated to quit smoking, people with a substance use disorder, people with serious mental health conditions). In addition, this review did not compare e-cigarettes with pharmacologic therapies often used for smoking cessation, such as bupropion and varenicline (Chantix).

Based on this review, nicotine e-cigarettes may seem promising; however, family physicians should be cautious of suggesting nicotine e-cigarettes for smoking cessation because of the potential risks. Cigarette smokers who start vaping to quit smoking may end up vaping and smoking. For example, a 2019 randomized trial showed that approximately 40% of patients who used e-cigarettes for smoking cessation continued to use e-cigarettes at the 52-week follow-up.[4] Because the current review includes only data up to two years, the long-term effects of e-cigarettes are unknown. The U.S. Preventive Services Task Force concluded that the current evidence is insufficient to assess the balance of benefits and harms from e-cigarettes for tobacco cessation in adults.[5]

Conclusion: Because no data from a long-term safety profile are available, we have assigned a color recommendation of yellow (unclear benefits) to this review, despite the promising certainty of evidence supporting nicotine e-cigarettes for smoking cessation. Further research with longer follow-up periods is needed to properly assess the balance of benefits and harms. Additional data are also needed to investigate the effect on populations with significant comorbidities and to evaluate newer e-cigarette devices.

This series is coordinated by Christopher W. Bunt, MD, *AFP* assistant medical editor, and the NNT Group.

A collection of Medicine by the Numbers published in *AFP* is available at https://www.aafp.org/afp/mbtn.

Author disclosure: No relevant financial relationships.

References

1. National Center for Chronic Disease Prevention and Health Promotion Office on Smoking and Health. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. Centers for Disease Control and Prevention; 2014.
2. *Key Substance Use and Mental Health Indicators in the United States: Results From the 2021 National Survey on Drug Use and Health*. Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration; 2022.
3. Hartmann-Boyce J, Lindson N, Butler AR, et al. Electronic cigarettes for smoking cessation. *Cochrane Database Syst Rev*. 2022;(11):CD010216.
4. Hajek P, Phillips-Waller A, Przulj D, et al. A randomized trial of e-cigarettes versus nicotine-replacement therapy. *N Engl J Med*. 2019;380(7):629-637.
5. Krist AH, Davidson KW, Mangione CM, et al. Interventions for tobacco smoking cessation in adults, including pregnant persons: US Preventive Services Task Force recommendation statement. *JAMA*. 2021;325(3):265-279. ■