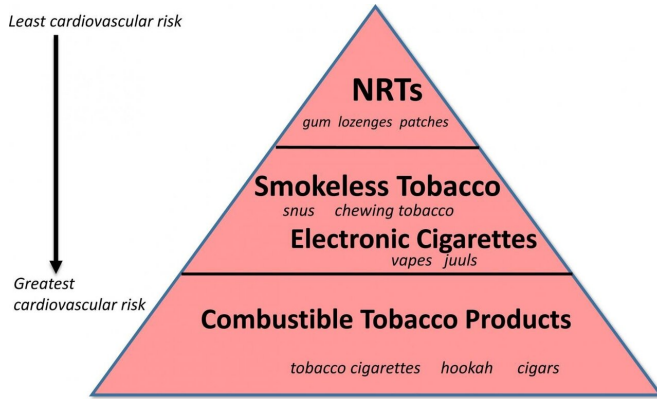


Cardiologists warn about the risks of vaping

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Nicotine delivery systems, including nicotine replacement therapies (NRTs), smokeless tobacco, electronic cigarettes (ECs) and combusted tobacco, can be ranked within a pyramid of cardiovascular harm, stratified by potency of nicotine delivery and the accompanying non-nicotine toxicants. NRTs have the least cardiovascular risk, and combustible tobacco products have the greatest risk. Smokeless tobacco produces and ECs likely have intermediate cardiovascular risk. Credit: Holly Middlekauff, MD

Electronic cigarette (EC) use, or vaping, has both gained incredible popularity and generated tremendous controversy, but although they may be less harmful than tobacco cigarettes (TCs), they have major potential risks that may be underestimated by health authorities, the public, and medical professionals. Two cardiovascular specialists review the latest scientific studies on the cardiovascular effects of cigarette smoking versus ECs in the *Canadian Journal of Cardiology*. They conclude that young non-smokers should be discouraged from vaping, flavors targeted towards adolescents should be banned, and laws and regulations restricting their availability to our youth should be passed and strictly enforced.

Arash Nayeri, MD, and Holly Middlekauff, MD, of the David Geffen School of Medicine at UCLA, Department of Medicine, Division of Cardiology, Los Angeles, CA, USA, have written this review to

provide physicians with an objective, rather than emotional, assessment of the available scientific data about ECs so that these physicians can help their patients make informed and thoughtful decisions.

TCs are lethal, killing up to half the people who use them. They are a leading cause of preventable cardiovascular morbidity and mortality around the globe, projected to account for an estimated eight million deaths annually worldwide by 2030, most of which resulting from cardiovascular disease.

ECs have gained popularity since 2007, both among long-term TC smokers and youth who have never smoked tobacco. There is evidence that ECs are less harmful than TCs, and the absence of a number of known toxic byproducts of TCs has helped cultivate the perception that ECs are healthy (or at least benign).

A recent review of more than 50 scientific studies involving over 12,000 participants concluded that ECs are more effective for smoking cessation than certified [nicotine replacement therapy](#) (NRT) like patches or gum and were also more effective than behavioral support alone, thereby providing a potential alternative to lethal cigarettes for adult smokers addicted to [nicotine](#). However, there is growing concern that some of their constituents, including nicotine, and their thermal degradation byproducts, may have adverse effects.

"EC vaping by our youth has become so popular that it is approaching a public health crisis," explain the authors. "Fast on its heels is the recent rapid rise in vaping marijuana. In fact, more youth use marijuana, including vaping it, than currently smoke cigarettes. We have got to get this under control, and the first step in doing so is to know the facts."

Dr. Nayeri and Dr. Middlekauff evaluate:

- Evolution in devices and nicotine delivery of ECs
- Cardiovascular effects of nicotine

- Non-nicotine constituents and byproducts and biomarkers of cardiovascular risk
- Effects of ECs on hemodynamics, arrhythmogenicity, oxidative stress and Inflammation, thrombogenesis, and vascular health
- ECs as effective tools to reduce tobacco smoking
- Public health implications of tobacco smoking versus vaping
- Emergence of pod-like devices
- EVALI (EC, or vaping, product use associated lung injury)

It has been calculated that 1.6 to 6.6 million American lives could be saved over 10 years by switching from TCs to ECs. However, the authors point out that the long-term risks of ECs are still unknown and recommend use for the shortest effective time. They also note that fourth generation devices, "pods," can deliver similar amounts of nicotine as combustible cigarettes by employing "nicotine salts." Each pod may contain a nicotine load equivalent to a pack of cigarettes, and thus may pose a greater risk of addiction to non-smokers than earlier generation devices. On the other hand, these pod-like devices replicate the nicotine delivery of combustible cigarettes, and thus may have more appeal to smokers addicted to nicotine who want to quit tobacco cigarettes.

The authors point out that smoking one to three cigarettes a day has almost the same cardiovascular risk as smoking one to three packs per day, so using ECs to cut down on smoking (rather than eliminate it) is not an effective strategy. Therefore, they recommend that TC smokers who want to quit and who have failed certified, conventional therapies may consider ECs, but should use them to replace TCs completely.

"Only with great caution and after exhausting all other smoking cessation strategies should we consider recommending that our TC smoking patients switch to ECs," comments Dr. Nayeri. "Switching to unregulated ECs, with all their promise as smoking cessation devices, may lead to unforeseen, potentially fatal consequences. As currently marketed without quality control, ECs are no panacea," caution the authors.

Since ECs are not harmless, non-smokers, especially adolescents and young adults, should not use them, say the authors. "The direct marketing to young never smokers and the development of thousands of dessert and candy flavored liquids have unconscionably attracted millions of children to try them," notes Dr. Middlekauff. To discourage young non-smokers from vaping, the authors propose that flavors should be banned, public health anti-vaping campaigns should be supported, and laws and regulations restricting their availability to young people should be passed and strictly enforced. They also strongly recommend that people should stay away from bootlegged or black-market nicotine- or marijuana-based EC products.

"Look before you leap," writes Andrew L. Pipe, CM, MD, Division of Cardiac Prevention and Rehabilitation, University of Ottawa Heart Institute, Ottawa, ON, Canada, in an accompanying editorial.

Dr. Pipe points out that despite limited evidence to support the use of electronic nicotine delivery systems (ENDS) for smoking cessation in recent clinical studies, evidence of successful cessation in "real world" settings is not apparent. "Nonetheless, the use of ENDS containing known quantities of nicotine and limited flavoring might facilitate their use for smoking cessation, however, in the absence of appropriate product regulation such clinical use is unlikely in the near future."

Commenting on the policy vacuum in Canada that allowed the virtually unregulated entry of ENDS into Canada in contrast to the situation in other jurisdictions, Dr. Pipe notes the government's lack of consideration of their attractiveness to youth and limited regulation of their content, marketing and merchandising, contributing factors to widespread use and abuse of ENDS in Canada. Outcries from parents, educators, clinicians, and health organizations like the Heart and Stroke Foundation of Canada are now resulting in regulatory proposals.

"Will we be replacing the burden of lung- and other smoking-related cancers with an unanticipated burden of differing forms of chronic, incapacitating respiratory disease in years to come?" concludes

Dr. Pipe. "Many who anticipated the arrival of ENDS with an optimistic curiosity now recognize the unfortunate realities that have surrounded their largely unregulated arrival. Perhaps some leapt—before they looked."

More information: Andrew L. Pipe, Vaping, Smoking Cessation, and Harm Reduction? Look Before You Leap, *Canadian Journal of Cardiology* (2021). [DOI: 10.1016/j.cjca.2021.02.002](https://doi.org/10.1016/j.cjca.2021.02.002)

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