

# E-cigarettes

## An update

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The uptake of electronic cigarettes (e-cigarettes), particularly among young Australians, is concerning given the lack of evidence regarding long-term health implications. Recent changes in regulatory guidelines and conflicting evidence regarding the role of e-cigarettes in smoking cessation present challenges for prescribers. This article summarises findings from a recently published systematic review on e-cigarettes.

**E**lectronic cigarettes (e-cigarettes) are battery-powered rechargeable or disposable devices that heat an 'e-liquid' to produce an aerosol, which is inhaled by the user and is also known as vaping.<sup>1</sup> The liquid can contain a variety of substances, including nicotine, tetrahydrocannabinol and cannabinoid oils, as well as flavouring and additives, including potentially harmful chemicals such as benzaldehyde, menthol, trans-cinnamaldehyde and polycyclic aromatic hydrocarbons.<sup>2</sup> It has been found that measured levels of chemicals are not accurately described on the product label. Measuring levels of the substance that reaches the lungs is challenging because of the varied chemical components, intensity of puffing and battery power.<sup>2</sup>

As detailed by Dr Vikram Palit and colleagues in the October 2021 issue of *Medicine Today*, despite regulatory frameworks that restrict access to e-cigarettes without a valid prescription, the uptake of vaping among young Australians continues to rise in keeping with global trends.<sup>3</sup> Data from the Australian National Drug Strategy Household Survey notably saw a rise in e-cigarette use in 18 to 24 year olds, from 4.9% in 2013 to 19.6% in 2019, with the total proportion of people who had ever used e-cigarettes rising from 8.8% to 11.3% during this period. Over half of all use was in combination with tobacco smoking; 16% was in people who had never smoked.<sup>4</sup>

RESPIRATORY MEDICINE TODAY 2022; 7(2): 30-32

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### Key points

- **Nicotine-containing electronic cigarettes (e-cigarettes) are only legal in Australia with a valid prescription, following legislation introduced in October 2021.**
- **The evidence surrounding the long-term health effects of e-cigarettes and their role in smoking cessation is limited.**
- **The increasing use of e-cigarettes, particularly among young people, presents a challenge.**
- **A recently published systematic review by the Australian National University is an excellent resource for GPs and Respiratory Physicians for contemporary evidence in relation to e-cigarettes.**

In October 2021, the Therapeutic Goods Administration (TGA) brought into effect new legislation that listed nicotine vaping products as prescription-only medicines.<sup>5</sup> Consumers now require a prescription to purchase nicotine vaping products, as well as to import products from overseas. In Australia, only pharmacies may sell nicotine vaping products (through prescription). Sale of nicotine vaping products through other retail outlets remains illegal.

GPs have a key role in providing information on and prescribing e-cigarettes for smoking cessation. This article aims to provide an update and commentary to assist primary care practitioners, following the recently published systematic review of global evidence on electronic cigarettes and health outcomes from the Australian National University for the Australian Department of Health.<sup>1</sup>

## Key findings of the systematic review

The recently published systematic review included 187 studies related to nicotine and non-nicotine e-cigarettes.<sup>1</sup> Key findings were as follows.<sup>1</sup>

- There is conclusive evidence that nicotine e-cigarettes and their constituents can cause poisoning, injuries and burns, as well as immediate toxicity through inhalation, including seizures.
- There is conclusive evidence that e-cigarettes can cause acute lung injury (e-cigarette- or vaping-use associated lung injury [EVALI]) largely, but not exclusively, relating to products containing tetrahydrocannabinol/vitamin E acetate.
- There is strong evidence that the use of e-cigarettes increases the uptake of combustible smoking in people who have never smoked, particularly young people.
- There is limited evidence that nicotine e-cigarettes are efficacious as an aid to smoking cessation.
- The impact of nicotine e-cigarettes on important health outcomes, including cancer, cardiovascular, metabolic, mental health, developmental and reproductive health, is not known.
- The health impact of dual smoking and e-cigarette use, the most common pattern of usage, is not known.

The lack of evidence surrounding key outcomes makes it challenging to guide patients to make informed choices about e-cigarette use. To aid these discussions, the following explores the above findings in more detail.

## Increased risk of poisoning, injuries and burns

The review found conclusive evidence that intentional or accidental exposure to nicotine e-liquids can lead to poisoning, which can be severe and even result in death, with a significant number of accidental poisonings occurring in children under the age of 6 years. E-cigarettes can also lead to immediate toxicity through inhalation, which can lead to seizures. Four systematic reviews found evidence that e-cigarettes can explode and cause burns, with one review not reaching any summative conclusions on burns or other injuries related to e-cigarettes.<sup>1</sup> These injuries are largely due to malfunctioning lithium batteries. Thermal burns to the lower body were the most common injury sustained.

## Why do people use e-cigarettes?

The National Drug Strategy Household Survey 2019 asked about people's drug use throughout their life and within the past 12 months. Results of the survey pertaining to the reasons for using e-cigarettes that were evaluated are highlighted in the Table.<sup>4</sup> Curiosity was the main reason for using e-cigarettes among current smokers (43.7% of respondents) and those who had never smoked (85.4%). People who already smoke also used e-cigarettes to help quit smoking, reduce regular cigarette use or to help stop themselves going back to regular cigarette use.

**Table. National Drug Strategy Household Survey 2019 results on why people vape<sup>4</sup>**

Response	Percentage
<b>People who have never smoked*</b>	
Curiosity	85.4%
Believe less harmful than regular cigarettes	9.5%
Think they taste better than regular cigarettes	7.4%
More acceptable than regular cigarettes	5.8%
<b>People who currently smoke*</b>	
Curiosity	43.7%
To help quit smoking	43.7%
To cut down on number of cigarettes smoked	31.9%
Believe less harmful than regular cigarettes	27.3%
Cheaper than regular cigarettes	23.3%
To try and stop going back to regular cigarettes	18.5%
More acceptable than regular cigarettes	11.8%
Can be used in places where cigarettes are banned	8.9%

\* Respondents could select more than one response.

## The role of e-cigarettes in smoking cessation

Overall, the review found limited evidence that e-cigarettes are effective for smoking cessation.<sup>1</sup> Some evidence indicates that there may be, at best, modest benefit, particularly when compared with established nicotine replacement therapy, such as nicotine patches and other medications, alongside counselling and behavioural support. There is limited evidence to suggest that people who have stopped smoking combustible cigarettes and who also use e-cigarettes have a higher relapse rate for combustible cigarettes (about double) than those who do not use e-cigarettes.

The review also found that most current e-cigarette use is not for smoking cessation and 16% of current e-cigarette users have never smoked combustible cigarettes. Dual users of combustible and e-cigarettes usually continue to smoke combustible cigarettes.<sup>1</sup> The review described substantial evidence from observational studies that people who have never smoked who have used e-cigarettes are more likely to try smoking conventional cigarettes and to transition to regular smoking.<sup>1</sup>

Australia's prescription-only model of e-cigarette use is unique worldwide. E-cigarettes are not registered therapeutic products in Australia and have not been approved for smoking cessation by the TGA or other global regulators. However, the Royal Australian College of General Practitioners (RACGP) guidelines state that they may be used in combination with behavioural therapy for people who smoke and are seeking to quit but have failed first-line

therapy and who have been fully informed about the risks.<sup>6</sup>

Conflicting positions on e-cigarettes as an aid to smoking cessation in different countries may seem confusing. Australia and the USA have not generally supported the use of e-cigarettes for smoking cessation because of limited data on safety and efficacy.<sup>2,6-8</sup> However, the introduction of e-cigarette prescribing in Australia in 2021 signalled a step towards their use. In contrast, the UK and New Zealand have more consistently embraced e-cigarettes for smoking cessation and harm reduction.<sup>9-12</sup>

### Do e-cigarettes cause nicotine dependence?

Nicotine addiction in people who do not smoke is an identified risk of e-cigarette use.<sup>1</sup> The nicotine dose from combustible cigarettes ranges from 0.5 to 1.5 mg, with registered nicotine replacement therapies delivering a dose of about 0.3 to 1 mg/hour in a sustained release. The dose of nicotine delivered by e-cigarettes is variable, depending on nicotine concentration in the liquid, type of device and user behaviour. High concentration nicotine salt disposable products are the most common products used by children and adolescents. These small devices contain the amount of nicotine equivalent to many packets of cigarettes.

### Long-term health outcomes

There is no available evidence regarding the effect of e-cigarette use on cardiovascular disease outcomes. There is moderate evidence that, among people who smoke, e-cigarette use increases heart rate, systolic blood pressure and arterial stiffness acutely after use. There is limited evidence that longer-term use of e-cigarettes, after switching from combustible cigarette smoking, is associated with decreased blood pressure. There is no available evidence on the relationship between e-cigarette use and cancer risk. Although there is conclusive evidence that e-cigarettes can cause EVALI, evidence in relation to other respiratory outcomes, such as asthma and chronic obstructive pulmonary disease, is insufficient.<sup>1</sup>

### Conclusion

Current data support the avoidance of e-cigarette use in non-smokers, especially young people. Strong concerns about the safety and efficacy of e-cigarettes in smoking cessation have also been raised, at the time of writing, in the National Health and Medical Research Council 2022 CEO Statement on *Electronic Cigarettes*.<sup>13</sup> There is limited evidence for nicotine e-cigarettes in smoking cessation in a clinical context, insufficient evidence for their efficacy outside a clinical context and limited evidence to suggest an association between e-cigarette use and relapse in people who formerly smoked combustible cigarettes. Although there is a need for more robust studies of the long-term health impacts of e-cigarettes, the literature to date indicates that their role in smoking cessation is limited, and that

there are well documented and serious risks associated with their use. The recently published systematic review discussed in this article provides a useful resource to assist GPs when counselling patients about these products.

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COMPETING INTERESTS: Associate Professor Stone is Deputy Chair, Thoracic Oncology Group of Australasia; Convenor Thoracic Society of Australia and New Zealand Tobacco Control Special Interest Group; and member of the International Association for the Study of Lung Cancer Tobacco Control Committee.  
Dr Beale: None.