

Electronic cigarettes

A guide for discussions with patients

COLIN P. MENDELSON MB BS(Hons)

Electronic cigarettes (ECs) may be an option for smokers who want to quit but who have failed using first-line therapies. GPs can have a role in providing patients with reliable information about ECs, supporting them in a quit attempt and prescribing nicotine solution.

Key points

- **Electronic cigarettes (ECs) are battery-powered devices that heat a liquid (with or without nicotine) into an aerosol for inhalation and simulate a smoking experience.**
- **Studies from Europe and the UK suggest that ECs can help smokers quit or reduce cigarette intake.**
- **Evidence and expert opinion suggests that EC use is around 95% safer than tobacco smoking; long-term effects are unknown but are likely to be substantially less than for tobacco smoking.**
- **For smokers who have failed to quit with first-line medications such as nicotine replacement therapy, varenicline or bupropion, ECs may offer an alternative quitting technique.**
- **ECs may also have a role in tobacco harm reduction as a safer long-term substitute for smokers who are unable to give up nicotine or the smoking ritual.**

RESPIRATORY MEDICINE TODAY 2016; 1(1): 40-44

Dr Mendelson is a former GP who now works as a Tobacco Treatment Specialist in Sydney; a Conjoint Associate Professor in the School of Public Health and Community Medicine at UNSW Australia, Sydney, NSW; and a member of the Content Advisory Committee for the RACGP Smoking Cessation Guidelines.



Electronic cigarettes (ECs) are consumer devices that create an aerosol for inhalation and simulate a smoking experience. They are increasingly being used by smokers to help them quit or as a long-term safer substitute for smoking (tobacco harm reduction).

The use of ECs (known as vaping) is growing rapidly in Australia in spite of regulatory restrictions. In 2013, 14.8% of Australian smokers reported using an EC in the previous 12 months.¹ Just under half of these used a nicotine-containing solution.²

Views on ECs are polarised. Their use for smoking cessation and tobacco harm reduction is widely supported in the United Kingdom following recent reviews by Public Health England and the UK Royal College of Physicians (RCP).³ However, there are concerns about ECs in Australia and the US, and they are not currently approved as therapeutic devices by the TGA.⁴ Commonly raised concerns and the responses of the UK RCP to these are listed in Table 1.⁵

Nevertheless, many patients ask their GPs for advice about ECs, and GPs need to be informed with the latest evidence. This article summarises evidence on the effectiveness and safety of ECs, examines their legal status in Australia and provides practical guidance for GPs on how to discuss them with patients when the issue is raised.

What are electronic cigarettes?

ECs are battery-operated devices that heat a solution (e-liquid) of nicotine (optional), propylene glycol, vegetable glycerin and flavourings into a fine mist that is inhaled by the user. ECs are popular as they also satisfy the behavioural, sensory and social aspects of the smoking

Table 1. Concerns about electronic cigarettes (ECs) and responses of the UK Royal College of Physicians⁵

Concern	UK Royal College of Physicians response
ECs may be a gateway to smoking for nonsmoking children and adults	'There is no evidence thus far that EC use has resulted, to any appreciable extent, in the initiation of smoking in either adults or children.' EC use is 'limited almost entirely to those who are already using, or have used, tobacco'
Widespread use of ECs could 'renormalise' smoking (give the appearance that smoking is acceptable)	'There is no evidence that either NRT or EC use has resulted in renormalisation of smoking.' Data demonstrate 'marked falls in smoking prevalence over the decade from 2004 to 2014 in all age groups' as EC use has been increasing
The long-term health effects are unknown	'Although it is not possible to quantify the long-term health risks associated with e-cigarettes precisely, the available data suggest that they are unlikely to exceed 5% of those associated with smoked tobacco products, and may well be substantially lower than this figure'
Vapour exposure is harmful to bystanders	'Harm to others from vapour exposure is negligible'
The overall effect on tobacco smoking rates is unknown	'Many smokers have succeeded in quitting simply by substituting electronic for tobacco cigarettes. EC uptake 'has contributed to a continued downward trend in UK smoking prevalence'
EC users may continue to smoke tobacco (dual use) and this may delay or discourage quitting	It is likely that dual users have a higher chance of quitting smoking than do smokers using NRT. 'A recent study has shown that dual users ... reduce their intake of smoke and related toxins significantly'
EC solutions are a poisoning risk to children	'Accidental poisoning has been reported and typically results in nausea and vomiting. It is mostly preventable through the use of childproof fasteners'
Tobacco companies are seeking to promote dual use rather than replace cigarettes	All leading tobacco companies are now producing ECs. This represents 'a significant potential threat to tobacco control', which needs to be carefully monitored

Abbreviation: NRT = nicotine replacement therapy.

ritual. They are also considerably cheaper to use than cigarettes.⁶

Most users start with first-generation ECs that resemble a cigarette ('cigalikes') and more closely replicate the act of smoking. Cigalikes are available as disposable, single-use products and also as reusable models with a rechargeable battery and replaceable, prefilled cartridges (Figure).⁶

Second- and third-generation models are larger and have more powerful batteries and refillable 'tanks' (Figure). These models are more complicated to use but provide a better sensation and generally deliver more nicotine. They require regular filling with e-liquid and changing of the heating element ('coil'). The e-liquid needs to be purchased separately and is available in a wide range of flavours.⁶

Are ECs effective smoking cessation aids?

ECs can deliver nicotine as well as simulate the behavioural ritual of smoking. Many studies have shown that nicotine-containing ECs alleviate cravings and nicotine withdrawal symptoms. Large population studies from Europe and the UK suggest that ECs are helping many smokers to quit.^{7,8} A recent survey of Europeans estimated that over six million smokers had quit smoking using ECs.⁷ Some have stopped smoking and vaping altogether; others have switched to long-term EC use to avoid relapse to tobacco smoking.

A large observational study in England found that smokers who used ECs to quit were 60% more likely to succeed than those who used over-the-counter NRT.⁹ A randomised controlled trial of an early cigalike with low nicotine delivery suggested that it was at least as effective as NRT.¹⁰ More recent models appear to be significantly more effective.^{11,12} However, the evidence so far is limited and more studies are needed before firm conclusions can be made.

ECs also have a role as a form of tobacco harm reduction, along the line of needle syringe programs to slow the spread of HIV.⁵

Are ECs safe?

The available evidence and expert opinion suggest that EC use is at least 95% safer than smoking, although not all authors agree with this figure.^{3,5,13,14} As there is no combustion (burning), ECs do not produce smoke or harmful products of combustion such as tar and carbon monoxide. Nicotine is the main addictive chemical in tobacco but otherwise has relatively minor health effects in the doses used in ECs, except in pregnancy.¹⁵

Most of the harmful chemicals in tobacco smoke are either absent from EC vapour or present at very low concentrations, mostly less than 5% of the levels in smoke.¹⁶ To date, the main chemicals that are present in EC vapour but not tobacco smoke (propylene glycol, vegetable



ELECTRONIC CIGARETTES

First-generation

- Resemble cigarettes
- Replaceable, prefilled cartridge
- Low capacity rechargeable battery
- Single use, disposable models also available
- Airflow sensor activates the battery during puffing
- LED at the tip glows during inhalation

Second-generation

- Large refillable reservoir (tank)
- Higher capacity battery
- User presses button to activate the battery during inhalation
- May have adjustable power output
- Deliver higher nicotine doses

Third-generation

- Large refillable reservoir
- Higher capacity battery
- Replaceable components allowing user to modify to their preferences
- Electronic circuits, LED displays
- Adjustable power output
- Deliver higher nicotine doses and larger vapour volume

Figure. Types of electronic cigarettes available.⁶

glycerin and flavourings) have not been associated with any serious risk.¹⁶ A Cochrane review of ECs for smoking cessation reported no serious adverse events in trials lasting up to two years.⁹ The main side effects were

mouth and throat irritation, which mostly dissipated over time. As with any new treatment, long-term adverse effects of EC use are unknown, but they are likely to be substantially less than those of smoking.^{3,5}

Most expert reviews have concluded that secondhand vapour is unlikely to cause significant harm to bystanders.^{3,5,17} Exhaled vapour has much lower concentrations of toxins than smoke and dissipates quickly.¹⁸

Are ECs legal?

In all Australian states, it is not illegal to possess or use ECs without nicotine, although there may be restrictions on where they can be used, such as in certain private venues, aircraft and nonsmoking areas in some states.

Nicotine is classified in the national Poisons Standard as a Schedule 7 dangerous poison, and it is an offence to possess or use it in Australia, except in tobacco or NRT.¹⁹ Most people who use nicotine-containing ECs purchase nicotine online or 'under the counter' and use it without approval.

However, there are two legal pathways for those wishing to use nicotine as an aid to quitting smoking, both requiring a prescription from a medical practitioner.

- Patients can import three months' supply of nicotine at a time from overseas for a therapeutic purpose such as quitting smoking under the TGA Personal Importation Scheme (www.tga.gov.au/personal-importation-scheme)
- Some Australian compounding pharmacies prepare nicotine-based e-liquid solutions. The online service Nicopharm (www.nicopharm.com.au) has a medical team that can provide a prescription, or the patient's GP can issue one. The prescription is forwarded to a compounding pharmacy, which prepares the solution and arranges delivery.

Advice for GPs

GPs should recommend approved first-line medications for nicotine-dependent smokers wishing to quit, such as NRT, varenicline and bupropion.²⁰ However, for smokers who have failed to quit with these therapies, GPs could consider suggesting ECs as an alternative quitting aid. ECs may be of special benefit for smokers for whom the hand-to-mouth ritual and sensory aspects of smoking are particularly important.²¹

Suggested steps for GPs who wish to manage patients using ECs to quit smoking tobacco are

IMAGES TOP TO BOTTOM: © LEBAZELE/ISTOCKPHOTO; INDIGILOTOS/DEPOSITPHOTOS; GRESEY/DEPOSITPHOTOS; FUNNYCREATURE/ISTOCKPHOTO

Table 2. Suggested steps for counselling patients about electronic cigarettes and prescribing nicotine

1. Counsel patient about ECs and their use		2. Advise on selecting an EC device	
Rationale	<ul style="list-style-type: none"> ECs deliver nicotine in a safer form than smoking tobacco and can help people to quit ECs reduce urges to smoke and withdrawal symptoms and can replicate the smoking habit 	First generation	<ul style="list-style-type: none"> Most people start with an EC model that looks like a cigarette (cigalike) These are prefilled with e-liquid and are easy to use Two types are available: single-use disposable models and reusable models with replaceable cartridges The flavour range is limited Nicotine-containing cigalikes can be bought online from overseas (e.g. www.kikit.co.nz, www.gamucci.com)
Safety	<ul style="list-style-type: none"> ECs are not risk-free but evidence suggests they are around 95% safer than smoking Avoid vaping around pregnant women and children 	Second or third generation	<ul style="list-style-type: none"> These models are more expensive initially but are more cost-effective in the long term They deliver more nicotine and are more satisfying to use The larger rechargeable batteries last longer Fill the tank with e-liquid as needed. Replace the heating element (coil) when the taste changes or the vapour diminishes, typically every 1 to 3 weeks Many flavours are available Second- or third-generation models are available from: <ul style="list-style-type: none"> vape shops (which provide advice and support) and tobacconists Australian websites (e.g. www.rightchoicevapes.com.au, www.thesteamery.com.au, www.vapora.com.au, www.victoryvape.com.au)
Correct use	<ul style="list-style-type: none"> Take longer, slow puffs, about 3 to 4 seconds each Use when there is an urge to smoke or to relieve withdrawal symptoms Have either 10 to 15 puffs like a cigarette or just a puff or two as needed ECs take a little longer to deliver a nicotine hit than cigarettes Daily use is more effective for quitting than intermittent use You may need to try different ECs, flavours or nicotine strengths before you find a product you like 	3. Select an e-liquid for second- or third-generation ECs	
Duration of use	<ul style="list-style-type: none"> Stop smoking when you are ready Try to stop vaping within 3 to 6 months. However, long-term use of ECs is safer than relapsing to smoking. Aim to stop smoking altogether Gradually reducing nicotine strength may be helpful when ceasing EC use Satisfaction increases with practice, so give yourself time to adjust 	Characteristics	<ul style="list-style-type: none"> E-liquid typically contains propylene glycol, vegetable glycerin and flavourings with or without nicotine Most users start with a nicotine concentration of 12 to 18 mg/mL (range, 6 to 24 mg/mL) Thousands of flavours are available
Counselling and support	<ul style="list-style-type: none"> ECs work best with counselling and support from your GP ECs can also be combined safely with a nicotine patch or varenicline if needed 	Availability	<ul style="list-style-type: none"> Australian compounding pharmacies (e.g. www.nicopharm.com.au) International websites (e.g. www.goodlifevapor.com, www.healthcabin.com, www.myfreedomsmokes.com)
Safe use	<ul style="list-style-type: none"> Always use the correct battery charger for charging the battery Keep nicotine out of reach of children 	4. Prescribe a nicotine solution	
		<ul style="list-style-type: none"> A prescription from a doctor is required for the legal purchase of nicotine e-liquid (see Table 3) 	
		5. Suggest sources of more information for the patient	
		<ul style="list-style-type: none"> Speak to the experts at your local vape shop Visit online forums (e.g. www.vapercafeaustralia.com, www.aussievapers.com.au, www.e-cigarette-forum.com) 	

Abbreviations: EC = electronic cigarette.

shown in Table 2. Patients should be informed about the risks and benefits of using ECs and instructed on their correct use. Advise smokers to aim for complete cessation of tobacco, although an initial transition period of dual

use is often required. Discussions should cover whether to use a cigalike or a more advanced model, the appropriate nicotine strength and where to get more information. It is helpful to have a range of EC models available in the

surgery to show patients. Most users start with a nicotine concentration of 12 to 18 mg/mL, but more dependent smokers may need 24 mg/mL. Guidance for GPs on writing a prescription for e-liquid is shown in Table 3.

Table 3. How to write a nicotine prescription

Product	Prescription	Sources
Nicotine e-liquid (bottled for second and third-generation EC models)	<ul style="list-style-type: none"> Nicotine liquid 1.8% (most popular concentration; range 0.6 to 2.4%) 90 mL, x two repeats (3 months' supply based on average daily use of 3 mL e-liquid) 	<ul style="list-style-type: none"> Australian compounding pharmacies (e.g. www.nicopharm.com.au); patient sends script to pharmacy Overseas purchase under TGA Personal Importation Scheme; patient keeps script
Prefilled cartridges (for cigalikes)	<ul style="list-style-type: none"> Nicotine 1.8% (or other strengths if available) 30 cartridges for electronic cigarettes, x two repeats (3 months' supply based on use of one cartridge per day) 	<ul style="list-style-type: none"> Overseas purchase under TGA Personal Importation Scheme; patient keeps script

As with any other smoking pharmacotherapy, the best results are likely when ECs are used with counselling and support as part of a comprehensive management plan.²⁰ Combining an EC with varenicline or nicotine patches is likely to increase quit rates further, although limited research is available

on the use of combination therapy.²²

Smokers should aim to cease EC use once they feel ready to do so without relapsing to smoking. This may take some smokers longer than others. However, some smokers are not able to give up nicotine or the smoking ritual. In these cases, long-term use of ECs appears to

be much safer than smoking.¹² Long-term dual use should be discouraged, but emerging evidence suggests it is safer than smoking.^{23,24}

Conclusion

ECs can help some smokers to quit and may help others as a safer long-term substitute for smoking. GPs should be able to provide patients with information about ECs and can have a role in supporting smokers who want to quit using an EC. Counselling and support from the patient's GP are likely to enhance quit rates further. **RMT**

References

A list of references is included in the website version of this article (www.medicinetoday.com.au).

COMPETING INTERESTS: Dr Mendelsohn has received honoraria for teaching, consulting and conference expenses from Pfizer Australia, GlaxoSmithKline Australia and Johnson and Johnson Pacific. He sits on Pfizer's Champix Advisory Board.

Discover Today's **Medicine**



MedicineToday

www.medicinetoday.com.au

Electronic cigarettes

A guide for discussions with patients

COLIN P. MENDELSON MB BS(Hons)

References

1. Australian Institute of Health and Welfare. National Drug Strategy household survey 2013. Drug statistics series no. 28. Cat. no. PHE 183. Canberra: AIHW. Available online at: <http://www.aihw.gov.au/alcohol-and-other-drugs/ndshs-2013/> (accessed September 2016).
2. Yong HH, Borland R, Balmford J, et al. Trends in e-cigarette awareness, trial, and use under the different regulatory environments of Australia and the United Kingdom. *Nicotine Tob Res* 2015; 17: 1203-1211.
3. McNeill A, Brose LS, Calder R, Hitchman SC, Hajek P, McRobbie H. E-cigarettes: an evidence update. A report commissioned by Public Health England. PHE publications gateway number: 2015260. London: PHE; 2015. Available online at: <https://www.gov.uk/government/publications/e-cigarettes-an-evidence-update> (accessed September 2016).
4. McKee M, Daube M, Chapman S. E-cigarettes should be regulated. *Med J Aust* 2016; 204: 331.
5. Royal College of Physicians. Nicotine without smoke: tobacco harm reduction. London: RCP; 2016. Available online at: <https://www.rcplondon.ac.uk/projects/outputs/nicotine-without-smoke-tobacco-harm-reduction-0> (accessed September 2016).
6. McEwen A, McRobbie H. Electronic cigarettes: a briefing for stop smoking services. Dorchester, UK: National Centre for Smoking Cessation and Training; 2016. Available online at: http://www.ncsct.co.uk/shopdisp_electronic_cigarette_briefing.php (accessed September 2016).
7. Farsalinos KE, Poulas K, Voudris V, Le Houezec J. Electronic cigarette use in the European Union: analysis of a representative sample of 27 460 Europeans from 28 countries. *Addiction* 2016 Jun 24. doi: 10.1111/add.13506. [Epub ahead of print]
8. UK Action on Smoking and Health. Use of electronic cigarettes (vapourisers) among adults in Great Britain. London: ASH; 2016. Available online at: <http://ash.org.uk/information/facts-and-stats/fact-sheets> (accessed September 2016).
9. Brown J, Beard E, Kotz D, Michie S, West R. Real-world effectiveness of e-cigarettes when used to aid smoking cessation: a cross-sectional population study. *Addiction* 2014; 109: 1531-1540.
10. Hartmann-Boyce J, McRobbie H, Bullen C, Begh R, Stead LF, Hajek P. Electronic cigarettes for smoking cessation. *Cochrane Database Syst Rev* 2016 Sep 14; 9: CD010216. [Epub ahead of print]
11. Adriaens K, Van Gucht D, Declerck P, Baeyens F. Effectiveness of the electronic cigarette: an eight-week Flemish Study with six-month follow-up on smoking reduction, craving and experienced benefits and complaints. *Int J Environ Res Public Health* 2014; 11: 11220-11248.
12. Lechner WV, Meier E, Wiener JL, et al. The comparative efficacy of first-versus second-generation electronic cigarettes in reducing symptoms of nicotine withdrawal. *Addiction* 2015; 110: 862-867.
13. Nutt DJ, Phillips LD, Balfour D, et al. Estimating the harms of nicotine-containing products using the MCDA approach. *Eur Addict Res* 2014; 20: 218-225.
14. McKee M, Capewell S. Evidence about electronic cigarettes: a foundation built on rock or sand? *BMJ* 2015; 351: h4863.
15. Zwar N, Bell J, Peters M, Christie M, Mendelsohn C. Nicotine and nicotine replacement therapy – the facts. *Aust Pharm* 2006; 25: 969-973.
16. McNeill A, Hajek P. Underpinning evidence for the estimate that e-cigarette use is around 95% safer than smoking: authors' note. London: Public Health England; 2015. Available online at: <https://www.gov.uk/government/publications/e-cigarettes-an-evidence-update> (accessed September 2016).
17. Burstyn I. Peering through the mist: systematic review of what the chemistry of contaminants in electronic cigarettes tells us about health risks. *BMC Public Health* 2014; 14: 18.
18. Bertholon JF, Becquemin MH, Annesi-Maesano I, Dautzenberg B. Electronic cigarettes: a short review. *Respiration* 2013; 86: 433-438.
19. Australian Government Department of Health. Poisons Standard July 2016. Authorised version F2016L01071. Available online at: <https://www.tga.gov.au/publication/poisons-standard-susmp> (accessed September 2016).
20. Zwar N, Richmond R, Borland R, et al. Supporting smoking cessation: a guide for health professionals. Melbourne: Royal Australian College of General Practitioners; 2011 (updated July 2014). Available online at: <http://www.racgp.org.au/your-practice/guidelines/smoking-cessation> (accessed September 2016).
21. Caponnetto P, Cibella F, Mancuso S, Campagna D, Arcidiacono G, Polosa R. Effect of a nicotine-free inhalator as part of a smoking-cessation programme. *Eur Respir J* 2011; 38: 1005-1011.
22. Hajek P, Corbin L, Ladmore D, Spearing E. Adding e-cigarettes to specialist stop-smoking treatment: City of London pilot project. *J Addict Res Ther* 2015; 6: 244. doi: 0.4172/2155-6105.1000244.
23. McRobbie H, Phillips A, Goniewicz ML, et al. Effects of switching to electronic cigarettes with and without concurrent smoking on exposure to nicotine, carbon monoxide, and acrolein. *Cancer Prev Res (Phila)* 2015; 8: 873-878.
24. O'Connell G, Graff DW, D'Ruiz CD. Reductions in biomarkers of exposure (BoE) to harmful or potentially harmful constituents (HPHCs) following partial or complete substitution of cigarettes with electronic cigarettes in adult smokers. *Toxicol Mech Methods* 2016; 26: 443-454.