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ARTICLE

Everything you wanted to know about e-cigarettes and vaping but were afraid to ask: a guide for mental health clinicians

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SUMMARY

Mental health clinicians are expected to offer support and advice to patients to promote smoking cessation. Alongside this is the relatively new and increasingly popular phenomenon of electronic cigarette use. The absence of any long-term evidence regarding safety is recognised and clinicians' awareness of e-cigarettes may be limited to personal experience or media publications, leading to uncertainty in their confidence discussing e-cigarettes with patients, both in general and as an aid to quitting smoking. This article provides a historical and contemporary overview of e-cigarettes and vaping. The reader will gain an understanding of e-cigarette usage, risks and benefits, the current position on use of e-cigarettes in mental health settings, and tips on how to take an e-cigarette/vaping history and how to offer advice about use. This is achieved in the context of recent publications and national recommendations. Although the focus is primarily on the mental health patient, the article is of benefit to all health and social care professionals to help them develop an understanding of e-cigarettes as a tobacco-smoking cessation or harm-reduction aid.

LEARNING OBJECTIVES

After reading this article you will be able to:

- provide a balanced overview of e-cigarette use
- understand the risk reduction approach in the use of e-cigarettes versus tobacco smoking in people with mental illness
- demonstrate the principles of taking a vaping history.

DECLARATION OF INTEREST

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KEYWORDS

E-cigarettes; vaping; mental illness; nicotine; smoking cessation.

The rise and rise of e-cigarettes

In 1963, Herbert Gilbert patented the first smokeless, tobacco-free electronic cigarette (Gilbert 1963). However, the modern electronic cigarette ('e-cigarette') can be traced to an invention in the early 2000s by a Chinese pharmacist, Hon Lik, reportedly in response to the death of his father from lung cancer. Commercially produced e-cigarettes were introduced in Europe in 2006 then in the USA in 2007 (Pepper 2014). Their rise in popularity since this time has been rapid and in 2010 Action on Smoking and Health (ASH) started collecting information on e-cigarette use in the UK. ASH estimated that in 2012 there were 700 000 UK adult users, tripling to 2.1 million within 2 years. More recently the number of e-cigarette users has started to stabilise: there were an estimated 3.2 million UK users by 2018 (Action on Smoking and Health 2018a).

Between August 2012 and December 2013, 215 new brands of e-cigarette were created. By January 2014 there were 466 brands and 7764 flavours of e-cigarette liquid on the market (Zhu 2014).

E-cigarettes are consumer products, not licensed medications. In 2016, a European Union regulation known as the Tobacco Products Directive came into effect, imposing restrictions on safety, packaging and labelling and setting out requirements regarding the monitoring and reporting of developments in e-cigarettes (European Commission 2016). E-cigarette liquid contents and vapour emissions must now be reported to a designated authority – in the

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UK this is the Medicines and Healthcare products Regulatory Agency (MHRA).

E-cigarettes can be bought from specialist vape shops, online and in some pharmacies. In the UK, sale is restricted to people aged 18 or older.

What is an e-cigarette?

E-cigarettes are devices that heat liquid held in a cartridge or reservoir, converting it into an aerosolised solution, or vapour, which the user inhales through a mouthpiece. The liquid contains water, propylene glycol and/or vegetable glycerine (as a base carrier) and flavouring.

E-cigarette liquids do not necessarily contain nicotine but in those that do, strength can vary to above 20 mg/ml, thus exceeding the limit set by the Tobacco Products Directive. Often, the company selling e-cigarette liquid will classify it as being of low, medium or high nicotine content, but the dose inhaled varies depending on the type of e-cigarette and each person's method of inhalation. Speed of nicotine delivery to the brain is slower than from inhaled tobacco smoke, which means users do not receive the virtually instant 'hit' of nicotine that is experienced when smoking a cigarette.

Of the thousands of flavour choices on the market, the most popular are menthol and tobacco, followed by fruit, sweets, alcohol and other drink flavours (Zhu 2014). More unusual examples include crab legs, beer and hot dog (authors' online search, 5 October 2018). The inclusion of a flavour in e-cigarette liquid may be important for the acceptability of e-cigarettes to smokers who are trying to quit. However, some flavourings may have cytotoxic effects (Farsalinos 2015).

Nicotine is the substance that causes addiction to tobacco-smoking, but it is not one of the components that can kill. Unlike standard cigarettes, e-cigarettes and their vapour do not contain tobacco, tar, carbon monoxide or the thousands of toxins that are in tobacco smoke; in fact, as burning is not involved, they do not produce smoke.

How has the design of e-cigarettes evolved?

Early e-cigarettes were designed to look like a standard shop-bought cigarette. They contained a battery, cartridge and atomiser and most were intended to be single use. The development of second-generation devices resulted in 'vape pens', rechargeable, refillable products that look distinctly and deliberately different from a cigarette. Subsequently, more modular models have been produced, consisting of removable and replaceable components that can be interchanged by the user to produce a personalised product.

The most commonly used e-cigarette type in the UK is currently a rechargeable device with a reservoir (Action on Smoking and Health 2018a).

What words are used relating to e-cigarettes?

The development of a new phenomenon has brought with it a new language (Box 1). 'Vapour' originates in the Latin *vapor* (steam), and in the early 2000s the verb 'to vape' came into use to describe a particular method of inhaling cannabis. Within a few years, the term was adopted by e-cigarette users. In 2014, 'vape' was the Oxford Dictionary's word of the year.

Who is vaping and why?

In the UK, it is estimated that 3.2 million adults (6.2% of the adult population) vape. Of these vapers, 52% are ex-smokers, 44% are concurrent tobacco smokers and 4.2% have never smoked (Action on Smoking and Health 2018a). Vaping among current smokers has stabilised over the past few years, whereas there is an upward trend in the percentage of vapers who are now ex-smokers (Brown 2019).

Although the most common reason for vaping among adults is to help cut down or quit smoking, 10% of ex-smokers and 15% of current smokers report that saving money is an important factor (Action on Smoking and Health 2018a).

Vaping among children in the UK is thought to be low, with 76% of 11- to 18-year-olds saying that they

BOX 1 E-cigarette glossary

Aerosol: The scientific term for e-cigarette emissions

Analogue: A term used by vapers meaning a cigarette

Carts: Abbreviation of e-cigarette cartridges

E-cig/e-cigarette: Abbreviation of electronic cigarette

E-liquid: The fluid placed in e-cigarettes before it is converted to vapour

ENDS: Electronic nicotine delivery system

E-vapour: Electronic-vapour (see vapour)

Juice: See e-liquid

Mod: A modified e-cigarette

Personal vapouriser (PV): An e-cigarette

Pod: An e-cigarette system with compartments, or pods, such as an e-liquid container and a battery compartment that snap together

To vape: To use an e-cigarette

Vaper: A person who uses an e-cigarette

Vapour: The substance produced when e-liquid is heated

Vapouriser (vaporizer): An e-cigarette

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have never tried e-cigarettes and only 2% vaping at least once a week; 99.8% of children who vape regularly have a history of cigarette use. The most common reason that children give for vaping is experimentation (Action on Smoking and Health 2018b).

What about vaping in other countries?

A survey of over 30 000 adults in Sweden, where smoking prevalence is 12.3%, found that 2% of the population vape and that 9.8% of cigarette smokers are also vapers. Of the vapers, 66.7% also smoke, 15% are ex-smokers and 18.3% have never smoked (Hedman 2018).

In Canada, where e-cigarettes containing nicotine were not approved for sale until the introduction of the country's Tobacco and Vaping Products Act in 2018, data from a national survey in 2013 showed that 8.5% of people aged 15 years or older had tried vaping, with the highest proportion of these being current tobacco smokers (37%, compared with 3% who had never smoked). Vaping was most common among 15- to 24-year-olds, with prevalence decreasing by age in those aged 25 or older. The majority of Canadian teenagers who vaped had never smoked (Reid 2015).

E-cigarettes have been available in the USA for more than a decade. Currently the US Food and Drug Administration regulates e-cigarettes and has the authority to place health warnings and age restrictions on their sale. A recent study of e-cigarette use in the USA (Mirbolouk 2018) reported a prevalence of 4.5%, corresponding to 10.8 million adult e-cigarette users. E-cigarette use is highest in the 18–24 age bracket, with 51.2% of current e-cigarette users being younger than 35. In addition, 15% of users reported that they had never been tobacco cigarette smokers.

In Australia e-cigarettes containing nicotine are not currently available for sale, but it is possible to import nicotine for use in e-cigarettes with a prescription for up to 3 months of personal therapeutic use under the Therapeutic Goods Administration's personal importation scheme (Australian Government Department of Health 2018).

In New Zealand a recent systematic review found that the current use of e-cigarettes is low (2–5%), with use being strongly predicted by smoking. However, investigation of other predictors has been inhibited by low prevalence and small samples (Merry 2018).

Vaping is banned in a number of countries, for example Turkey and Thailand (where those caught vaping risk imprisonment), and in Brazil the manufacture and sale of e-cigarettes is illegal.

What are the potential benefits of vaping?

The main purported benefit of vaping is that it can act as an aid to smoking cessation or to help people reduce the number of cigarettes they smoke. Smoking remains the single greatest threat to the health of individuals and populations. Smokers die on average 10 years earlier than non-smokers, and smoking is a risk factor for a wide range of diseases (Aveyard 2007). The health risks of smoking are especially important among people who use mental health services, since smoking contributes disproportionately to health inequalities. Nicotine replacement forms the cornerstone of effective smoking cessation strategies (National Institute for Health and Care Excellence 2018) and vaping has emerged as a very popular form of nicotine delivery for those who are dependent on nicotine and tobacco. Guidance on what might be offered to help people to cut down or quit smoking is offered in the UK by bodies such as Public Health England and its counterparts in the devolved nations. Over recent years such guidelines have come to offer specific recommendations on the place of vaping among the range of strategies to quit. The latest Public Health England guidance on what clinicians should discuss with patients regarding options for stopping smoking (Public Health England 2018) makes reference to vaping as a viable option for self-managed quitting. It states that using an e-cigarette has similar or better results than an attempt to quit using nicotine replacement therapy (NRT). Public Health England suggests that, as with standard smoking cessation treatment, some people may benefit from using more than one form of nicotine (i.e. vaping and something else, such as nicotine patches), that a quit attempt is less likely to be successful if the e-cigarette is used too infrequently (because of the associated increase in nicotine craving) and that the person should continue to vape for as long as is needed for them to remain smoke-free.

The stance of the US National Academies of Sciences, Engineering and Medicine (2018) is that 'e-cigarettes are likely to be far less harmful than combustible tobacco cigarettes', and that of Public Health England is that 'e-cigarette use is around 95% safer than smoking' (McNeill 2018). The current position statement of the British Medical Association (BMA) backs this up by declaring that there are clear potential benefits to e-cigarette use, reducing the harms associated with smoking (British Medical Association 2018). It notes that e-cigarette use has 'the potential to make an important contribution towards the BMA's ambition to achieve a tobacco-free society, leading to substantially reduced mortality from tobacco related disease'.

However, it urges caution that any potential risks associated with vaping must be minimised.

What are the risks associated with vaping?

The safety of e-cigarettes in terms of product quality and safety testing is variable and there have been reports of exploding devices and fires caused by chargers that do not meet current safety standards (Zhang 2018).

Many companies that sell e-cigarettes and related paraphernalia have comprehensive websites. Tapping into mass appeal, and at times ahead of the generalist clinician's understanding of vaping, they often serve as sources of support for vapers, citing clinical research and making use of YouTube links to report possible risks or adverse effects and what users can do about them. Examples of adverse effects reported on such sites include vapers' tongue (sudden-onset reduction in ability to sense the flavours of the vapour, lasting 1–3 days) (Vaping360 2017), dry mouth and chest pain (VAPING360 2018). Consumers are also reminded to keep e-liquid in child-resistant containers (Vapemate 2018).

Unfortunately, there is a lack of research into any longer-term health risks associated with vaping. Human research is limited and what we know is mostly based on laboratory findings or animal testing rather than clinical trials. E-cigarettes have not existed long enough for us to have an understanding of long-term risk.

Public Health England (Public Health England 2018) and the latest Cochrane review on e-cigarettes (Hartmann-Boyce 2016) both advise that possible side-effects include throat irritation and dry mouth. Laboratory-based research shows potential cellular mechanisms for side-effects: for example, Scott *et al* exposed alveolar macrophages from eight non-smokers to e-cigarette liquid or vapour with and without nicotine. After 24 h exposed to nicotine-containing e-liquid, 79% of cells remained healthy (as did 84.5% of cells exposed to nicotine-free liquid), compared with 18% of cells exposed to nicotine-containing vaped liquid (and 63% of those exposed to nicotine-free vaped liquid) (Scott 2018). This suggests that vaping might have the potential to damage the user's lungs at a cellular level. However, the research did not go on to directly compare these effects with those of smoking. The lungs of mice and human bronchial epithelial cells exposed to vapour containing high levels of nicotine have been found to go through changes usually associated with chronic obstructive pulmonary disease. These changes did not occur in nicotine-free vapour (Garcia-Arcos 2016) suggesting that the nicotine content plays a key role in lung changes. There have also been case reports of lipoid pneumonia thought to have been related to inhalation of vapour (Britton 2014).

Does vaping pose a risk to others?

In 2018, a putative link between vaping in pregnancy and the risk of sudden infant death syndrome was widely reported in the press. What was less widely reported was that this link was based on laboratory experiments in which unborn rats were exposed to nicotine in order to study serotonin levels. Rats that had been exposed to nicotine and were born with a serotonin deficiency had a poorer ability to respond to and recover from oxygen deprivation than those that were either exposed to nicotine and born with normal serotonin or that had a serotonin deficiency but were not exposed to nicotine (Lee 2018).

The residue of exhaled vapour, including products linked to carcinogenesis, has been found on cotton and paper towels in a business located close to a vape shop, suggesting that vape can travel and settle elsewhere, potentially causing a third-hand exposure environmental hazard (Khachatoorian 2018). However, in other studies, levels of toxins inhaled by people who vape have been found to be well within permitted occupational exposure levels and at much lower levels than those found in cigarette smoke (Royal College of Physicians 2016) and, thus far, laboratory research has found that exposing non-smokers to exhaled vapour results in nicotine levels at one tenth those received from a smoked cigarette (Britton 2014).

In amalgamating the current evidence, what is clear is that, although vaping is not 100% safe, it remains a much safer alternative to smoking and should be promoted as such. Indeed, the 2016 Cochrane review on the effects of e-cigarettes states that there are no serious side-effects associated with vaping for up to 2 years (Hartmann-Boyce 2016).

How should mental health services respond to the rise of vaping?

As with the wider population, we postulate that large numbers of people who use mental health services will be both smokers and vapers. There is currently no consensus regarding vaping in in-patient mental health settings in the UK. At present it is left to individual National Health Service (NHS) trusts to decide how they approach this issue, with some trusts treating vaping in the same way as smoking and banning both on their premises (including grounds), while other smoke-free hospitals allow patients to vape as part of a smoking cessation strategy.

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Herein lies the crux of the debate. Do we consider vaping to be a popular method of harm reduction, treating nicotine addiction with minimal exposure to toxins, or do we see it as a return to a situation where 'smoking' (vaping) in public is considered the norm, encouraging addiction in a new cohort of the population, appealing to teenagers and becoming the 21st-century equivalent of the Big Tobacco industry? In August 2018, following an inquiry into vaping, a House of Commons Select Committee took the stance that psychiatric inpatients who smoke should be encouraged to switch to e-cigarettes as a way out of addiction. It advised that NHS England should set a policy to allow patients in mental health facilities to use e-cigarettes and that 'it is unacceptable that a third of the 50 English NHS trusts who responded to the Committee's survey ban them' (Science and Technology Select Committee 2018).

How do I take a vaping history?

Pearson *et al* (2018) recommend asking standardised questions when conducting research about vaping, to help strengthen cross-study comparisons and the emerging evidence base in this area. It could be helpful to adopt this approach in day-to-day clinical work. Box 2 lists suggested questions, which we outline in more detail below.

Ask about frequency of use

To establish frequency of vaping, Pearson *et al* (2018) propose asking a question that allows flexibility in defining a meaningful level of use (as it is currently not known what level of use is of relevance in health outcomes). It also allows for comparison of an individual's use over time.

As e-liquid bottle size and cartridge sizes vary considerably between devices, little information can be gained from asking about the amount of e-liquid that is used.

Clarify and record the type of e-cigarette used

The available products are diverse, and it is important to distinguish between different devices as they have different health effects. Of clinical relevance, single-use devices and rechargeable ones that use prefilled cartridges tend to have less powerful batteries, which affects nicotine delivery. The exception to this general rule is the latest pod devices that use nicotine salts, resulting in nicotine delivery that is not affected by battery power. It is also important to note that modular devices and those that use a refillable e-liquid may be associated with a risk of accidental poisoning (Farmer 2018).

Are they using any nicotine?

Find out about nicotine by asking whether the device they use most often contain nicotine. Asking about nicotine strength can be a rough-and-ready way of monitoring an individuals' nicotine intake from vaping using a particular device over time, but nicotine dose cannot be compared between different vaping or e-cigarette devices because actual intake of nicotine depends on variables such as how the device is used and the type of device (Royal College of Physicians 2016). For these reasons it is also unwise to make consumption comparisons between e-cigarettes and standard cigarettes.

The National Centre for Smoking Cessation and Training (NCSCT), vaping organisations and tobacco control researchers all advise against making consumption comparisons between e-cigarettes and standard cigarettes.

BOX 2 Some questions to ask about vaping

Establish the frequency of use

How often do you currently use an e-cigarette or vaping device?

Clarify the type of device used

What e-cigarette or vaping device do you use (the most)?

Is it:

- a disposable device
- rechargeable using pre-filled cartridges
- rechargeable using tanks that can be refilled with liquid or modular systems?

Ask whether nicotine is used and its strength

Does the e-cigarette or vaping device that you use most often contain nicotine?

If it does, what is nicotine strength of the e-liquid you use?

(After Pearson 2018)

How might I encourage my patients to give up smoking by vaping?

Smokers with severe mental illnesses such as schizophrenia or bipolar affective disorder are more likely to smoke a higher number of cigarettes and to extract more nicotine from each cigarette than smokers in the general population. They are less likely to be offered support to stop smoking, yet are equally as likely to want to quit (Royal College of Physicians 2013). When mental health clinicians first meet a patient, they have an obligation to ask about and record smoking status. If the patient is a smoker, the clinician must advise that they stop smoking and offer help with smoking cessation. This offer should be at the initial assessment and, if help is declined, during each subsequent clinical

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contact (National Institute for Health and Care Excellence 2013).

The method most likely to lead to successful cessation of smoking is a combination of smoking cessation medication and behavioural support (National Institute for Health and Care Excellence 2018). E-cigarettes are not medically licensed, but since 2015 Public Health England has endorsed them as a smoking cessation aid. E-cigarettes containing nicotine can be used instead of, or in conjunction with, licensed nicotine replacement therapy (such as patches, gum, lozenges, mouth sprays or nasal sprays) to replace some of the nicotine that would otherwise have been obtained from tobacco. E-cigarettes are now the UK's preferred smoking cessation aid.

Research evidence derived from systematic reviews is strongly supportive of the effectiveness of smoking cessation programmes among people with severe mental illness (Peckham 2017), and there has been a large-scale trial of this in the UK (Gilbody 2019).

Access to smoking cessation services for people with severe mental illness is variable in the UK (McNally 2010), but the gold standard is provision of the NCSCT evidence-based combination of a behavioural support programme and smoking cessation medication. The NCSCT advises that 'stop-smoking services' should be willing to work with people who want to vape to help them give up smoking, especially those who have previously tried but not managed to quit by using licensed smoking cessation medicines (National Centre for Smoking Cessation and Training 2016). Recent research has confirmed that behavioural support plus e-cigarette use is more effective for smoking cessation than behavioural support plus nicotine replacement medication (Hajek 2019).

Future developments

Consensus has now started to emerge from the debate on vaping. Increasingly, leading health organisations are concluding that vaping is safer than smoking and should be considered a useful aid to smoking cessation. The UK's strict Tobacco and Related Products Regulations 2016 help ensure that consumers have a degree of protection in place and we anticipate that it is only a matter of time before a manufacturer puts forward a proposal to make their e-cigarette products a medicinal, prescribable smoking cessation aid in the UK.

It is imperative for clinicians, healthcare providers and policy makers to develop an understanding of the differences between vaping and tobacco smoking. Although Public Health England has provided guidance on how vaping is dealt with in public, clearer national policies or laws need to be implemented to determine how vaping is dealt with in settings such as leisure facilities, workplaces and on public transport.

National vaping regulations will need to be reviewed and amended in a timely manner to ensure that policy can keep apace with technological developments and to avoid it being overly restrictive to a point that it discourages development of newer, healthier e-cigarette products, for example with fewer toxins or a more predictable nicotine content. Some e-cigarettes already have sensors in them to give users quick, easy access to data on their vapour intake. If these increase in popularity and if this information is reliable, it could be shared with clinicians to assist their vaping history-taking and advice-giving in their role as advocates of smoking cessation.

However, e-cigarette developments need to be balanced with the vaping industry taking responsibility to stop using marketing, packaging and flavours that appear blatantly directed at young people (Pepper 2016). Smoking is a major source of ill health and contributes to health inequalities among people using mental health services. Clinicians and services have a responsibility to address smoking and to work alongside people to help them to cut down or quit. Being aware of vaping and ensuring that policies reflect the rapidly evolving knowledge regarding electronic nicotine products are important aspects of this responsibility. When used safely and with support, vaping can be a useful adjunct to smoking cessation in mental health services.

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MCQs

Select the single best option for each question stem.

1 The range of nicotine content permitted for e-cigarette liquids sold in the EU is:
a 5–20 mg/ml
b 10–40 mg/ml
c 0–35 mg/ml
d 5–15 mg/ml
e 0–20 mg/ml.

2 Which of the following statements about vaping is false?
a vaping is less harmful to health than tobacco products
b vapers' tongue is a known side-effect
c vaping is recognised as an aid to quitting
d vaping is more expensive than smoking
e vaping is permitted in some UK hospitals.

3 When a patient wants to switch to e-cigarettes to help them give up smoking, the clinician should consider:
a asking about vaping usage
b supporting the option of using an e-cigarette to aid smoking cessation
c offering behavioural support
d promoting use of an additional nicotine replacement therapy product
e all of the above.

4 Taking a good vaping history identifies:
a frequency, device used, amount of liquid used
b frequency, device used, strength of nicotine in liquid used
c device, strength of nicotine, amount of liquid used
d device, technique, amount of liquid used
e frequency, device, technique.

5 Which of the following statements does not reflect current evidence regarding vaping in the UK?
a vaping is considered to be 80% safer than smoking
b there is limited evidence available on long-term risks associated with vaping
c e-cigarette products and e-liquid contents are regulated
d e-cigarettes cannot be prescribed as an aid to stop smoking
e e-cigarettes are the most commonly used smoking cessation aid in the UK.

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