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Changing behaviour: Electronic cigarettes

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Smoking is one of the largest causes of death and disease in the developed world, responsible for 96,000 deaths per year in the UK¹. If current trends continue, it is estimated that globally, a billion lives will be lost to smoking-related diseases by the end of the 21st century². This briefing summarises the facts and figures around smoking cessation and the use of e-cigarettes for behaviour change in adults followed by public policy recommendations to facilitate smoking cessation.

The background

On an individual level, a long-term regular smoker loses an average of 10 years of their life³. The combined direct medical and indirect costs (e.g. loss of productivity) to the NHS are estimated to be £13.9 billion annually⁴.

Most people who smoke want to quit and around a third make a quit attempt each year⁵. Around half of these people will try to quit unassisted, but many are now reaching for electronic cigarettes to help them stop smoking. In fact, e-cigarettes are more likely to be used by smokers (33 per cent) compared with Nicotine Replacement Therapy (NRT) purchased over the counter (11 per cent), prescription stop smoking medicines (9 per cent) and NHS stop smoking services (< 5 per cent)⁶.



The challenge

Smoking prevalence in the UK is currently 15.8 per cent⁷. Although prevalence has been steadily declining since the 1970s, the rate of decline is slow⁵. Tobacco control strategies aim to reduce smoking prevalence by:

- a) deterring smoking uptake;
- b) increasing the number of quit attempts; and
- c) increasing the success rates of those attempts.

Yet success rates in those attempting to quit, even with the use of proven effective methods such as Nicotine Replacement Therapy (NRT) or other pharmacotherapies (e.g. bupropion, varenicline), remains very low. The NHS Stop Smoking Services (SSS; established in England and Wales in 2000) evidence the highest level of success with 4-week quit rates of 53 per cent translating to 15 per cent at one year^{8,9}. Since 2012 however, the number of people attending has fallen and continues to decline⁹.

Quitting smoking and nicotine use completely is the best way to improve health, however many smokers find abrupt quitting extremely difficult. Reducing the harm associated with smoking even though this may involve continued use of nicotine (tobacco harm reduction) is a potentially useful goal that has recently been introduced in the UK. It has been recommended by the National Institute for Health and Care Excellence (NICE) in relation to NRT¹⁰ but there are other new and emerging nicotine delivery products. Among these, e-cigarettes are the most popular and have the potential to both boost the number of quit attempts and increase success rates^{6,38} although data vary across countries¹¹.

E-cigarettes are battery-powered devices that heat a nicotine containing liquid to produce an aerosol that is inhaled. Physical appearance varies considerably, from small closed-system disposable devices resembling cigarettes (cigalikes or first generation devices) to larger, modular open-system devices with refillable tanks (newer generation devices). Although not completely safe, they are estimated to reduce the harms associated with smoking by around 95 per cent^{12,13} since, under normal usage conditions, they are associated with far lower toxic emissions compared with burning tobacco^{14,15} and people who use them reduce their exposure to a range of toxicants and carcinogens^{16,17,18}. There are approximately 2.9 million people currently using e-cigarettes in Britain of whom 45 per cent are smokers ('dual users') and 52 per cent are ex-smokers¹⁹, and e-cigarettes are now the most popular method for quitting smoking⁶. Nevertheless, whilst there is emerging evidence to suggest they may be effective for smoking cessation, many smokers continue to smoke alongside e-cigarette use^{19,20} or report that e-cigarettes are not a satisfying alternative to smoking^{19,21}. Twenty-six per cent, moreover, erroneously believe that e-cigarettes are as harmful or more harmful than smoking¹⁹.



Figure 1:
E-cigarette types

*Images courtesy of
Anna Phillips*

Increasing the number of people attempting to quit and improving the success rates of those attempts is a clear priority for public health. This means encouraging smoking cessation via any means but given their increasing popularity and the emerging evidence for smoking cessation, e-cigarettes have the potential to help meet this goal. How can we harness this potential? What are the barriers and opportunities for behaviour change?

The psychology

Smoking

Smoking is a behaviour influenced by a wide range of factors including nicotine addiction and psychological factors such as expectancies, beliefs, drives, motives and impulses²² as well as sensory components and aspects of the behaviour itself (e.g. holding the cigarette, feeling the smoke in the mouth and throat, or to facilitate social interaction). Cigarette smoking delivers a high level of nicotine to the brain very quickly (10–20 sec), an effect which immediately activates the brain chemical, dopamine^{23,24}. Because other stimuli (e.g. the handling of the cigarette, the ‘catch’ of smoke in the throat) are associated with this effect of nicotine, they too can become pleasurable in their own right, contributing to smoking addiction.

NRT and other drug-based therapies address the nicotine addiction but they lack the speed of delivery and do not address the important psychological (sensory and behavioural) cues that have become a fundamental part of cigarette smoking. An electronic device that can deliver nicotine without the harmful ingredients associated with tobacco smoke (carbon monoxide and tar) and which provides some of the psychological effects of smoking (i.e. mimicking the hand-mouth action, providing the feeling of vapour in the mouth) may be appealing for behaviour change since it can address both the physical and psychological aspects of the addiction.

Nevertheless, whilst smoking involves only a cigarette and a lighter, e-cigarette use (to varying degrees, depending on the device) involves charging, replacing and refilling along with some knowledge of how to use and store the device. Psychology tells us that the easier something is the more likely people are to change their behaviour. However, in a survey by ASH (2016)¹⁹ 8 per cent of those who had stopped using an e-cigarette reported doing so due to difficulties such as refilling, replacing components, or leaking. Newer generation devices have been described as ‘bulky’ or ‘scary’²⁵. This may explain why many smokers start vaping with a cigalike product^{12,25,26} which are easy to use and more readily available in shops but may be less effective than newer and larger tank-like models²⁷ which deliver nicotine more efficiently^{28,29}. To what extent e-cigarettes can promote successful smoking cessation, for whom, and under what circumstances, remain unclear.

The evidence – what works?

Smoking cessation

Policy interventions delivered at a population level such as mass media campaigns³² and fiscal and legislative measures³³ can provide the opportunity, and enhance the motivation, for change and have been shown to be effective in prompting people to quit smoking³⁴.

Support services: Among the various aids to help people quit, the UK Stop Smoking Services (SSS) currently produce the highest smoking cessation rates^{8,9} and provide pharmacological and psychological support. Psychological support, provided in an individual or group format, includes a variety of evidence-based strategies including goal-setting and feedback (e.g. CO monitoring), education (provision of health-related information), training (e.g. how to deal with a lapse),

incentivisation (e.g. money saved, or in certain cases, provision of vouchers) and instilling a non-smoker identity^{31,35}. Providing smoking cessation support at SSS is estimated to generate 24,400 additional life years annually³⁶ costing less than £1000 for each Quality Adjusted Life Year gained³⁷. However, numbers are dwindling and success rates various markedly between local authorities⁹.

Smoking cessation and e-cigarettes

Compared to the wealth of evidence for NRT on smoking cessation, very few studies have explored the effectiveness of e-cigarettes for quitting although emerging reports are generally encouraging. A 2016 report estimated that 2.5 per cent of smokers who used an e-cigarette in their quit attempt (22,000 people) succeeded where they would have failed if they had used nothing or a licensed nicotine product purchased over the counter³⁸.

Data from the 2014 Eurobarometer on smoking and electronic cigarettes²⁰ reveal that of the 7.5 million current e-cigarette users, 35.1 per cent reported smoking cessation due to e-cigarettes and an additional 32.2 per cent reported reduced smoking consumption. Extrapolating to the EU population suggests in excess of six million smokers in the European Union have quit completely and 9 million have reduced their cigarette consumption using e-cigarettes. More recently, population data from the US suggest that the increase in e-cigarette use is associated with an increase in the population cessation rate³⁹.

Evidence from clinical trials also suggests that e-cigarettes can aid smoking cessation. The Cochrane review⁴⁰ of e-cigarettes for smoking cessation found that smokers were twice as likely to quit with a nicotine vs. a placebo e-cigarette. Nevertheless, the quality of the overall evidence was rated as low; although the studies were well-conducted, the results were based on only a small number of studies. E-cigarettes have also evolved and improved markedly since these early trials were conducted highlighting a need for more studies exploring the effects of e-cigarettes for smoking cessation.

Another meta-analysis which included a greater range of other studies (e.g. cross-sectional and prospective cohort studies)⁴¹ recently concluded that there is no evidence to show e-cigarettes help people quit, or that they may even undermine quitting. However a problem with some of these studies was that they excluded people who may have already quit smoking using e-cigarettes. Added to this limitation, most of the included studies were not designed to examine the efficacy of interventions and so the results are difficult to interpret.

The effects of e-cigarettes for smoking cessation may also depend on the regulatory environment. A recent report published this year (2017)¹¹ compared the real-world effectiveness of e-cigarettes for adult smokers in two countries with restrictive policies towards e-cigarettes (Canada and Australia) with two countries with less restrictive policies (USA and UK). Compared with quitting unaided, smokers using e-cigarettes to quit in less restrictive policy environments were more likely to quit, whereas those using e-cigarettes to quit in more restrictive policy environments were less likely to quit.

Although e-cigarettes provide nicotine and address some of the psychological (ritualistic and sensori-motor) aspects of smoking, for many they are still not as satisfying as smoking. Between 30–60 per cent of e-cigarette users continue to smoke whilst using e-cigarettes^{7,19,20}. Forty-five to 58 per cent of smokers who try e-cigarettes don't continue to use due to lack of satisfaction (e.g. less enjoyable than cigarettes, didn't feel like smoking or poor craving reduction^{19,21}) and a further 8 per cent stop using due to practical difficulties/technical faults¹⁹.

Alongside behavioural factors, nicotine delivery is generally regarded as a main driver for tobacco smoking⁴². Although early studies suggested inefficient nicotine delivery from e-cigarettes^{43,44} products have evolved and improved naturally over time and recent studies have demonstrated rapid

nicotine delivery similar to cigarette smoking^{29,45}. However, devices vary markedly with some devices delivering higher levels of nicotine than others⁴⁶. Given the high number of 'dual users' and lack of satisfaction from many smokers^{19,21}, allowing further product development and the sale of higher nicotine concentration e-liquid should assist smokers to fully transition to e-cigarettes. E-cigarettes have also improved over time in other areas (increased battery life, less leaking and over-heating), however, there is still some way to go. Continued innovation producing low cost, simple to use devices that are effective in delivering nicotine, along with clear and consistent information, easy access and assistance where needed (e.g. via the SSS), are all necessary in order to encourage more smokers to quit smoking using e-cigarettes.

Summary /recommendations

Many intervention functions and policy measures designed more generally to promote smoking cessation (e.g. stop smoking services, behavioural support, tobacco price increases) are also applicable to quitting smoking using e-cigarettes. However, facilitating e-cigarette use for smoking cessation requires some more specific recommendations.

In order for e-cigarettes to be more effective in facilitating transition to non-smoker status they need to address the psychological as well as the biological factors associated with smoking addiction. Drawing on the COM-B model of behaviour change^{30,31} these include capabilities (easier to use), opportunities (more available) and motivation (more appealing). Correctly and appropriately informing the general population about effects on smoking cessation and relative risks should also impact on motivation to use in a quit attempt.

The Society makes the following specific recommendations:

- **Improve education** about the relative harms of smoking, nicotine and e-cigarettes. Use public messaging campaigns to **disseminate correct evidence-based information** about the harms of smoking/reduced health risk of e-cigarettes and the potential benefit of e-cigarettes for smoking cessation. Likewise, provide guidance on relative risk, efficacy and nicotine delivery for health professionals.
- **Combine existing best practice (NHS SSS) with the most popular quitting method (e-cigarettes)** to increase attractiveness of the SSS and further boost success rate. Offer e-cigarettes and technical support as part of the SSS and fund the services to support smokers to quit.
- **Use policy interventions and fiscal measures to raise the cost of smoking and reduce the cost of e-cigarettes.** Continue to increase taxes, smoke-free regulation and purchasing barriers for cigarettes but regulate the reduced risk product less heavily. For e-cigarettes, avoid taxation and 'vape-free' legislation and promote unrestricted advertising of factual information.
- **Regulate to promote product development** – allow e-cigarettes to further evolve and improve so they are safer, more appealing and satisfying for more smokers. This means allowing higher nicotine strength e-liquid to remain on the market where there is no evidence to suggest harm, and avoid unnecessary burdensome and costly procedures for manufacturers so they can focus on improving the safety and efficacy of their products.
- **Invest in research** to continue to explore the effects of e-cigarettes on smoking cessation to determine which devices offer the best potential for quitting, for whom and under what circumstances.

Note: This briefing was produced using the best evidence available at the time of writing (August 2017).

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