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REVIEW ARTICLE

E-cigarettes in ENT: what do we need to know?

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Abstract

Background: E-cigarette use in the UK is increasing and we are commonly encountering patients in the ENT clinic who are e-cigarette smokers. Currently, there is no regulatory body or licensing for e-cigarettes. This means that the contents, and therefore potential carcinogenic and toxic risks, can vary greatly from product to product. Patients are starting to ask about the risks of e-cigarettes and their use in smoking cessation.

Objectives: This review aimed to examine the regulations, trends, and carcinogenic and health risks of e-cigarettes, and summarise the evidence for their use in smoking cessation. It also aimed to provide a general awareness regarding the advice and information that can be safely given to patients.

Key words: Smoking Cessation; Electronic Cigarettes; Carcinogens; Nicotine

Introduction

The largest avoidable cause of death and serious disability in the UK and most other developed countries is cigarette smoking.[1] It is a known aetiological factor in the development of head and neck malignancies, especially laryngeal carcinoma.[2] Nicotine is the addictive element in cigarettes and is not known to be carcinogenic;[2] it is instead the tar and other additives in cigarettes that increase the risk of developing a malignancy. There have, however, been some suggestions that nicotine may well function as a 'tumour promoter'.[3]

Recently, more and more patients are switching to using electronic cigarettes, also known as e-cigarettes, electronic nicotine delivery systems or personal vaporisers. These were invented in China in 2003.[4] They deliver an aerosol by heating a solution that users inhale, the main constituents of which are nicotine, propylene glycol and flavouring agents.[3]

Patients will often deny smoking when asked about their social history; however, on further questioning, many of them may well use e-cigarettes. As e-cigarettes have only been in use for 12 years, there are no data on the long-term usage, and there are many concerns and issues surrounding their popularity.

This review aimed to examine the regulations, trends, carcinogenic and health risks of e-cigarettes, and summarise the evidence for their use in smoking cessation. Overall, the review aimed to provide a general awareness regarding the advice and information that can be safely given to patients.

What are e-cigarettes?

E-cigarettes typically comprise a re-chargeable lithium ion battery, and a battery-powered atomiser which produces vapour by heating a solution of nicotine, usually in propylene glycol or glycerine, held in a cartridge in the device (see Figure 1 for an example).[1] Many of the devices take the form of a conventional tobacco cigarette, but they can also have the appearance of everyday items such as pens, Universal Serial Bus ('USB') memory sticks, and larger cylindrical or rectangular devices.[3]

In 2014, it was estimated that there were 466 different brands of e-cigarette available,[5] and they are readily accessible from numerous e-cigarette shops on the high street, at petrol stations and via the internet.

E-cigarette popularity

Smokers of e-cigarettes report that the main reasons for using them are to reduce or stop smoking, and because they can be used in smoke-free places.[6] They are an option for those who are unable or unwilling to quit, permitting the total or partial replacement of smoked tobacco without warranting any commitment to reduce or abstain from recreational nicotine use.[7]

In 2013, a study investigating the numbers of people who had ever used e-cigarettes reported figures of 15 per cent in the USA, 10 per cent in the UK, 4 per cent in Canada and 2 per cent in Australia, with typically higher rates among younger age groups.[8] In 2012, it was estimated that there were 800 000 regular e-cigarette users in the UK,[7] and this number is thought to

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FIG. 1
An example of an electronic nicotine delivery system or e-cigarette.

be increasing, with a recent survey indicating that there are currently 2.6 million e-cigarette users in the UK.[9]

Regulations and prescribing laws

At the moment, e-cigarettes are not formally regulated. They can be sold by anyone, in any form, with any vapour products. However, in 2013, the Medicines and Healthcare Products Regulatory Agency decided it would regulate e-cigarettes and other nicotine-containing products as medicines.[10] The legislation is expected to come into force in 2016, whereupon such products will be regulated under the European Commission Tobacco Products Directive, so manufacturers have until this time to become registered and licensed.[11]

Once e-cigarette products are registered as medicines with the Medicines and Healthcare Products Regulatory Agency, theoretically e-cigarettes could be prescribed by National Health Service (NHS) practitioners as a smoking cessation aid. The National Institute for Health and Care Excellence (NICE) guidance on nicotine-containing products for reducing tobacco use states that licensed nicotine-containing products are a safe and effective way of reducing the amount people smoke, and can be used as a complete or partial substitute for tobacco, either in the short- or long-term.[12] At the moment, e-cigarettes are not licensed and therefore their use cannot be promoted by NICE; however, if alternative nicotine-containing products gain licensing authorisation in the future, their statement on these products will be reviewed and potentially revised.[12]

Carcinogenic risk

E-cigarettes are promoted as a conventional cigarette substitute using only vapour and nicotine, without the carcinogens such as tar, and are often marketed using statements that indicate the aerosol is merely 'water vapour'.[3] However, there have been various different chemical compounds found in e-cigarettes that are either already known carcinogens or may well prove to be carcinogenic in the future. As e-cigarettes are not currently regulated, users cannot be certain about what chemicals are found within the vapour.

For example, a study investigating e-cigarette contents, conducted in 2013, found tin particles in cartridge fluid, which were revealed to be cytotoxic in assays using human pulmonary fibroblasts.[13] In addition, tin, silver, iron, nickel, aluminium and silicate particles have been found in aerosols.[13] The concentrations of 9 out of 11 elements in e-cigarette aerosol were higher than or equal to the corresponding concentrations in conventional cigarette smoke, and many of the elements identified in e-cigarette aerosol are known to cause respiratory distress and disease.[13] In addition, the Food and Drug Administration found that one e-cigarette contained diethylene glycol, a toxic chemical that can cause death.[14] Some of the e-cigarette manufacturers state that the refill fluid or vapours are nicotine-free; however, some of these have been found to contain significant amounts of nicotine.[15]

In comparison, a study from 2015 found that e-cigarettes had a more favourable toxicity profile compared to tobacco cigarettes when toxic and carcinogenic metabolites in the urine of both user types were reviewed.[16] Goniewicz *et al.* also confirmed that e-cigarettes contained some toxic compounds, such as formaldehyde, nitrosamines and nickel, but the concentrations were much lower than those found in conventional cigarettes.[17] The authors supported the idea that substituting tobacco cigarettes with e-cigarettes may substantially reduce exposure to tobacco-specific toxicants.

Health risks

E-cigarettes have recently been in the media because of concerns about the devices being potential fire and explosive hazards. It has been claimed that they were responsible for up to 100 fires over the last 2 years, and 1 death after a device exploded igniting oxygen equipment being used at the time.[18]

The short-term effects of e-cigarette use include eye and respiratory irritation caused by exposure to propylene glycol.[3] A study investigating nicotine-free shisha pens found that the main components of the vapour were glycol and glycerol in approximately equal amounts, and the concentrations in just one puff were sufficient to cause airway irritation based on a previous human study.[19]

Smoking cessation evidence

Evidence for the effectiveness of e-cigarette use as a method for stopping tobacco smoking is limited and does not allow conclusions to be reached.[3] However, the results of the only randomised, controlled trial to compare the use of e-cigarettes, with or without nicotine, with the use of nicotine patches without medical

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assistance, showed similar, although low, efficacy for quitting smoking.[20]

A recent Cochrane review investigated the use of e-cigarettes for smoking cessation and reduction. It found evidence from 2 trials (over 600 participants) that e-cigarettes help smokers to stop smoking long-term compared with placebo e-cigarettes.[21] Additionally, in those patients who cannot stop tobacco smoking, e-cigarettes seem to reduce their conventional cigarette consumption.[21] However, given the small number of trials and the wide confidence intervals around the estimates, the results are rated low by the Grading of Recommendations, Assessment, Development and Evaluation Working Group ('GRADE') standards.

There are no long-term data available on the outcomes of using e-cigarettes as smoking cessation devices. A long-term trial is currently ongoing; the final results of a cohort study after follow up for five years will be due in 2019. The provisional results after 12 months (revealed in 2015) showed that the use of e-cigarettes in addition to tobacco smoking did not facilitate smoking cessation or reduction, as dual smokers and tobacco-only smokers showed similar outcomes.[22] In contrast, most exclusive users of e-cigarettes were able to maintain smoking abstinence at 12 months.[22]

Currently, no e-cigarettes have been approved for smoking cessation by governmental agencies. However, the Medicines and Healthcare Products Regulatory Agency are in the process of reviewing this.[3] In the future, e-cigarettes may be recommended as a cessation method and be available on prescription from the NHS.

What does this mean for our patients?

The fact remains that smokers will obtain the maximum health benefit if they completely refrain from both tobacco and nicotine use.[3]

The current literature does not fully support the use of e-cigarettes as a smoking cessation tool. Although several trials suggest that e-cigarettes may be beneficial to some smokers who want to quit or reduce smoking, e-cigarettes have not been around long enough or adequately used to evaluate their long-term effects.[23]

For patients, this means we should currently not be advocating the use of e-cigarettes as a smoking cessation tool or adjunct, and should continue to provide advice and support regarding the current approved methods as described in the NICE guidance.[12]

Patients may ask about the safety and risks of e-cigarettes. Recent safety data indicate that e-cigarettes contain detectable levels of toxic substances, but generally at lower levels than tobacco cigarettes, and the acute effects are generally similar to effects of tobacco cigarettes, but at a lower severity.[24]

Regulation of e-cigarettes is necessary to establish a scientific basis on which to judge the effects of their use. This will also help to ensure that adequate research is conducted, so that the public has current and reliable information as to the potential risks and benefits, and so that the health of the public is protected.[3]

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