



## Designing an intervention to help the quitters quit: A qualitative, intervention co-design study

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### ABSTRACT

**Objective:** E-cigarettes are increasingly being provided by publicly funded stop smoking services. Our objectives were to understand the challenges and establish the means by which services could best support the use and subsequent discontinuation of e-cigarettes for this purpose.

**Methods:** Semi-structured interviews and co-design workshops with service users and providers of a stop smoking service. **Results:** Thematic analysis was conducted. Interviews identified: 1. a reluctance to use e-cigarettes for cessation, 2. struggle to quit e-cigarettes (dependency, fear of relapse, compensatory “puffing”) and 3. service development needs (consistency of approach). Co-design workshops suggested: 1. facilitation of e-cigarette use through understanding previous failed attempts, 2. offering a longer, two-staged approach to tobacco then e-cigarette cessation, careful timing of behavioural strategies and 3. enhanced communication between providers.

**Conclusions:** Our study suggests additional modifications to smoking cessation support measures when e-cigarettes are used for smoking cessation to address the challenges posed by public health guidance: “smokers should switch to vaping and vapers should stop smoking completely”.

**Innovation:** Our study is the first to consider experiences of service users and providers about the challenges of using e-cigarettes for cessation; our co-design group of providers informed nine strategies needed to support this approach in practice.

### 1. Introduction

Tobacco smoking is associated with adverse health effects and is the most important modifiable risk factor for many long-term conditions and premature death [1]. Reducing the prevalence of smoking is key to improving global population health and governments around the world invest in services to support smoking cessation. Electronic cigarettes (e-cigarettes), also known as electronic nicotine delivery systems (ENDS), became commercially available in 2007 and have grown in popularity. Their role for supporting smoking cessation remains subject to debate with different policies adopted around the world. The United Kingdom (UK) government endorse e-cigarettes as a quit aid and they are increasingly being provided by publicly funded specialist stop-smoking services [2,3].

E-cigarettes are battery-operated, hand-held devices that heat e-cigarette liquid (ECL) to create a vapour for inhalation by the user. Devices come in various shapes and sizes and later generations of e-cigarettes allow users to modify their components and settings, offering a customisable experience [4]. ECLs are available in a wide range of flavours with varying nicotine

content and form. The ability to tailor the experience to an individual's preference contributes to their popularity but also makes understanding the potential long-term health effects more difficult [5].

The main reason that tobacco smokers use e-cigarettes is as a smoking cessation aid [6].

As e-cigarettes are generally accepted as less harmful than tobacco, this may be considered a desirable harm reduction strategy. However, the health effects of long-term e-cigarette use remain unclear [7-10], as do the benefits of ‘harm reduction’ strategies [11]. The latest guidance from the National Institute for Health and Care Excellence (NICE) does not recommend e-cigarettes for harm reduction, stating that further research is needed in this regard [11]. A recent Cochrane review concluded there is moderate-certainty evidence that e-cigarettes increase tobacco quit rates compared to NRT [12]; their ability to help smokers achieve abstinence from tobacco, many of whom have had past failed attempts, cannot be overlooked.

In a UK based randomised control trial (RCT) of smokers, people offered e-cigarettes with behavioural support achieved a one year tobacco

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abstinence rate of 18% compared to 9.9% in those who received nicotine replacement therapy (NRT) and behavioural support [13]. However, 80% of the tobacco quitters in the e-cigarette arm continued to use e-cigarettes after 1-year. This contrasts with fewer than 10% of tobacco quitters still using NRT. Those who stop smoking with the support of e-cigarettes may have a different relationship with their quit aid than those who use NRT.

The uncertain health impact of long-term e-cigarette use and observational data suggesting that continued e-cigarette use post tobacco-cessation may be associated with increased risk of relapse [14,15] is cause for concern. Tobacco cessation is therefore not necessarily the final step in the smoking cessation journey for those who do so with the aid of e-cigarettes. We propose that specialist stop smoking services that harness the benefits of e-cigarettes to achieve tobacco cessation, should also support those transitioned onto e-cigarettes to achieve abstinence from their quit aid. However, there are limited data on interventions to support e-cigarette cessation. Our recent review of the literature identified fear of returning to tobacco, e-cigarette dependency, and the perceived need to continue use for stress reduction as barriers to quitting e-cigarettes; facilitators were cessation support, step-down of both nicotine (lower dose) and flavour (less desirable or enjoyable to the individual), and appropriate health messaging [16].

Building on this literature, we worked with a smoking cessation service who were piloting e-cigarettes as a means of smoking cessation. Our objectives were:

- i) With service users and providers, explore through interviews the challenges, solutions and service needs in relation to e-cigarettes and their use as a quit aid,
- ii) With service providers, using co-design methods, establish the means by which services could best support the use and subsequent discontinuation of e-cigarettes

## 2. Methods

Co-methodologies are becoming more prominent in health care investigation because they bring together researchers, service users and providers to facilitate innovation and improved performance [17]. Co-working requires lay people and professionals to work as equals [18]. We followed good practice guidance for co-design, including meaningful, early engagement, respecting all views and actively managing power and inter-personal interactions [19,20]. The study was conducted in two phases. We interviewed service users and providers to establish challenges, solutions and further service needs when e-cigarettes are used for smoking cessation and then we conducted co-design workshops with smoking cessation advisors to identify strategies to address issues raised in phase 1 to modify the existing clinical (cessation) intervention and service model.

### 2.1. Participants

This study was part of an evaluation conducted in a stop-smoking service, commissioned by the Local Authority in a deprived [21] northern city in the UK and as such research ethical approval was not required. The service had adopted the choice of e-cigarettes as an alternative to NRT between April 2020 and March 2021. On the e-cigarette programme, behavioural support was offered for 12 weeks compared with eight offered to those choosing NRT. Service user participants were competent adults (aged over 18 years) who had been offered e-cigarettes as a means of smoking cessation. We aimed to recruit a maximum variation sample according to age and gender who had taken up the offer of e-cigarettes and those who had declined. Service providers were specialist stop smoking advisors who had supported service users who had chosen e-cigarettes as a means of smoking cessation. We also interviewed a senior representative from the company commissioned to both provide e-cigarette devices and liquids and to advise service users in their use (hereafter, technical support). Service providers accessed the National Centre for Smoking Cessation online training package [22].

### 2.2. Design

**Phase 1:** To explore challenges, solutions and service needs of users and providers on the use of e-cigarettes for cessation, we conducted interviews between September 2020 and March 2021. Service users were interviewed on up to two occasions aimed to coincide with i) active contact with the stop smoking service and ii) in the later stages or post-service contact. Interviews were held with stop smoking and technical support providers once. We developed interview schedules from our review of the literature [16] and the Theoretical Domains Framework [23] which has previously been used to understand the determinants of health behaviours [24] (including smoking cessation [25,26]). Due to Covid-19 participants were interviewed by telephone. **Phase 2:** To establish the means by which services could best support the use and subsequent discontinuation of e-cigarettes, we invited all specialist smoking cessation advisors ( $n = 10$ ) from the service in question to an online co-design group. We used PowerPoint slides to offer information to inform discussions. Each slide consisted of: i) the themes/subthemes identified in phase 1 ii) illustrated with data, iii) where relevant, solutions offered in phase 1 and the literature and iv) the “challenge”, a conversation starter question. An example is presented in Fig. 1 (where the “no puffs” rule refers to total cessation, rather than reducing cigarette use to avoid the risk of compensatory (deeper inhalation) smoking). **Audit:** As per usual practice, the service recorded 12-week cessation data and at 26 weeks conducted a telephone survey to establish cessation status.

### 2.3. Procedure

**Phase 1:** All service users choosing e-cigarettes and a sample who declined were given written information about the study by a smoking cessation adviser. Those interested in participating were asked for permission to share their name and telephone number with a researcher (JD, PhD, female, no prior relationship with or knowledge of any of the services or participants) who contacted to offer more information prior to recruitment. A gatekeeper (specialist stop smoking service manager) forwarded an email from the researchers to all *smoking cessation advisors* with information and instruction to contact a researcher (JD) directly if interested in participating. The owner of the company dispensing the e-cigarettes and providing *technical support* (e.g., how to load liquids and use the devices) acted as gatekeeper to allow recruitment following the same procedure as with smoking cessation providers. At the end of each interview with service users, permission was sought to contact them again on one occasion later in their cessation journey. Recorded verbal consent was taken in all cases at the beginning of interviews. **Phase 2:** The co-design workshop with service providers was arranged on video call (Microsoft teams) to immediately follow a routine meeting when service providers were expected to be available. All stop smoking advisors were invited by gatekeeper email with relevant information and the opportunity to contact researchers for further information or with questions. At the beginning of the workshop, participants were given information about the study, a further opportunity to ask questions and consent was taken to collect and present anonymised data. Participation in phase 1 did not preclude inclusion in phase 2. MC (MD, Consultant Physician, Male) and JD jointly facilitated the workshop.

### 2.4. Analysis

All interviews and co-design groups were audio recorded and transcribed verbatim. **Phase 1:** Interviews were analysed inductively and thematically in line with Braun and Clarke's process [27], drawing on subsequent formulations of reflexive thematic analysis [28,29] according to the study aims. Reflexive thematic analysis was selected to allow flexible exploration of participants' perceptions and experiences while allowing us to balance subjectivity through reflection, team discussions and iterative adaptation. Analysis was concurrent to data collection until saturation was achieved with no novel themes being identified. Coding of interviews was completed by JD and JS (PhD) independently initially to generate candidate themes. The full team reviewed successive iterations of the coding

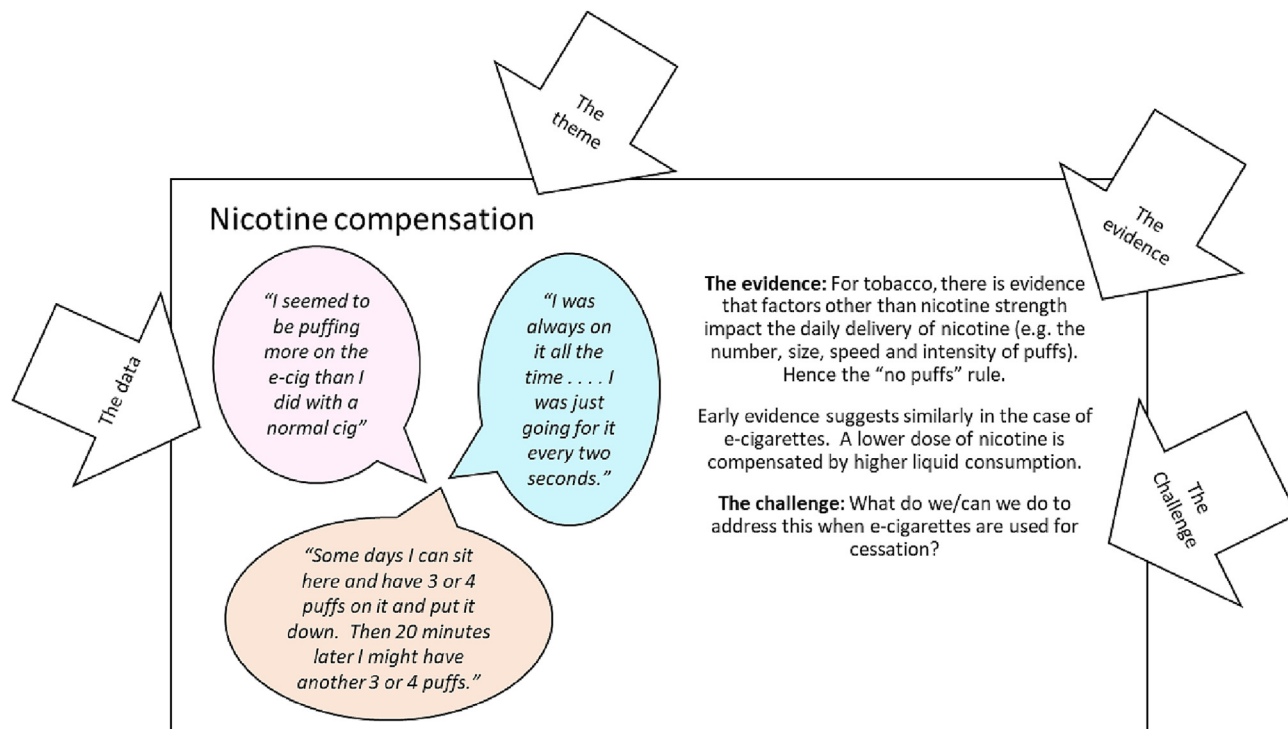


Fig. 1. Co-design workshop example slide.

framework until consensus was reached. **Phase 2:** As data from phase two aimed to address challenges and service needs identified in phase one, analysis was deductive thematic analysis with data categorised to existing themes. **Audit:** Service providers collected and were able to provide anonymised collated data which we present as received.

### 3. Results

#### 3.1. Participant characteristics

Eleven interviews were conducted with 5 service users (three of whom were interviewed at two different time points), 2 service providers and 1 technical support provider. Interviews took between 16 and 44 min (mean duration 27 min). The co-design focus group took 2 h. Service user participant details are illustrated in Table 1. Six out of a possible ten service

providers participated in the phase 2 co-design workshop, two of whom had been participants in interviews.

**Phase 1:** There were three themes and nine subthemes relating to challenges or service needs which are illustrated in columns 2 and 3 in Fig. 2. **Phase 2:** We categorised data according to our coding framework for phase 1. There were three higher level solutions or means by which services could best suggest their use addressing themes identified above with nine lower level, tangible practice actions as illustrated in columns 4 and 5 in Fig. 2. Data from both phases are presented below according to themes from phase 1. Pseudonyms are used in all cases and role is identified as: SU – service user, SP – service provider, TSP – technical support provider. **Audit data:** During the year that e-cigarettes were offered for cessation, 30 people accepted. At 12 week review, four had relapsed to tobacco and 26 had quit tobacco completely. Of these 26, eleven had also stopped using e-cigarettes and 15 continued. At 26 weeks telephone follow up, of

Table 1  
Service User Characteristics.

Pseudonym	Occupation	Age	Smoking history	Quit attempts	E-cigarette use, cessation progress and intentions	
Jenny	Housewife	53	Smoked 35 years, 30/day roll ups	One previous quit using e-cigarettes without services.	<i>First interview:</i> No tobacco. Using e-cigarettes for 4 months, 6 mg, wants to cut down but no specific plans.	<i>Second interview:</i> No tobacco. Using e-cigarettes 6 mg, intends to continue.
Iris	Carer	31	Smoked 15 years, 30/day	Several times before without support, never quit before for longer than a few days.	<i>One interview only:</i> no tobacco for 8 weeks, e-cigarette dose 6 mg. Hoping to reduce and quit e-cigarettes in the next 3 weeks.	-
Alison	Retired	71	Smoked 54 years, 20/day	Stopped once in 1986 for "a few weeks". No other quit attempts.	<i>First interview:</i> From 12 to 0 mg e-cigarettes. After a short time on 0 mg went back to tobacco and currently now smoking. Intends to go back onto e-cigarettes "after Christmas" on 12 mg.	<i>Second interview:</i> E-cigarettes 12 mg with "the odd cigarette". Intends to stop tobacco and continue with e-cigarettes.
Jodi	Domestic supervisor	47	Smoked 33 years, 10 to 15 per day	Tried to stop "numerous" times with patches, the best attempt was for two years.	<i>First interview:</i> Started on 6 mg and now on 3 mg. Intends to quit e-cigarettes completely.	<i>Second interview:</i> Tried 0 mg e-cigarettes and was tempted to buy cigarettes so went back to 3 mg. Intends to continue.
Jemma	Carer	49	Smoked 38 years, 15+ roll ups	Several previous quit attempts using patches and e-cigarette without cessation support.	<i>One interview only:</i> Declined e-cigarettes, chose to use a nicotine spray. No longer on tobacco or spray.	

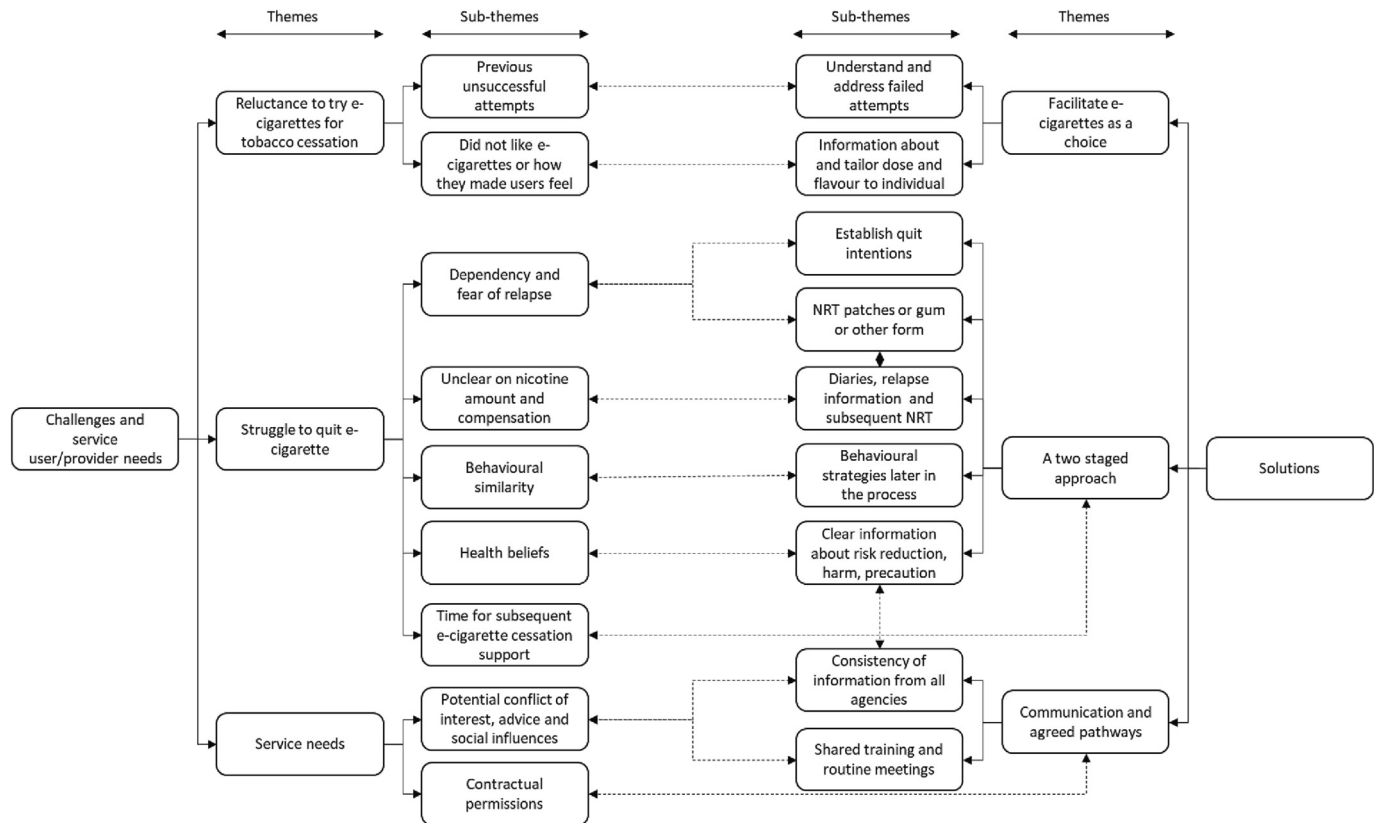


Fig. 2. Themes and subthemes from interviews and co-design workshops.

the 20 service users contacted none were smoking tobacco (e-cigarette status was not recorded).

### 3.2. Findings

#### 3.2.1. Theme 1: Reluctance to try e-cigarettes for smoking cessation

Service users who tried them found e-cigarettes an effective means of tobacco cessation. “I honestly can say, hand on heart, I cannot believe how easy it was, I was totally amazed” (Alison SU). When service users were reluctant to try e-cigarettes, in some cases this was due to **previous unsuccessful attempts**. We interviewed one person who had declined e-cigarettes for smoking cessation. She had tried e-cigarettes before (without cessation support) but found she was using them more than tobacco cigarettes, assumed she was not getting enough nicotine and went back to tobacco. Service providers confirmed this; they experienced reluctance from service users due to previous failures. “I thought every person we offered it to would just say yes and almost snap our hands off but that simply wasn't the case ... they have tried and it hasn't worked” (Sally SP). Some did not like e-cigarettes **or how they made them feel**. “The majority of people will tell you that I have tried it and it made me cough or feel horrible” (Sally SP). It was suggested that to **facilitate the choice of e-cigarettes** it would be helpful to offer service users the opportunity to **explore the reasons for previous unsuccessful attempts** and seek to address these. The role of technical support was considered key in **tailoring the dose and flavour** of e-cigarettes according to individual needs and preferences. Because individuals who had unsuccessfully tried e-cigarettes had not received behavioural support, participants said the potential impact of such support from cessation services be emphasised. For example: “Explore the reason why they feel they failed” (Madeline SP) and “the expert advice from the [technical support] ... the right strength or the right flavour” (Sally SP).

#### 3.2.2. Theme 2: Struggle to quit e-cigarette

Users reported **dependency and fear of relapse** to tobacco, in particular, struggling as they reduced the nicotine dose. One participant described how this had led them to return to tobacco and others described reluctance to reduce the nicotine dose for fear of returning to tobacco: “I am worried about stopping altogether, worried that I might go onto cigs again ... I know I would, and I don't want that ... they are addictive” (Jenny SU). Co-design participants suggested **a two staged approach** where e-cigarette cessation is considered after successful tobacco cessation. Strategies to address dependency and fear of relapse included a discussion about longer-term **intentions relating to e-cigarettes**. Although providers routinely explained that the device was being offered for short term quitting use, they perceived some users' intentions were to continue. By exploring longer term intentions for e-cigarette use resources could be targeted and advice given on the potential risks of continued use (e.g., relapse to tobacco). For example, “A lot of the time the language is that ‘well who knows’ and ‘if I do decide to stay on this for good’, they have already made that decision” (Charlotte SP). A repeated suggestion to address e-cigarette dependency was offering other forms of **NRT to support subsequent e-cigarette cessation**: “You could use the patches to come off an e-cig the way you would use them to stop smoking” (Jessica SP). Dependency linked with participants being **unclear on the nicotine amount** they were using and the possibility they were **compensating** by using the e-cigarette more frequently or taking more puffs as they lowered the dose. “You probably use your vape more than your cigarettes... with a cigarette its finished, but with vaping you could literally, just sit there and vape for hours” (Alison SU). In addition to NRT co-design groups suggested the use of diaries for monitoring and to support the identification of strategies to address more frequent use: “Monitor it, do you know like we would with a smoking diary, how it made you feel and what could you have done differently” (Charlotte SP). The **behavioural similarity** to tobacco cigarettes was a challenge to users who told us they maintained their smoking routine, replacing their usual cigarette with an e-cigarette. “I missed the



feel of it, something in my hand, the hand to mouth thing, but with this vape you obviously get that" (Jodi SU). Co-design participants discussed the option of counselling quitters in using the e-cigarette only for nicotine and not to replace the cigarette behaviourally. However, the "replacement" element was considered one of the reasons e-cigarettes were successful in supporting tobacco cessation. Ultimately the consensus among the group was a *two-phased approach* where routines and habits were addressed through **behavioural techniques at the point of e-cigarette cessation** rather than the move between tobacco and e-cigarette. Service users had mixed beliefs about the **health impact** of e-cigarettes; some thought they were completely safe, and others thought they were less harmful than tobacco. One person said they had heard of "popcorn lung" (a lay term for the lung condition bronchiolitis obliterans caused by a flavouring banned from e-cigarettes in the UK) but didn't know what this was. For example: "[The] *only health risks* [are with] *underlying health conditions which I don't have ... there is nothing harmful in them as far as I am aware*" (Iris SU). Service providers had some experience of users questioning the health consequences, for example: "*A common one is 'I have read this', or someone told me it will 'give me this'*" (Sally SP). Co-design group participants said they routinely advised that e-cigarettes were less damaging to health than tobacco. However, the lack of evidence about the long term effects of e-cigarettes on health was at times challenging to communicate. The general opinion of the group was to offer **clear advice** and caution regarding their longer term use and more information on the addictive nature of nicotine. For example: "*It should be used for a limited period of time. Because we don't know the long-term effects*" (Madeline SP). There was a consensus among service users, providers and technical support that **12 weeks was insufficient time to quit, or support quitting, both tobacco and e-cigarettes**. "*I think the problem is, in the 12 weeks I went from smoking right down to naught, I think it was too quick*" (Alison SU) and "*It takes a lot longer than 12 weeks*" (Davina TSP). The solution identified in co-design groups was to **extend the time for cessation support** when e-cigarettes were used as the quit aid in addition to a two-phase approach: from tobacco to e-cigarette then complete cessation: "*A two-stage approach with a longer length of time*" (Jessica SP).

### 3.2.3. Theme 3: Service Needs

Service users recognised that the support offered from both service and technical providers played a vital role in quitting smoking: "*... she [advisor] rings and she is really supportive ... praise, encouragement, support. The guy in [technical support] nice guy, always friendly, any advice or any problems*" (Jodi SU). Both the service and technical support expressed the possibility of **conflict of interest** from technical support as the service is a profit-making business. For example: "*They [TSP] want to encourage people to use e-cigs ... we [SPs] would look at it as being for a limited period of time whereas they may have other ideas*" (Madeline SP) and "*You can't make them [quit e-cigarettes] ... it's up to that customer*" (Davina TSP). Both groups recognised the potential for undesirable and **unintended social influences** from the technical support staff who were all e-cigarette users. Technical support had taken steps to address this: "*They [service users] would come in and the staff would be vaping. We have put no-vaping signs up in the shop now*" (Davina TSP). Service providers cited examples of when technical support **advice conflicted** with guidelines. Sometimes these conflicts were identified and resolved in conversation. Our data demonstrated some conflicting or undesirable advice may go unnoticed, for example: "*If you really still need that tiny little bit still, if you mix half of your zero and half of your three then you have one and a half*" (Davina TSP) compared with, "*Mix the dose isn't something that we should be doing*" (Jessica SP). Another example of conflicting advice was in approaches to service users expressing they were about to relapse. Technical support offered an e-cigarette, service providers offered psychological support. For example: "*They come in if they know they are going to have a lapse ... we say ... we will give you a disposable one to tide you over*" (Davina TSP) compared with "*It's about managing that psychologically, breaking that psychological link if you like*" (Jessica SP). Strategies were suggested to address conflicts in advice including joint meetings and joint training, a leaflet given out by both services and a script to support the technical support provider in giving the right advice.

Finally, service provider participants felt restricted **by contractual permissions** and suggested changes to these. It was not considered part of their role to support e-cigarette cessation in those who chose it as their quit aid. As reported above, a two-phase process and better communication and consistency between service and technical providers with more time allocated was considered necessary to complete the cessation process, achieving both tobacco and e-cigarette abstinence. "*If we help them with the e-cigarette and that then becomes the issue for them, there should be more resources to help them transition* [to complete cessation]" (Sally SP).

## 4. Discussion and conclusion

### 4.1. Discussion

Of the 30 service users who used e-cigarettes, the majority 87% (26/30) quit tobacco and maintained cessation at 12 weeks follow-up. Of these, half remained on e-cigarettes. Our interviews with service users, service providers and technical provider participants identified challenges and service needs associated with the use of e-cigarettes as a means of smoking cessation. Our co-design workshop suggested solutions to address these challenges and needs.

To our knowledge, our study is the first to explore service user and provider experiences and to suggest tangible, comprehensive strategies to address challenges and needs in cessation services when e-cigarettes are used as the quit aid. Existing studies focus on effectiveness [30] or the safety [31] of e-cigarettes for cessation. Previous studies concur that users struggle to quit e-cigarettes and report some of the reasons we identified. For example, e-cigarette replication of tobacco cigarettes leads to perpetuated rituals and habits and as such are a barrier to e-cigarette cessation [32]. Fear of relapse [33] and physical dependence [33,34] have also previously been identified as reasons users find quitting e-cigarettes challenging. Equally some of the solutions identified by our participants have been previously suggested. Our participants suggested the use of NRT to support e-cigarette cessation once tobacco cessation is complete. Other studies suggest similarly [33] with further suggestions from the literature to address the challenge of fear of relapse including sharing information about the risk of tobacco relapse if e-cigarette use continues [14,15]. We identified one previous study where users were unsure of how much nicotine or "vape" they are using [34], but no solutions were suggested in the literature.

There is a more substantial literature supporting health beliefs as barriers to e-cigarette cessation [35-39]. One study found well timed and progressive information an effective technique in addressing this [32]. Information too early may perpetuate smokers' reluctance to try e-cigarettes for cessation. We were unable to find any other paper that evaluates a service where e-cigarettes are used for cessation so we are unable to substantiate or confirm our findings that 12 weeks is insufficient to ensure total (tobacco and e-cigarette) cessation, or indeed to suggest how long might be necessary. We identified a clear need for technical support with choosing nicotine dose and flavour and to give instruction on how to operate the e-cigarette, but we also identified challenges in the consistency of the advice given. Our participants suggested some measures to overcome these challenges (e.g., joint training, consistent written material) but this remains untested.

Our study has limitations. Our audit data serves to offer context for the qualitative work presented here but the numbers of service users choosing e-cigarettes for cessation was insufficient to make inferences. Our qualitative work is novel and much of it transferrable. However, local services differ nationally. We were not able to find published evaluations of such services, but we are aware of other services in the UK that offer e-cigarettes for tobacco cessation. In one of these a pharmacist dispensed the device and liquids. Such an approach may address some of the challenges we identified regarding a potential conflict of interest arising from an e-cigarette business providing this service, however, it is unlikely that pharmacy services are able to offer and tailor the range of flavours offered by a business. Our interviews were by telephone; although this was a

**Table 2**  
Challenges and solutions to e-cigarettes for smoking cessation.

1. Barriers to e-cigarettes for smoking cessation (interviews)	2. Barriers to e-cigarette cessation from literature	3. Service level adaptations suggested (co-design groups)	4. E-cigarette cessation support needs from literature	5. Summary - suggested changes to service provision	
Reluctance to use e-cigarettes for smoking cessation	Previous unsuccessful attempts Didn't like e-cigarettes or feeling	n/a n/a	Discuss and address issues related with previous failed attempts. Present evidence that e-cigarettes <i>plus</i> support likely to lead to success Information technical support re nicotine and flavour	n/a n/a	<p><b>1. Facilitate E-cigarettes as a choice:</b> i. Explore (and address) reasons for previous unsuccessful attempts ii. Discuss the role of technical support in tailoring dose and flavour of e-cigarette</p> <p><b>2. A two staged approach</b> i. Establish service users intentions about e-cigarettes after tobacco cessation (intend to quit or continue) ii. NRT to support e-cigarette cessation, iii. Diaries, relapse information, NRT iv. Reinforced or delayed behavioural techniques – delivered at the point of e-cigarette cessation, v. Clear information about e-cigarettes <i>reducing risk</i> (compared with tobacco) rather than being harm free. Information about the addictive nature of nicotine. Advise adoption of a precautionary principle</p> <p><b>3. Communication and agreed pathways</b> i. Consistency of information from all agencies  ii. Shared training and routine meetings</p>
Struggle to quit e-cigarettes	Dependency and fear of relapse	Physical dependence [33] [34] Fear of returning to tobacco/relapse [33]	NRT (e.g. gum or patches) to support e-cigarette cessation once tobacco cessation complete.	Step down nicotine, NRT [33], present evidence that relapse is more likely for those that stay on e-cigarettes [14,15]	
	Unclear on nicotine amount and compensation	Unsure of how much vaping they are using [34]	Diaries, relapse information, NRT	n/a	
	Behavioural similarity	Replicated tobacco cigarettes re rituals and habits [32]	Behavioural similarity	n/a	
Service needs	Health Beliefs	Health and hazard beliefs [35-39]	Information on risk reduction, lack of evidence, nicotine	Well timed, progressive health information [32,33]	
	Time for subsequent e-cigarette cessation support	n/a	Extend the period of contact between cessation services and service users.	n/a	
Service needs	Potential conflict of interest, advice and social influences	n/a	Shared training and meetings between technical and support providers	n/a	
	Contractual permissions	n/a	Alterations to service contract.	n/a	

convenient approach for participants and researchers alike due to Covid-19 restrictions we acknowledge that face-to-face interviews may have offered opportunity to respond to non-verbal communication and thus enhance our data.

More research is needed in relation to the challenges and identifying and testing strategies tailored to support needs identified by service users and providers when e-cigarettes are used for smoking cessation.

**4.2. Innovation**

The use of e-cigarettes for smoking cessation by services is a new initiative [2,3]. Although there is research evidence that e-cigarettes support tobacco cessation there are also published accounts of e-cigarettes being continued after the tobacco cessation process [13]. There is no literature relating to the views of service users and providers on the use of e-cigarettes for cessation within the service context. Previous accounts of e-cigarette cessation are from the public whether or not they have started to use e-cigarettes for cessation (always without service support) or otherwise [16]. There is no previous study that seeks to explore service user (rather than members of the public) and provider experiences or to suggest strategies to address challenges experienced. In Table 2, we summarise the nine discrete innovations identified in our co-design workshops mapped to the challenges and needs of users and providers and, where available, contextualised within existing literature. Although co-design has been used to develop smoking cessation strategies previously [40,41] our study is the first to use this approach with the use of e-cigarettes.

**4.3. Conclusion**

E-cigarettes have previously been identified as an effective means of supporting smoking cessation. Our study suggests when e-cigarettes are

used for cessation additional support measures may be needed to achieve “*smokers should switch to vaping and vapers should stop smoking completely*” [42].

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**Declaration of Competing Interest**

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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