

# Smokers' perspectives of tobacco dependency medications and medication adherence during a quit attempt in an urban NHS stop smoking service : a qualitative study

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## Research article

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2 **medication adherence during a quit attempt in an urban NHS**  
3 **stop smoking service : a qualitative study**

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## 48 **ABSTRACT**

49 **Background:** Smoking and poor medication adherence are both associated with increased  
50 morbidity, mortality and immense costs for the healthcare system. Numerous studies have  
51 investigated the barriers and facilitators of medication adherence among patients with chronic  
52 disease. However, the factors influencing adherence to medication targeted to reduce smoking  
53 remain unexplored. In order to achieve further reduction of smoking prevalence, improvement  
54 of medication adherence is essential. Thus, this study aims to uncover and understand adult  
55 smokers' attitudes towards adherence to medication to reduce tobacco dependence.

56 **Methods:** A purposive approach was used to recruit smokers aged over 18 and motivated to  
57 quit using pharmacotherapy. In-depth semi-structured interviews were conducted with a  
58 diverse sample of eleven smokers who were engaged with a NHS Stop Smoking Program.  
59 Data were thematically analysed using *PRIME theory*.

60 **Results:** Smokers were active decision makers regarding their tobacco dependence  
61 medications. Adherence was influenced by smokers' evaluations, plans, access to support and  
62 experiential learning, highlighting the need for tailored adherence support. Conflicting views  
63 about medication were held by all participants. Side effects, fear of dependency and inability  
64 to stop cravings influenced initiation and adherence. Electronic cigarettes were viewed  
65 negatively. Adherence was influenced by their unique psycho-social contexts including deep-  
66 rooted personal rejection and, fear of medicines. These attitudes influenced smokers' beliefs,  
67 decisions about quitting and the role and use of medications in the quitting process.

68 **Conclusions:** Tobacco dependency is a unique treatment context with specific adherence  
69 issues. Lay perspectives of medications to support quit attempts differ from the medical  
70 viewpoint. Adherence to tobacco dependency regimens is a challenging goal, inhibited by  
71 many complex factors. There is a need for smoking cessation interventions to respond to  
72 individual medication beliefs and concerns to help to build a smoker's confidence that an  
73 individual can take their tobacco dependency medication as prescribed and maximise benefits.

74 **Keywords** **smoking**, *smoking cessation; medication adherence; qualitative research, PRIME theory.*

## 75 **BACKGROUND**

76  
77 Worldwide, smoking remains the most important preventable cause of premature death and  
78 disability (1). Smoking contributes to health inequalities, causes 16% of all UK deaths (2) and  
79 costs the National Health Service (NHS) circa £2bn annually (3). Tobacco dependency  
80 medications (TDMs) effectively aid initial abstinence and decrease lapse risk (4); however,

81 globally, most smoking cessation (SC) attempts are unassisted. NHS stop smoking services  
82 (SSSs) provide evidence based and cost-effective support to quit attempts (5, 6). Evidence  
83 indicates that, although the majority of current smokers are motivated to quit, the number of  
84 people using NHS SSSs to help them quit continues to decline (7). This may be because in  
85 recent years, e-cigarettes have become prevalent, generating uncertainty within clinical SC  
86 practice and amongst smokers. There is a lack of international consensus regarding the role of  
87 using e-cigarettes as a tool for SC. Public Health England (PHE) and NHS Health Scotland  
88 advocate e-cigarettes in contrast to other public health bodies such as the World Health  
89 Organisation. A recent UK trial found that, smokers who used e-cigarettes when combined with  
90 behavioural support to quit smoking were twice as likely to succeed as smokers who used other  
91 nicotine replacement products (8). In contrast, a qualitative study found that both smokers  
92 seeking to quit and SC advisors had ambivalent attitudes towards e-cigarettes with regards to  
93 efficacy, health risks and incompatibility to SC goals (9). Overall, long-term quit success  
94 through NHS SSSs remains low (10) partly explained by poor TDM adherence.

95 Medication adherence, defined as *the extent to which patients take medication as prescribed by*  
96 *their healthcare professionals* (HCPs) is an important aspect of treatment efficacy, healthcare  
97 costs and patient safety (11). Internationally, medication non-adherence is recognised as a major  
98 public health issue with serious consequences (12). It is estimated that £300m of NHS  
99 prescribed medicines are wasted each year (13). Factors that influence adherence to TDMs  
100 remain unclear; for example, we know little about the ways in which smokers perceptions and  
101 experiences of TDMs influence adherence. A recent meta-ethnography (14) found that smokers  
102 are active decision makers regarding using TDMs. For HCPs to work in partnership with  
103 smokers, knowledge of smokers' poor TDM adherence during quit attempts is required.  
104 Research on lay perspectives regarding adherence to TDMs is sparse and there remains a  
105 paucity of literature to inform the design of effective TDM adherence promoting interventions.

106 Adhering to prescribed medication regimens is a complex behaviour requiring the ability to  
107 access prescribed medication and the cognitive capacity and motivation to take it. Non-  
108 adherence may occur at initiation (the medication is not started), implementation (delay,  
109 omitting or taking extra doses during treatment) or persistence (premature discontinuation)  
110 phases of medication use (15). There are many reported barriers and facilitators of medication  
111 adherence (16); in particular, patients' treatment-related beliefs are important for their  
112 adherence behaviours as medication-related concerns and necessity-beliefs predict adherence  
113 (17). The perspective of patients, carers and HCPs often differs in terms of the determinants of  
114 medication adherence owing to priorities and knowledge of the situation. Estimates of the rate  
115 of adherence to TDMs ranges widely between studies and countries (12). Additionally, tobacco  
116 dependency (TD) is a unique treatment context with specific adherence issues. TDM adherence  
117 is shaped by several complex factors: dependence on tobacco, preference not to use  
118 medications, fear of side effects, depression, gender, weight gain, cravings, withdrawal  
119 symptoms, low motivation to quit smoking, poor social support and fear of dependency on  
120 TDMs (16). In contrast, motivation, access to free TDMs and SC support have been found to  
121 increase adherence to TDMs (18).

122 There is a strong relationship between cigarette smoking and social disadvantage (19). Smokers  
123 from deprived areas have low awareness of services available to help them, and hold  
124 misconceptions about their availability and effectiveness (20). Previous studies have found  
125 several factors that partly explain TDM underuse such as side effects, cost and access,  
126 satisfaction, lack of awareness or knowledge, prior experience of using TDMs, perceived poor  
127 efficacy or concerns about safety and dependency (16). Adherence to medication may be  
128 determined by other factors such as socioeconomic resources and individuals' beliefs trust or  
129 expectations. Poor medication adherence is considered a potential contributor to disparities in  
130 health outcomes (21).

131 Theories of behaviour change stress the central importance of an individual's motivation to quit  
132 an addiction. Contemporary behaviour change frameworks such as the *Theoretical Domains*  
133 *Framework* (22) and *Behaviour Change Technique* (BCT) taxonomy (23) have been used  
134 across a range of health behaviours, and they are increasingly applied within medication  
135 adherence research. The seminal work of Horne and colleagues (17), the *Necessity-Concerns*  
136 *Framework*, suggests that adherence is influenced by implicit judgements of personal need for  
137 the treatment (necessity beliefs) and concerns about the potential adverse consequences of  
138 taking it. The *PRIME* (*Plans, Responses, Impulses, Motives, Evaluations*) *theory of motivation*  
139 (24) has been applied to smokers in attempting to explain how quit attempts are made. *PRIME*  
140 *theory* states that the decision to quit smoking is based on a smoker's evaluative beliefs (positive  
141 or negative) about smoking, which influence motivation to quit or not. This involves internal  
142 tensions (impulses and urges to smoke) and external triggers (e.g. cues in the environment) to  
143 determine subsequent behaviour.

144 A comprehensive review of interventions to increase medication adherence and improve related  
145 outcomes using a variety of approaches found their effects were inconsistent; only a few clinical  
146 trials improved both adherence and clinical outcomes (25). The most effective medication  
147 adherence interventions adopted comprehensive approaches involving a range of strategies,  
148 were high-intensity, and tailored to individual patients (26). HCPs (i.e., physicians, nurses,  
149 pharmacists) played a key role in supporting, promoting and monitoring medicines adherence  
150 in chronic conditions. Patient-centred approaches to improve adherence are considered  
151 promising (27); however their effectiveness remains unclear. In the absence of a single  
152 definitive intervention to address non-adherence, current NICE Guidelines combine trial  
153 evidence of interventions and explanatory studies of non-adherence (28). The dearth of  
154 evidence underpinned by health psychology theory is of concern given its importance for  
155 informing intervention design and implementation. In order to understand the potential of

156 interventions supporting TDM adherence, it is important to explore views and attitudes towards  
157 smoking, quitting, and TDMs. Using the conceptual framework of *PRIME theory*, this article  
158 reports on a UK-based qualitative study exploring in-depth, smokers' beliefs, experiences and  
159 attitudes towards TDMs to help explain poor TDM adherence. The study findings are of value  
160 to clinicians, nurses, policymakers and researchers as it seeks to inform future design of SC  
161 interventions that enhance TD treatment engagement, adherence, and long term quit outcomes.

## 162 **METHODS**

163 The authors conducted a qualitative study based on in-depth interviews with smokers attending  
164 an urban NHS Stop Smoking Service in Birmingham, UK between November 2014 and April  
165 2015. As our aim was to uncover and understand adult smokers' TDM adherence from their  
166 own perspective, we used this methodological approach, which allows a flexible exploration of  
167 participants' experiences and beliefs (29, 30).

### 168 *Recruitment and eligibility of study participants*

169  
170 A purposive approach was used to recruit a sample of smokers aged over 18 currently engaged  
171 in quit attempts using TDMs. Participants were recruited from a single residential area in  
172 Birmingham and received no reimbursement for taking part. Advertising posters inviting  
173 smokers to discuss their opinions about TDMs were placed in the SSS. The SSS SC Advisers  
174 asked for interested people to volunteer to take part. Participants were enrolled into the study  
175 after they had selected their TDMs. In line with current clinical SC support this was ahead of  
176 their quit date in Week One of their behavioural support group (31). The present study set out  
177 to obtain interviews from each participant four weeks after their quit date. Recruitment aimed  
178 to obtain enough data to sufficiently describe the phenomenon of interest and address the  
179 research question (29).

180

181 *Interviews*

182 Data was collected between November 2014 and April 2015. An initial meeting was set up  
 183 with each participant, prior to arranging a date and time for the face-to-face interviews in which  
 184 participants consented, in writing, to the study after full explanation of what was involved. All  
 185 the interviews were conducted by CJS. A short survey was completed by participants before  
 186 the start of the interviews to gain insight into their demographic characteristics, TDM use,  
 187 smoking history and TD (assessed using the Fagerström Test for Cigarette Dependence (FTCD)  
 188 (32)).

189 An interview guide (Additional File 1: In-depth interview guide) was developed to explore how  
 190 the views, beliefs and experiences of adult smokers shaped their adherence behaviours.  
 191 Interviews lasted up to 90 min in a private room within an NHS SSS and were audio recorded.  
 192 The main topics were experiences, views, meanings and beliefs held about TDMs and e-  
 193 cigarettes, barriers to adherence and suggestions for reducing these barriers. Questions were  
 194 guided by concepts from *PRIME Theory*, for example asking for details of plans to quit or return  
 195 to smoking and evaluative beliefs about smoking and TDMs.

196 **Additional File 1:** In-depth interview guide

Category	Questions	Probes
Knowledge and experiences of medication to aid smoking cessation	<p>What kind of support do you need and/or prefer in dealing with your experiences and symptoms of quitting smoking?            What is your view on the medication methods for people trying to quit?</p> <p>Do you think it is necessary to use TDMs to help you stop smoking? Do you think it is safe?            How have your experiences of using TDMs changed your views of them?            Do you adhere (stick to) to other medication differently to TDMs?</p>	<p>(Probe: motives to choose medication to aid a quit attempt, what has supported past quit attempts, evaluations of the causes of relapse to smoking)</p> <p>(Probe: emotional issues, impulses that undermine adherence, do you think it is effective?)            (Probe: how has knowledge and understanding changed over the quit journey?)</p>
Medication use and adherence	Tell me about all the medicines that you are taking currently.	(Probe: names, doses, and timings, motives for choosing to use a medication to quit)

	<p>How do you feel to take all the medicines as advised by your physician?  Do you know about the importance of taking all your medicines?  What do you know about the side effects of your medicines?</p> <p>What problems do you face to take your medicines?</p> <p>How much support do you get from your family and friends about taking all your medicines as advised by your SC adviser?</p>	<p>(Probe: emotional issues, impulses that undermine adherence, do you think it is effective?)  (Probe: could you please tell me in your own words what did you do to help adhere (stick to) your TDM prescription?)  (Probe: responses to medication, why is it important or not? evaluations)  (Probe: Could you please tell me about your experiences with medications to help you stop smoking?)</p> <p>(Probe: Can you tell me more about situations that affected how you took your medication?  What are the most important things that helped you take your medication?)  (Probe: Do you have suggestions for health professionals about providing support to help people adhere (stick to) talking their TDMs?  (Probe: what plans did you make to aid medication adherence, what supports them / undermines them?)</p>
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197

198 *Ethical considerations*

199 Smokers were provided with a Participant Information Sheet during their SSS clinic visit  
200 outlining details of the study and the opportunity to contact the researcher if they had any  
201 enquiries before confirming their involvement. All participants were assured of confidentiality,  
202 the anonymous processing of the data and that SSS staff did not have access to the data. The  
203 researcher (CJS) had no access to SC patient records. Ethics committee approval was obtained  
204 from both NHS Health Research Authority (REC 13/SW/0173) and the University of  
205 Birmingham.

206 *Analysis*

207 Transcripts were coded using NVivo software, using Braun and Clarke’s method (33). A two-  
208 stage process included (i) generation of initial descriptive content codes and (ii) consolidation

209 of codes in ‘higher order’ analytic themes to produce an interpretation. The analysis was both  
 210 inductive, from the accounts (experiences and views) of participants, and deductive, through  
 211 being informed by existing literature and the conceptual framework of *PRIME theory* (also  
 212 reflected in the study objectives and the topics chosen for the interviews). The first draft of the  
 213 analysis was generated by the first author and reviewed/reworked by all authors until  
 214 interpretation was agreed. This process identified meaningful extracts of text used to identify,  
 215 label and refine the themes which best explained the data. To assure methodological rigour,  
 216 authors undertook an “audit trail” outlining decisions made throughout the process of data  
 217 collection and analysis (34). Authors documented their discussions on coding and analysis of  
 218 data as a method of checking plausibility of emerging themes, the paths taken to arrive at those  
 219 themes and data interpretations (29, 33). In addition, the transcribed data allowed all authors  
 220 to revisit the text to check emerging themes and ensure that they remained true to participants’  
 221 accounts. Details of demographics, smoking characteristics, TDM and adherence history are  
 222 described in (Table 1: characteristics of study participants) allowing readers to contextualise  
 223 participants’ responses. COREQ guidelines were followed in reporting the methods (35).

224 **Table 1. Characteristics of study participants**

Characteristic	n=11 participants
Mean age, years (SD) (range)	47 (11.27) (31-65)
Gender, percent (number of participants)	
Female	55% (n=6)
Male	45% (n=5)
Ethnicity, percent (number of participants)	
White, British	100% (n=11)
Age of smoking initiation, years (range)	15 (13-17)
Fagerström score, percent (number of participants)	
7 to 10 points = highly dependent	82% (9)
4 to 6 points = moderately dependent	18% (2)
less than 4 points = minimally dependent	0% (0)
Number of cigarettes smoked per day, percent (number of participants)	
10 or fewer	0% (0)
11-20	18% (2)
21-30	18% (2)
31 or more	64% (7)

Number of cigarettes smoked per day (cpd), Mean (range)	32cpd (20-60)
Time to first cigarette of the day, percent (number of participants)	
<5 min	36% (4)
5-30 min	45% (5)
31-60 min	18% (2)
>60 min	0% (0)
Ever used nicotine replacement therapy in attempt to quit percent (number of participants)	
Yes	8 (73%)
No	3 (27%)
Ever used pharmacotherapy (Varenicline ( <i>Champix</i> ) or Bupropion ( <i>Zyban</i> ) in attempt to quit percent (number of participants)	
Yes	10 (91%)
No	1 (9%)
Number of previous quit attempts, total for cohort, Mean	40 (4)
Adherence behaviour group, percent (number of participants)	
Group A: fully adherent	55% (6)
Group B: partially adherent	27% (3)
Group C: nonadherent	18% (2)
SC medication used to aid their current quit attempt, percent (number of participants)	
NRT (any form of NRT such as gum, patch, inhaler, tablet/lozenge, nasal spray)	18% (2)
Champix	73% (8)
Zyban	0% (0)
No SC medication	9% (1)

225

## 226 **RESULTS**

227

228 Eleven adult smokers registered with an urban NHS SSS participated in the study. The  
229 participants were all long-term, highly nicotine dependent smokers who had failed several  
230 previous SC attempts and had a varied adherence history with TDMs. All participants stated  
231 that they were motivated to quit and had chosen to use TDMs to support their quit attempt. The  
232 process of defining and labelling the themes was guided by the study objectives, *Prime Theory*  
233 and new concepts developed inductively from the data. Key categories identified in our data  
234 were mapped against motivational reasons that may have influenced non-adherence. We were  
235 encouraged by the consistency between our categories and the concepts of *Prime Theory* i.e.  
236 plans, responses, impulses and inhibitory forces (urges), motives (feelings of want or need)  
237 evaluations (evaluative beliefs) and the findings of previous research.

238 Our central analytical focus, however, were the original, previously unreported themes in our  
239 analysis. When grouped, these indicated four new processes that could help explain TDMs  
240 adherence behaviours:

- 241 1. Evaluating TDMs;
- 242 2. Planning to use TDMs;
- 243 3. Available support;
- 244 4. Experiential learning.

## 245 246 **Evaluating TDMs**

247 *PRIME theory* states that “we arrive at evaluations through a process of generalisation and  
248 *deduction*”. Participants reminisced about their smoking in positive and negative terms which  
249 influenced their acceptance of TDMs. Cognitions about SC were deeply embedded in  
250 participants’ experiences which evoked their emotions, shaping their ideas about TDMs.

251 *“I’ve got the NRT, why do I need it? I ask myself, why?” (P4)*

252 *“...I need to have something to help me stop...” (P8)*

253  
254  
255 TDM experiences led participants to believe that they were not a complete solution; mostly  
256 owing to TDMs’ inability to stop NWS. Participants’ beliefs had both positive and negative  
257 dimensions which affected motivation to use TDMs. Participants’ evaluations of TDMs were  
258 expressed as conflicting emotions and beliefs while reflections on past quit attempts motivated  
259 participants to use TDMs. Reflections on past relapses also motivated participants to use TDMs.  
260 Beliefs about TDM evolved increasing confidence in TDM efficacy.

261 *“I think with things like Champix in the past, I didn’t do what I was meant to do because I found  
262 it too hard...” (P14)*

263 Most participants articulated strong fears of TDM use (e.g. side effects, dependency). They  
264 assessed the risks and benefits of TDMs within their psychosocial context: these TDM  
265 evaluations were an important facet of TDM adherence:

266 *“...it was so hard, with the mood swings and stuff like that, and I felt really down when I was*  
267 *on the Champix (P2)*

268  
269 *“...perhaps if I had more motivation, I may have had more tolerance to the side-effects, but*  
270 *when I look back on it I just think it was a horrible experience”. (P6)*

271  
272 This indicates that HCPs should tailor their TDM advice in line with an individual’s beliefs to  
273 increase TDM adherence.

#### 274 **Planning to use TDMs**

275 Plans, according to *PRIME theory* “allow for behaviours to be deferred according to priorities  
276 or anticipated opportunity or threat (36). The process of planning seemed more important to  
277 some participants than the plans that emerged; it provided smokers with “thinking time” about  
278 past failed quit attempts. They were frequently challenged by the pressures of addiction to  
279 cigarettes which undermined adherence.

280 *This is really hard. I'm struggling. I think on Saturday I'm going to go out and have a few*  
281 *drinks. I won't wear a patch, and I'll smoke.' (P7)*

282 *“I can't do it without them. So, I guess to me they're essential. I feel that I couldn't cope without*  
283 *the patches, or the lozenges now, but having said that, I'm quite dependent on them. (P1)*

284  
285 TDM use reflected participants’ (i) realisation they needed TDMs in order to implement their  
286 desired behaviour change in the face of conflicting wants, needs and urges; (ii) understanding

287 that TDMs provided a way forward that minimised NWSs and (iii) required a shift in deep  
288 identity - from smoker to non-smoker.

289 *“... the mistakes that I've made, I've rectified them this time around, whereas in the past I used*  
290 *to leave it too long in the morning before having any NRT...” (P5)*

291 In contrast, participants' who were not fully committed to SC made choices in the way they  
292 used TDMs that enabled them to smoke.

293 *“I'd smoke through the Champix and make myself feel really ill, and then I'd think, the next day,*  
294 *'Oh, well, I gave in yesterday. I'm not going to take them [sic Champix] today,' and I'd*  
295 *deliberately not take them (P2)*

296 Partial adherence, described by some participants, occurred in response to impulses or urges to  
297 smoke. Participants then made independent decisions about increasing or decreasing their TDM  
298 doses. Planning activities emerged as useful to achieving TDM adherence. *PRIME theory*  
299 identifies that *acting in pursuit of what we most want and need is a central feature of addictive*  
300 *behaviour (37)*. Participants deviated from their plans to use TDMs in response to various  
301 stimuli, commonly the urge to smoke, habit, psychosocial factors e.g. significant others,  
302 negative emotions:

303 *“I'd deliberately not take Champix for a couple of days because I wanted to smoke...”(P11)*

304  
305 Participant's narratives revealed the importance of coping, reassurance and predictability that  
306 came with having a cigarette. These needs were not fully replaced by TDMs. They suggested  
307 that the prerequisites of an effective TDM was that it replaced the cigarette niche in their life.  
308 Conversely, as none of the participants wanted to be viewed as an addict, they believed TDMs  
309 should not have characteristics of a cigarette or contain “the enemy” nicotine. All participants  
310 were aware of e-cigarettes and a predominant narrative was that they wanted certainty about  
311 their safety and role within SC. Two participants felt that e-cigarettes mimicked smoking a real

312 cigarette and believed that that the use of them was either ineffective or an indication that a  
313 person was not ready to quit smoking.

314 *“...these e-cigarettes, and I've been told that because there's been no research into them no one*  
315 *really knows how effective they are or what they do to you...what damage they can do in the*  
316 *long run...I personally don't see them as a replacement, although others obviously do because*  
317 *they are stopping with them...” (P2)*

318 *“Before I started out on the patches, I wanted to do the e-cigs, because I'd heard so many good*  
319 *things about them. But it was the fact that they weren't licensed that put me off...” (P3)*

320 *“It makes no difference whether it's an e-cigarette or a Benson and Hedges, you're still doing*  
321 *the same habit...” (P6)*

322 Participants did not recognise that their adherence was “poor” in clinical terms and it was not  
323 given as the reason for the difficulties of SC. Participants conveyed how they had actively  
324 selected different TDMs over the course of their journey to stop smoking. They expressed a  
325 limited confidence in TDMs with anger and/or denial about their smoking addiction. Some said  
326 they quickly stopped TDMs in response to side effects and worried about replacing their  
327 addiction to cigarettes with an addiction to medication. These converging cognitions  
328 destabilised TDM adherence. Participants displayed differing opinions regarding TDMs; some  
329 believed that they were essential to their SC plans, whereas others did not. Most participants  
330 held negative views towards TDMs stating that they were concerned about the side effects and  
331 were not confident about TDM efficacy. Some participants also held expectations that TDMs  
332 were a “quick fix” for their smoking addiction, believing it was their last hope for becoming a  
333 non-smoker. Others liked the relief and confidence TDMs provided. Participants' past  
334 experiences of TDMs helped to build a schema that was drawn upon to form plans for their  
335 subsequent quit attempts. This meant that plans to use TDMs were affected by what happened  
336 around them which determined their TDM adherence behaviours.

337 **Available support**

338 All participants' TDM adherence behaviours were influenced by various social interactions.  
339 TDM adherence involved positive (supportive) behaviours by their social circle, such as shared  
340 decisions about which TDM to use, and reinforcement such as agreement on how to use TDMs.

341 *“We both said that if we were going to do it, it would be with Champix. I think we both*  
342 *see it (Champix) the same way. It's just a tablet. Pop it, finish for the day, sort of thing.*  
343 *Get on with it”*. (P4)

344 In contrast critical (negative) behaviours, such as challenging the participant's smoking, shared  
345 complaints/concerns about TDMs or agreed decisions to smoke, led to poor adherence. Family  
346 context and cohabitants' smoking status (social support) were influential to participants' SC  
347 attempts and decisions regarding TDMs access and adherence behaviour.

348 *“smoking has been my thing and a lot of people round me that have said, oh you know,*  
349 *especially my partner, ‘Oh, it is easy to give up, you just make a choice’... to them that*  
350 *might be possible but I find it incredibly difficult to give up without some support*. (P7)

351 Some participants portrayed chaotic lives, carelessness with TDM use and intentional non-  
352 adherence. Participants' reported stress, conflict and anxiety because of trying to rationalise  
353 smoking with family members' concerns regarding the dangers and harms associated with  
354 smoking. Participants' addiction to smoking had many significant and enduring impacts on  
355 family dynamics and functioning. A greater role for family support might be considered  
356 regarding supporting use and adherence with TDM regimens. *PRIME theory* states that  
357 *environmental cues can influence the decision to smoke by triggering impulses*. SC support  
358 accessed by participants influenced TDM adherence behaviours. Most participants were  
359 inspired to make a quit attempt by the Stoptober campaign (38) which provided a supportive  
360 social context to attempt to quit. Participants found accessing the SSS helpful in providing

361 support to their TDM use. The SSS role was a place to access TDMs but also met participants’  
362 social and emotional support.

363 *“When she'd explained what patches did... what Champix did, because she was telling*  
364 *me that you just take a tablet and then it makes you stop smoking, I thought, 'Great.' So*  
365 *that choice was made by the information that she'd given me at the clinic.” (P2)*

366 Narratives contained several interactions with HCPs that were very positive and a main source  
367 of advice regarding the selection and management of TDM, side effects and regimen  
368 modification. However, not all interactions with HCPs were positive. One participant was  
369 frustrated that although he did not want to use NRT, the SC adviser issued it regardless:

370 *“I did say to the SC Adviser that I didn't want any medication and she said, 'But when*  
371 *the nicotine receptors in your brain start crawling round for nicotine, you're going to*  
372 *find it very, very hard'. That's the only thing I disagree with her about. I think she could*  
373 *probably find out more about the person, before shoving the medication at them” (P6)*

374 Another participant recalled a negative experience regarding access to his Champix  
375 prescription, the HCP was perceived as unhelpful and unfortunately the participant returned to  
376 smoking. Most participants preferred having an active role in TDM decision making which had  
377 important effects on adherence:

378 *“I tried again, about three years ago, on Champix... Every time I'd go the prescription*  
379 *wasn't ready or he couldn't see me or he was really busy, so I'd go two, three days*  
380 *without having anything at all. So, I just automatically started smoking again...I think*  
381 *if he was more reliable, I don't think I would be smoking now...” (P4)*

382 **Experiential learning**

383 Participants described in detail their smoking addiction and struggles to stop; this formed a  
384 highly negative context for achieving adherence to TDMs. They all had unique histories and  
385 relationships with TDMs which shaped their adherence behaviours. Learning from experiences  
386 with TDMs led to an increased perception of their role with reducing NWSs; this strongly  
387 influenced participants' TDM adherence. When a TDM stopped urges to smoke and NWSs,  
388 participants were more likely to persist with TDMs.

389 *"...what I've learnt from the two failures before, is that you must complete the course..." (P7)*

390 *"what I did learn about the Champix, I found that there was a learning curve...don't ever think*  
391 *that it is a magic pill; it's not a magic pill, but what it does is, it's a blocker." (P7)*

392 *"I'm starting to learn more how they (NRT patches) affect me and how I need to do it, to change*  
393 *it, do you know what I mean..." (P4)*

394 While participants acknowledged TDM benefits, they held strong concerns about dependency  
395 and side effects. They described how TDMs added to their problems, particularly noting the  
396 experience of intense emotions or unpleasant bodily effects caused by TDMs. The most  
397 common reasons given for not taking TDMs were side effects, forgetfulness, deciding to omit  
398 a dose, other priorities and emotional reasons which caused changes in physical or mental  
399 status. Previous experiences with TDMs that generated unpleasant side effects delayed future  
400 initiation of TDMs; significantly some participants associated TDMs with a failed quit attempt  
401 that made them feel horrible.

402 *"I felt really down when I was on the Champix (P2)*

403 *"I think for me it didn't help to know that it was blocking the nicotine, because that just made*  
404 *me think, 'Oh, I'm going cold turkey.'" (P9)*

405 *"I think with the Champix it's blocking me getting nicotine, but with these patches, they're giving*  
406 *me nicotine" (P11)*

407 Asking participants to talk about how they found out about TDMs provided new insights into  
408 why TDM adherence is often poor. There exists a disjoint between smokers and HCPs about  
409 TDM efficacy; participants' adherence was strongly influenced by their experiential learning  
410 rather than advice they received from HCPs. The experiential learning of TDMs formed  
411 participants' judgements of TDM efficacy; adherence behaviours were susceptible to  
412 participants' experiences.

413 *“When you use Champix, you get up in the morning and you haven't got the urge for a*  
414 *cigarette...I can't describe it, it's just weird. They are the best thing ever.” (P6)*

415 Participants had limited faith (confidence) in TDMs, exhibited anger or denial about their  
416 addiction and quickly rejected TDMs in response to side effects experienced.

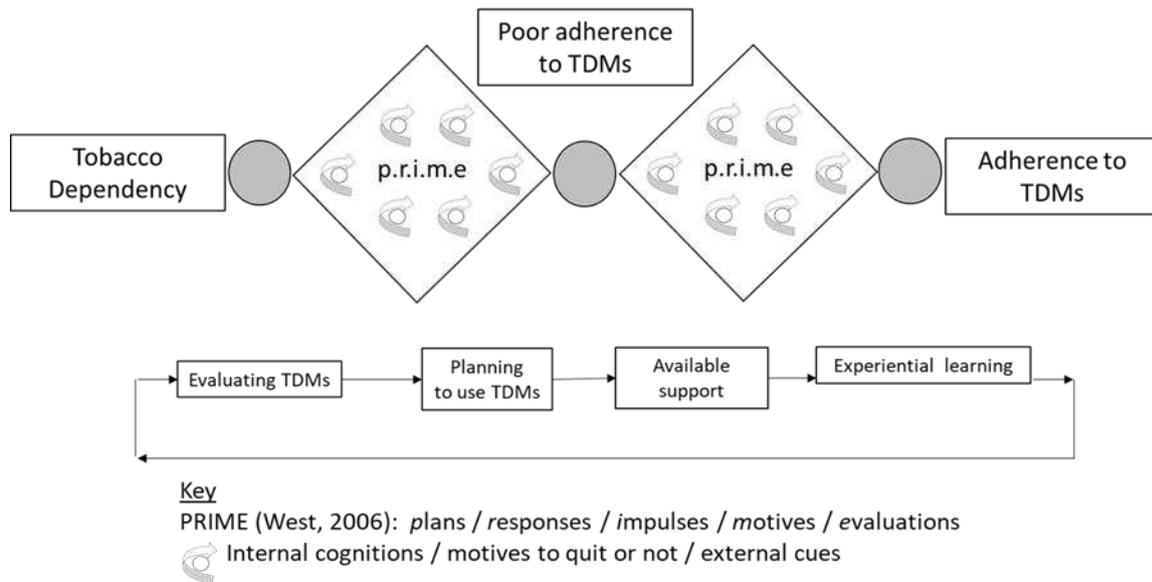
417 *“Champix, I found them potent, and I didn't like putting them into my body because of what they*  
418 *did to me, in terms of not feeling well, and the mood and the stomach problems. (P5)*

419 All participants expressed a strong view of not wanting to replace their addiction to cigarettes  
420 with an addiction to TDMs. These converging cognitions were key deterrents to TDM  
421 adherence. Participants were unable to express their behaviours in the same terms as HCPs;  
422 adherence was not a concept/term they knew. In stressing the negative aspects and addictive  
423 potential of TDMs, participants expressed views about TDMs that opposed medical knowledge  
424 of TDM benefits.

425 Incorporating the conceptual framework of *PRIME theory* with the four themes found in the  
426 present study, we conceived a model of smokers' TDM adherence (Figure 1). The model depicts  
427 the dynamic cognitions and complex processes that, within the context of TD, affect adherence;  
428 this model may be helpful to SC policy and clinical practice guideline formulation. This model  
429 seeks to help optimise adherence with TDMs and contribute to improving the desired outcomes  
430 of SC and avoidance of pharmaceutical waste. Improving the ability to properly assess the risk

431 of TDM non-adherence and deliver interventions aimed at reducing this, may lead to improved  
432 SC outcomes.

433 **Figure 1:** A model of smokers' tobacco dependency medication adherence  
434



435

## 436 DISCUSSION

437 This qualitative study aimed to understand adult smokers' poor TDM adherence during quit attempts  
438 via a qualitative approach using the conceptual framework of *PRIME theory*. In this sample of smokers  
439 seeking to quit via an NHS SSS, the processes of evaluating TDMs, planning to use them, available  
440 support and experiential learning affected TDM adherence behaviours. TDM adherence has been  
441 investigated before (16); the exploration of how smokers' views, beliefs and experiences of TDMs  
442 shaped their adherence behaviours during their quit attempts is particularly unique to this study. As with  
443 most smokers (14, 39), unassisted quitting was perceived as the optimal way to stop smoking. A history  
444 of failed quit attempts caused participants to feel inadequate and frustrated that their willpower alone  
445 had not enabled them to quit. Motivation, willpower and commitment have been found to be important  
446 to smokers who quit without TDMs (Smith, Chapman, & Dunlop, 2015); all participants understood  
447 that those factors affected their SC success. Utilising beliefs about the importance of willpower in SC  
448 clinical interactions may be important to improving TDM adherence.

449 *PRIME Theory* emphasises *plans* to develop strategies that assist smokers with quitting smoking.  
450 Planning emerged as an intrinsic part of achieving TDM adherence. We found many complex influences  
451 leading to poor TDM adherence. According to *PRIME Theory*, an individual's *evaluations* inform their  
452 motives and intentions to plan a certain course of behaviour. Participants' evaluations, critically of their  
453 smoking addiction and past failed quit attempts, eventually led to learning about the role of TDMs and  
454 to acceptance that medication was important to their SC solution. Participants cited the inability of  
455 TDMs to stop cravings (impulses and urges) for a cigarette as the reason for stopping TDM use. Over  
456 time, participants transitioned from unfamiliarity and rejection of TDMs towards critically accepting the  
457 role of TDMs in undoing their addiction. The main driver of this transition was experiential learning  
458 from past failed quit attempts. This led to acceptance of the need to prevent/respond to impulses to  
459 smoke with TDMs. Participants were distressed about their smoking addiction and this transferred into  
460 fear of becoming dependant on TDMs. Participants' rejection of TDMs, influenced by strong beliefs in  
461 unassisted quitting, has been found in other studies (40, 41). This belief augments concerns about TDMs  
462 and is a factor in poor TDM adherence.

463 Our finding that participants commonly did not use TDMs in accordance with clinical recommendations  
464 is consistent with evidence from other studies (12, 42, 43). Poor TDM adherence increased participants'  
465 experience of NWS which further weakened perceptions of TDM efficacy. Deliberate non-adherence  
466 mostly occurred owing to relapse to smoking; the lived world of nicotine addiction undermines TDMs  
467 adherence. Poor TDM adherence has been explained in other studies as being due to: a high level of  
468 dependency (44), low mood (45), concerns about side effects and future adverse effects (16) and nicotine  
469 withdrawal symptoms (46, 47). We found that participants' attitudes towards TDM options were formed  
470 by several diverse, converging, dynamic issues. Participants expressed several concerns about electronic  
471 cigarettes (ECs) i.e. that they mimicked smoking, undefined safety, potential for nicotine dependence,  
472 and sought evidence of safety from HCPs. There is evidence that ECs help smokers to stop smoking in  
473 the long term compared with placebo ECs (48). In our study, the perceived role of ECs as a quit aid was  
474 uncertain amongst participants who had concerns about safety and nicotine dependence. This finding is  
475 contrary to current academic thought that ECs may have an important role in harm reduction (49). Some

476 participants, as with smokers in general (50), viewed ECs tentatively as being less harmful than smoking  
477 but were unsure of their efficacy as aids for SC.

478 Arguably, the current treatment approach has an overemphasis on the medical model, which  
479 underestimates the impact of complex TDM taking cognitions and behaviours that occur. Most  
480 participants depicted their smoking behaviour as a “*response*” (a concept of *PRIME Theory*), to  
481 external triggers (social influences) and internal cues (self-image). Participants’ narratives revealed that  
482 their TDM adherence behaviours were underpinned by responses to complex psychosocial factors and  
483 addiction which caused impulsive and conflicted decision making. The study found considerable  
484 reluctance to take TDMs and a preference to take as little as possible for a short duration. This may  
485 partly explain why adherence to TDMs has been found to be very low in the long term (< 40%) (12).

486 We found that each participant’s experience of TDMs was deeply personal and their judgements were  
487 influenced by their individual context and personality. Improved TDM adherence may be facilitated by  
488 a greater emphasis on collaborative approaches that recognises the expertise of both the person  
489 attempting to quit smoking and HCPs. Participants did not passively accept what HCPs told them about  
490 the need for or how to use TDMs. Understanding of smokers’ perceptions of TDMs is an important  
491 element of establishing an effective therapeutic relationship. HCPs need to identify where people with  
492 TD are in relation to rejection and initiation in TDM decision-making in order to work with them to  
493 achieve TDM adherence. It is also important TDM adherence is viewed within a broader context of a  
494 holistic framework rather than from a narrower medical discourse. Future efforts to improve adherence  
495 to TDMs may need to take the processes outlined in this study into consideration.

## 496 **LIMITATIONS**

497  
498 The qualitative design of this study allowed us to extend the existing literature on TDM adherence to  
499 provide a more in-depth discussion of the complex reasons for why adherence to TDMs is poor. An  
500 important strength of this study was the sample’s in-depth experiences of SC and TDMs. The qualitative  
501 nature of our study limits the generalisability of our findings to a broader population of individuals with  
502 TD. Furthermore, the study was conducted in a single NHS SSS situated in a deprived area. Participants

503 we recruited had several prior attempts at SC and experience with TDMs and may not reflect the  
504 experiences of smokers seeking to quit for the first time. Therefore, results may be not generalisable to  
505 smokers in other settings. ECs have emerged as a controversial SC method, but we did not explore  
506 directly its role in increasing adherence to TDMs.

## 507 **CONCLUSION**

508  
509 Adherence to TDM regimens is a challenging goal, potentially sabotaged by many complex factors.  
510 Smokers TDM literacy and contextual influences are important to TDM adherence. Poor adherence may  
511 be difficult to comprehend, though this study does provide some explanation using the conceptual  
512 framework of *PRIME Theory*. ECs were viewed negatively by participants who voiced the need for  
513 further authoritative safety information. Adherence to TDMs was influenced by smokers' evaluations,  
514 plans, access to support and experiential learning highlighting the need for individualised TDM  
515 adherence support. The findings of this study are important for future TD clinical practice guideline  
516 development if HCPs are to contribute to the further reduction of smoking prevalence. As this was  
517 qualitative research, no inferences about the prevalence of these beliefs, experience and attitudes  
518 towards TDMs in the larger population of smokers can be drawn. However, these findings provide  
519 valuable insights into complex processes that influence TDM adherence. Interventions to improve  
520 adherence to TDMs need to acknowledge and incorporate smokers' concerns and perspectives.

## 521 **ABBREVIATIONS**

522  
523 HCPs: healthcare professionals  
  
524 NHS: National Health Service  
  
525 PHE: Public Health England  
  
526 SC: smoking cessation  
  
527 SSSs: NHS stop smoking services  
  
528 TD: Tobacco dependency

529 TDMs: Tobacco dependency medications

530 UK: United Kingdom

531

## 532 **DECLARATIONS**

533 *Ethics approval and consent to participate*

534 Ethics committee approval was obtained from both NHS Health Research Authority (REC

535 13/SW/0173) and the University of Birmingham.

536 *Consent for publication*

537 Not applicable.

538 *Availability of data and materials*

539 Data sharing is not applicable to this article as no datasets were generated or analysed during the current

540 study.

541 *Competing interests*

542 The authors declare that that they have no competing interests.

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547 *Authors' contributions*

548 All authors have agreed on the final version and meet the following criteria (recommended by

549 the ICMJE ([http://www.icmje.org/recommendations/browse/roles-and-](http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html)

550 [responsibilities/defining-the-role-of-authors-and-contributors.html](http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html)):

<b>Criteria</b>	<b>Author Initials</b>
Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data;	CJS, AL, JM
Involved in drafting the manuscript or revising it critically for important intellectual content;	CJS, AL, JM
Given final approval of the version to be published. Each author should have participated sufficiently in the work to	CJS, AL, JM

take public responsibility for appropriate portions of the content;	
Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.	CJS, AL, JM

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# Figures

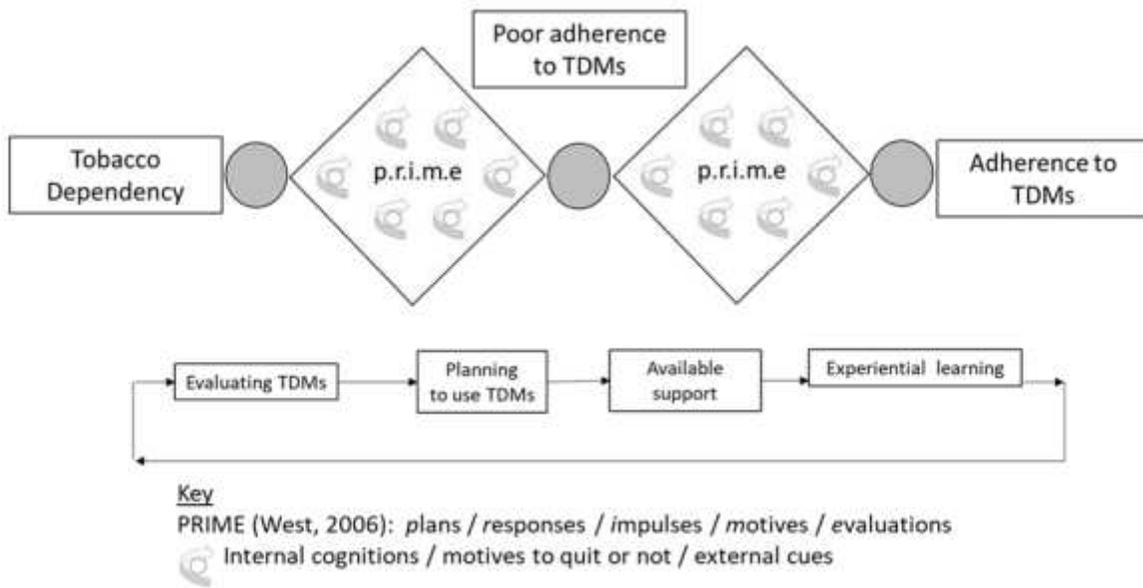


Figure 1

A model of smokers' tobacco dependency medication adherence