

## 1 **Abstract**

2 **Objectives:** To identify barriers to medication adherence in patients prescribed medicines for  
3 the prevention of cardiovascular disease and map these to the Theoretical Domains  
4 Framework (TDF), to produce a conceptual framework for developing a questionnaire-based  
5 medication adherence tool.

6 **Methods:** A scoping review of barriers to medication adherence in long-term conditions was  
7 conducted to generate an initial pool of barriers. After preliminary mapping to the TDF, these  
8 barriers were presented to two focus groups of patients prescribed medicines for the  
9 prevention of cardiovascular disease (n=14) to stimulate discussion. The group discussions  
10 enabled the patients' interpretations of the adherence barriers to be determined, provided  
11 validity from the patient perspective, and identified additional barriers unrepresented in the  
12 scoping review.

13 **Key findings:** The preliminary pool of adherence barriers was identified from 47 studies  
14 across a range of long-term conditions. The majority of TDF domains were represented by  
15 these literature-identified barriers except 'social/professional role and identity' and  
16 'behavioural regulation'. Barrier mapping was largely endorsed by focus group participants,  
17 who also contributed additional barriers, including those relating to not having a 'system' in  
18 place for managing their medicines and the negative emotions evoked by medicine taking.

19 **Conclusion:** The TDF enabled full exploration of adherence barriers including those relating  
20 to emotions which have received limited attention in the literature. This work has provided a  
21 conceptual framework for developing a questionnaire to identify an individual's adherence  
22 barriers which may then be coupled with appropriate behaviour change techniques to deliver a  
23 theory-based intervention tailored for individual need.

24 **Keywords:** Scoping review, Theoretical Domains Framework (TDF), focus group,  
25 questionnaire, IMAB-Q

26

## 27 **Introduction**

28 An estimated 30 to 50% of patients with long-term conditions (LTCs) are non-adherent to  
29 their prescribed medicines.<sup>1</sup> A large-scale meta-analysis, estimated adherence to medicines for  
30 the prevention of cardiovascular disease (CVD) to be 57% (95% CI 50-64%).<sup>2</sup> These  
31 medicines are prescribed for a range of LTCs including hypertension, dyslipidaemia and  
32 angina and are amongst the most commonly prescribed medicines in the UK.<sup>2</sup>

33 Medication adherence is a complex health behaviour, influenced by a plethora of factors.<sup>3</sup>  
34 Non-adherence can diminish treatment effects leading to increased morbidity and mortality<sup>4</sup>  
35 plus wasted healthcare resources.<sup>3</sup> Evidence suggests that a greater understanding of the  
36 barriers to adherence is needed to improve the effectiveness of adherence interventions.<sup>5</sup> A  
37 plethora of theoretical models have been developed to explain the complexities of medication  
38 adherence, including those focused on the balance between patient perceived necessity and  
39 concerns about medicines<sup>6</sup> and those focused on the importance of practitioner consultation  
40 style<sup>7</sup>. Though these models highlight important considerations for medication adherence  
41 research, the most recent Cochrane review highlights that meaningful progress with adherence  
42 research is still sub-optimal.<sup>5</sup> Theoretical models such as Social Cognitive Theory, the Health  
43 Belief Model and Self-regulation model have been applied to medication adherence  
44 interventions.<sup>8</sup> However, a systematic review of theory-based interventions to improve  
45 medication adherence identified that none have successfully guided the development of an  
46 effective adherence intervention applicable to all long-term medications<sup>8</sup>.

47 Psychology-based behaviour change techniques, such as motivational interviewing, show  
48 promise as effective adherence interventions.<sup>9</sup> However, core training of the existing  
49 healthcare workforce is not designed to equip practitioners in selecting the most appropriate

50 behaviour change techniques (BCT) for improving adherence, according to identified  
51 individual adherence barriers.<sup>10,11,12,</sup>

52 Developing an adherence tool which identifies a patient's barriers to adherence and guides the  
53 practitioner to work with the patient to select the most appropriate BCTs may enable the  
54 healthcare workforce to respond to the call for theory and evidence guided, individualised  
55 interventions,<sup>13, 14,</sup> which identify potential barriers to behaviour change.<sup>8, 155,</sup>

56 The Theoretical Domains Framework (TDF)<sup>16, 17</sup> is a composite of health psychology theory  
57 which offers a structured approach for exploring the determinants of individual behaviour.<sup>18</sup>  
58 The domains of the TDF have been linked to evidence-based BCTs,<sup>19,20</sup> leading to successful  
59 use of the TDF to guide the intervention development for behaviour change.<sup>21</sup> The TDF may  
60 therefore be suitable for mapping adherence barriers and creating a conceptual framework.

61 Literature describing application of the TDF to medication adherence<sup>22-25</sup> represents notable  
62 advancements in the field. However, each study focusses on medication adherence in a  
63 specific disease rather than multiple LTCs. Most patients have multiple diseases for which  
64 they are prescribed multiple medicines; routine practice consultations such as medication  
65 reviews are therefore not focused on medication adherence in one specific disease state.  
66 Intervention implementation is supported by compatibility with routine practice,<sup>26</sup> thus, an  
67 adherence support tool applicable across a range of LTCs is a stronger candidate for effective  
68 implementation into routine practice.<sup>27</sup> Exploration of barriers to adherence in medicines  
69 prescribed for the prevention of CVD (which covers multiple LTCs) is therefore an intuitive  
70 opportunity to broaden TDF-based adherence research towards multiple LTCs, whilst  
71 minimising the confounding factors that could be introduced by considering all LTCs  
72 collectively.

73 The current article presents the developmental work which underpinned the Identification of  
74 Medication Adherence Barriers Questionnaire (IMAB-Q);<sup>28</sup> a TDF-based questionnaire to  
75 support practitioners in identifying non-adherent patient's and elucidating their individual  
76 reasons for non-adherence. It comprises a scoping review of barriers to adherence in LTCs,  
77 the initial mapping of these barriers to the TDF and the qualitative exploration of these  
78 barriers in patients prescribed medicines for the prevention of CVD, in order to develop a  
79 conceptual framework to inform questionnaire development.

80 Existing literature syntheses (e.g.<sup>29,30</sup>) report quantitative findings from intervention studies  
81 and non-modifiable adherence determinants such as age, gender and socioeconomic status.  
82 Modifiable determinants of adherence, relating to psychosocial and environmental barriers are  
83 often overlooked. These reviews also consider non-adherence in all conditions, yet important  
84 differences in adherence determinants exist between acute and LTCs.<sup>3</sup> A broader evidence  
85 synthesis, narratively combining both quantitative and qualitative studies may therefore  
86 provide a better foundation for exploring adherence barriers. Scoping reviews are an  
87 appropriate method to 'map' relevant literature and address broad topics where differing study  
88 designs are available.<sup>31</sup>

89 Correct mapping of adherence barriers to a theoretical framework requires deep understanding  
90 which cannot always be elucidated from the literature. Qualitative exploration to supplement  
91 a literature review can provide this depth of understanding,<sup>32</sup> enhance the utility of a scoping  
92 review and ensure meaningful mapping.

93

## 94 **Methods**

95

96 The programme of work included four phases:

97 1. Scoping review of barriers to medication adherence in LTCs

- 98 2. Preliminary mapping of literature-identified barriers to the TDF  
99 3. Focus groups with patients prescribed medicines for the prevention of CVD  
100 4. Refinement of adherence barriers mapping

101 *Phase 1 Scoping review*

102 This phase aimed to generate a preliminary repository of barriers to medication adherence in  
103 LTCs, for stimulating focus group discussions.

104 *Search strategy*

105 The Embase, Medline and PsychINFO databases were accessed via the Ovid interface on 18<sup>th</sup>  
106 September 2012, to undertake the search detailed in supplementary file 1. The search was  
107 restricted to articles written in English and since 2005, as scoping searches indicated that prior  
108 to this, psychosocial determinants of adherence were seldom explored. Abstracts were  
109 screened against pre-defined inclusion and exclusion criteria.

110 *Inclusion and exclusion criteria*

111 Abstracts of any study design, reporting medication adherence barriers in LTCs were eligible  
112 for inclusion. LTCs beyond those covered by ‘CVD prevention’ were included to ensure  
113 breadth of the preliminary pool of adherence barriers before later refinement.

114 Abstracts were excluded if they:

- 115 • Included participants with drug addiction or mental health problems (the nature of non-  
116 adherence in this population is condition-specific)

117 *Data collection and synthesis (charting)*

118 Full texts were accessed where possible, but when unavailable, adherence barriers were  
119 extracted from abstracts. Adherence barriers were initially recorded using the exact  
120 terminology in the article. Once all barriers had been extracted, barriers with the same  
121 underpinning characteristic but presented differently due to specifics of context or variations  
122 in language were grouped, for example ‘forgetting to take medicines’ and ‘not remembering  
123 doses’ were grouped as one barrier related to forgetting medicines.

## 124 ***Phase 2 Mapping of adherence barriers to the TDF***

125 Adherence barriers were mapped to one of the 12 domains of the original TDF.<sup>16</sup> Existing  
126 literature<sup>16, 17, 33</sup> were utilised to interpret each of the TDF domains in the context of barriers  
127 to medication adherence. Preliminary mapping was discussed by the authors until consensus  
128 was achieved about which barriers belonged to each domain.

## 129 ***Phase 3 Focus groups with patients prescribed medicines for the prevention of CVD***

130 Focus groups with patients prescribed medication for CVD prevention were undertaken to:

- 131 1. Identify additional adherence barriers not elicited from the scoping review
- 132 2. Optimise the research team’s understanding of identified barriers
- 133 3. Ensure appropriate mapping of barriers to the TDF

## 134 ***Participants and recruitment***

135 Recruitment commenced post ethical approval from the University of East Anglia Faculty of  
136 Health ethics committee (reference number 2012/2013-04). The large pool of employees and  
137 students at the university were used as potential participants and gatekeepers to the wider non-  
138 university community for recruitment. Recruitment was via posters placed across campus, a  
139 weekly e-bulletin emailed to all staff and students, and university social media.

140 Advertisements were worded to extend recruitment beyond university students and staff, to  
141 include their friends and family, thus increasing the likelihood of recruiting a diverse  
142 population. Participants were offered a £10 high street shopping voucher for participation.

#### 143 *Inclusion and exclusion criteria*

144 Adults (individuals aged 18 years or older) able to provide informed consent were eligible if  
145 prescribed medication for the prevention of CVD as defined in the literature.<sup>2</sup> Those who  
146 were unable to read or speak English, or receiving medication for the treatment of addiction  
147 or mental illness were excluded.

#### 148 *Procedures*

149 Eligible members of the public expressing interest in participation were posted a study  
150 information leaflet, consent form and brief questionnaire to collect demographic information,  
151 plus the number of medicines prescribed and prescription charge exemption status. Returned  
152 consent forms and questionnaires were used to assign participants to one of two focus groups.  
153 Two focus groups, each with six to eight participants was deemed to be appropriate for  
154 generating sufficient data for the exploratory nature of this stage, whilst not over-burdening  
155 members of the public. Recruitment continued until each focus group had between six and  
156 eight participants representing a range of demographic characteristics.

157

#### 158 *Focus groups*

159 Each focus group was audio-recorded, approximately two hours long, transcribed verbatim  
160 and moderated by the lead author with co-facilitation. The TDF-domains deemed applicable  
161 to medication adherence barriers (established in phase one) were divided across the two focus  
162 groups. Adherence barriers mapped to differing behavioural domains were considered in each



163 focus group but the ‘emotions’ domain was duplicated to investigate consistency of  
164 interpretation between participants of the two focus groups. This domain was selected for  
165 duplication across both focus groups as it was considered to be the domain most likely  
166 influenced by differing personal experience; we therefore aimed to explore how these  
167 personal experiences differed across the largest possible number of participants.

168 Each behavioural domain was described to participants in turn, before discussing the  
169 literature-identified adherence barriers mapped to the domain. The initial mapping of barriers  
170 to each domain of the TDF is provided in supplementary file 4; this mapping therefore served  
171 as the topic guide for the focus groups. Participants were encouraged to share their  
172 experiences and thoughts, using the adherence barriers presented as prompts for discussion.  
173 For each behavioural domain, participants were asked if there were any additional adherence  
174 barriers that were not represented.

#### 175 *Data analysis*

176 Primary data analysis was undertaken by the lead author then validated by the co-authors as  
177 recommended in the literature.<sup>34</sup> Data were analysed using a framework approach,<sup>35</sup> based  
178 upon the domains of the TDF.

#### 179 ***Phase 4 Refinement of adherence barriers mapped to the TDF and summary***

180 Data from the focus groups were used to refine the mapping of adherence barriers, according  
181 to the participants’ understanding of their meaning and relevance. Any additional barriers  
182 generated during the consultation exercises were also considered.

### 183 **Results**

#### 184 ***Phase 1 Scoping review***

185 Forty-seven eligible studies (representing a range of LTCs) were identified, from which the  
186 preliminary pool of adherence barriers were extracted. Similar barriers were initially grouped  
187 into 17 themes, (as summarised in supplementary file 2) which included beliefs, cognitive and  
188 memory associated factors, knowledge-related factors and administration problems.

## 189 *Phase 2 Mapping of adherence barriers to the TDF*

190 The agreed interpretations of how each behavioural domain of the TDF relates to medication  
191 adherence barriers are provided in supplementary file 3. All adherence barriers were  
192 considered carefully, though some required a deeper level of consideration and discussion. An  
193 interesting example here is the adherence barrier ‘experience of side effects’ which was  
194 ultimately mapped to the ‘beliefs about capabilities’ domain of the TDF. This decision was  
195 reflective of the recognition that it is not the side effects per se that influence medication  
196 adherence, but more an individual’s ability to appropriately cope with the medication side  
197 effect that determines their behaviour. The ‘skills’ domain was considered to encompass both  
198 physical skills, (e.g. medicines administration) and cognitive skills (e.g. processing and  
199 understanding instructions). A number of barriers such as ‘being too busy’ and ‘having a  
200 chaotic lifestyle’ related to competing goals; these barriers did not intuitively map onto any of  
201 the existing behavioural domains of the TDF. Guided by relevant literature,<sup>33</sup> an additional  
202 behavioural domain termed ‘goal conflicts’ was created. The behavioural domains termed  
203 ‘social/professional role and identity’ and ‘behavioural regulation’ were excluded as no  
204 literature identified adherence barriers were mapped to these domains. The constructs  
205 associated with the ‘behavioural regulation’ domain are barriers and facilitators to  
206 behaviour<sup>16</sup>; as the study was focused on barriers to medication adherence, the ‘behavioural  
207 regulation’ domain was redundant. The ‘nature of the behaviour’ domain was also excluded;  
208 Michie *et al*<sup>16</sup> explain that this domain is accorded to a different order as it describes the

209 dependent variable, in this case, taking medicines as prescribed.<sup>36</sup> It is therefore not treated as  
210 a domain of behaviour change, but its constructs such as habits, were considered throughout  
211 the mapping task. Of the original 12 domain TDF, the three domains of ‘social/professional  
212 role and identity’, ‘behavioural regulation’ and ‘nature of the behaviour’ were not therefore  
213 active in the context of medication adherence barriers and an additional ‘goal conflicts  
214 domain’ was generated yielding 10 active domains in the present study.

215 The adherence barriers initially grouped to each TDF domain are detailed in supplementary  
216 file 4. Barriers were well distributed across the 10 relevant domains, though the beliefs about  
217 capabilities, beliefs about consequences and social influences domains had the broadest range  
218 of adherence barriers. Some barriers, for example ‘no medical insurance’ were excluded as  
219 they were not relevant to the UK healthcare system.

### 220 ***Phase 3 Focus groups with medicine-taking members of the public***

221 Interest in focus group participation was expressed by 32 members of the public; signed  
222 consent forms and demographic questionnaires were returned by 17 (54.8%) respondents, of  
223 whom, 14 (82.4%) were able to attend one of the two focus groups. Table 1 summarises the  
224 participant’s descriptive characteristics. Across all participants, there was a relatively even  
225 gender split and a median (IQR) age of 62.0 (51.5, 75.5) years. The majority of participants  
226 were exempt from prescription charges and most were prescribed multiple medicines; the  
227 median (IQR) number was 3 (1.5, 6). Only three participants (21.4%) were students or  
228 employees of the university.

229 [Table 1 about here]

230 Participant discussions demonstrated an understanding of the TDF and agreement with the  
231 mapping process.. Participants discussed adherence barriers known through personal

232 experience as well as offering opinion on potential adherence barriers that others may  
233 experience.

#### 234 *Focus group one*

235 A summary of topics discussed is provided in supplementary file 5. Topics were discussed  
236 across all six TDF domains presented in this focus group. Three adherence barriers,  
237 undetected by the scoping review were discussed:

- 238 • Not knowing about medicine delivery and repeat ordering systems – mapped to the  
239 knowledge domain
- 240 • Difficulties with identifying medicines, especially when the brands and packaging  
241 regularly change – mapped to the skills domain
- 242 • Hostility from GP receptionists which can prohibit medicine access – mapped to the social  
243 influences domain

#### 244 *Focus group two*

245 A summary of the topics of participant discussion is provided in supplementary file 6. Topics  
246 were discussed across all five behavioural domains presented but the beliefs about  
247 consequences domain was particularly stimulating of discussion. Adherence barriers  
248 discussed by participants undetected by the scoping review were:

- 249 • Negative emotions caused by feelings of getting a ‘raw deal’ with regards to medicines  
250 supply, e.g. only getting one month’s worth of medicines when others get three months’ –  
251 mapped to the emotions domain
- 252 • Reduced motivation to adhere caused by questioning whether medicines represent ‘good  
253 value for money’ – mapped to the motivation and goals domain

- 254 • ‘Annoyance’ about medicines taking when medicines have to be declared on insurance  
255 forms – mapped to the emotions domain.

256

257 The emotions domain was discussed in both focus groups, whilst there were similarities in the  
258 discussions on this topic between the two focus groups, differing personal experiences meant  
259 that in the second focus group, emotions related to ‘annoyance’ and ‘getting a raw deal’ were  
260 discussed which were not raised within the first focus group.

#### 261 *Phase 4 Refinement of adherence barriers mapped to the TDF*

262 A summary of the re-mapping of adherence barriers from one TDF domain to another due to  
263 the additional perspectives identified from the focus groups is provided in supplementary file  
264 7. Seventeen adherence barriers were re-mapped at this stage. Some barriers, for example  
265 knowing how to identify tablets or access them from packaging were moved from the  
266 knowledge domain to the skills domain. Additional understanding gained from the patients’  
267 perspective meant that these behaviours could be understood as an ability that can be acquired  
268 through practice (skill), rather than direct knowledge. Similarly, barriers such as feeling  
269 negative about medicines taking or burdened by this were originally conceived to relate to  
270 motivation and goals but understanding from the patient perspective enabled an appreciation  
271 of the genuine emotive aspects of these barriers.

272 Table 2 summarises the adherence barriers mapped to the domains of the TDF<sup>16</sup> highlighting  
273 the wide range of adherence barriers captured.

274 [Table 2 near here]

#### 275 **Discussion**

276 Use of the TDF<sup>16</sup> to both organise literature-identified barriers to adherence and structure  
277 focus group discussions has facilitated their detailed analysis. It has identified ten active  
278 domains, each incorporating a range of determinants of medication adherence, such as those  
279 relating to emotions, which have previously received less attention in literature.<sup>29</sup>

280 It is acknowledged that further relevant literature may have emerged since the conduct of the  
281 scoping review, however, its function was to act as a vehicle for prompting discussion in the  
282 focus groups. Given that the scoping review was designed to be supplemented by qualitative  
283 work and not intended to quantify the importance or prevalence of different barriers to  
284 adherence a full systematic review was inappropriate. The new adherence barriers and  
285 changes in mapping arising from the focus groups indicate that the methodological approach  
286 was appropriate for initiating and structuring the discussions.

287 Recruitment through university advertisements for the focus groups may have introduced  
288 biases. However, participants represented a wide range of ages and medication regimen  
289 complexities. Furthermore, only three participants were university students or employees, of  
290 which only one was an academic. Whilst anecdotal evidence gathered from the focus group  
291 discussions means that we are confident that a wide range of educational and professional  
292 backgrounds were covered in our sample of focus group participants, characterisation of  
293 participants through formal data collection about educational level may have added further  
294 rigour. Additional information regarding whether adherence barriers suggested by focus  
295 group participants were based upon personal experience or supposition, may have been  
296 beneficial and provided readers with further contextual information.

297 No relevant adherence barriers were identified for three of the TDF domains and a new  
298 domain termed 'goal conflicts' was added to capture adherence barriers that were not

299 reflected by the 2005 version of the TDF. The appropriateness of the adaptation is confirmed  
300 by the updated version of the TDF,<sup>17</sup> which now incorporates goal conflicts.

301 Contrary to the present paper which mapped adherence barriers to all bar three of the TDF  
302 domains, Presseau *et al.*<sup>22</sup> report that fewer TDF domains were relevant and did not map  
303 adherence barriers to the skills, beliefs about capabilities, motivation and goals,  
304 environmental context or emotions domains. Differing methodological approaches may  
305 account for this as Presseau and colleagues sought to identify the most relevant domains  
306 whereas the present article sought to explore the breadth of determinants. The latter approach  
307 has allowed exploration of adherence barriers which are often overlooked. A further  
308 difference is that Presseau and colleagues included the social/professional role and identity  
309 domain which was excluded from the present paper. Crayton *et al.*<sup>23</sup> also report redundancy  
310 of this domain when exploring adherence determinants in stroke survivors, as do Voshaar *et*  
311 *al.*<sup>24</sup> with regards to adherence barriers and facilitators for disease-modifying anti rheumatic  
312 drugs. In the present paper the social norms domain was used for barriers associated with not  
313 identifying oneself as a medicines taker. These minor differences in mapping highlight that  
314 despite robustly employed methods, there is still inherent subjectivity in TDF interpretation.  
315 The inherent subjectivity of the TDF mapping process means that a different theoretical map  
316 could have been produced by other researchers, as highlighted by the work reported by  
317 Presseau *et al.*<sup>22</sup> The mapping decision being undertaken by a research team with expertise in  
318 behavioural science and medication adherence plus refinement of this mapping based on  
319 patient input provides some confidence in the final map. However, further validation of the  
320 mapping decisions by an independent peer with expertise in these fields may have added  
321 further rigour.

322 Crayton *et al.*<sup>23</sup> highlight that ‘emotions’, ‘beliefs about consequences’ and ‘knowledge’  
323 appeared to be most influential TDF domains when mapping adherence determinants in stroke  
324 survivors. This finding is consistent with the qualitative explorations reported in this present  
325 paper. Voshaar *et al.*<sup>24</sup> also report mapping of adherence barriers across the range of TDF  
326 domains, with notable consistency in mapping compared to the work presented in the present  
327 paper. Both studies therefore support applicability of the work presented in the current  
328 article, beyond CVD prevention.

329 The studies reporting mapping of adherence barriers to the TDF<sup>22-24</sup> provide useful  
330 contextualisation of the present work and highlight the similarities of adherence barriers  
331 across a range of LTCs. However, the utility of each of these studies for adoption as routine  
332 practice is limited by their focus on specific diseases. The present paper presents the first  
333 TDF-based conceptual framework of medication adherence barriers across multiple LTCs,  
334 and is also the first paper to develop a framework based on both literature-identified and  
335 qualitatively explored adherence barriers.

336 The focus groups in the present study, added richness to the data and, despite a large body of  
337 existing literature regarding adherence barriers, new barriers were identified spanning a range  
338 of TDF domains. An awareness of barriers such as a lack of knowledge about repeat  
339 prescription ordering services may be useful in supporting patients who wish to adhere but  
340 struggle with the management of their medicines. Likewise, the information yielded about  
341 the range of negative emotions associated with medicines taking, adds to our knowledge of  
342 the factors that may influence a patient’s decisions to not adhere. Emotions, such as feelings  
343 of frustration and being ‘short-changed’, may represent modifiable determinants of adherence  
344 worthy of further investigation as these are often overlooked<sup>29,37</sup>. Practitioners seeking to



345 resolve non-adherence should be aware of the diverse plethora of factors that may influence  
346 adherence and mindful of the emotional components of medicines-taking behaviour.

347 The present work creates an evidence-based platform for developing novel, theory guided  
348 interventions to improve medication adherence. Whilst other theoretically informed  
349 adherence interventions have not always yielded improved outcomes,<sup>15,37</sup> this may be  
350 influenced by the lack of guidance regarding how these theories should be used for  
351 intervention design. The structured approach offered by the TDF and availability of work  
352 linking TDF domains to evidence based BCTs may address this difficulty. A programme of  
353 work to develop a novel adherence intervention, based on this conceptual framework will  
354 follow. Whilst theory guided literature<sup>20</sup> can be utilised to match BCTs to the domains of the  
355 TDF, much work is needed in understanding how these BCTs are applicable to medicines-  
356 related consultations. Moreover, notable implementation work is necessary to explore how  
357 these BCTs are best delivered, from where and by whom.

## 358 **Conclusion**

359 This work provides the foundations for developing a patient questionnaire, grounded in the  
360 adherence barriers mapped to the TDF which will enable identification of an individual's  
361 barriers to adherence. As the focus groups were undertaken in the context of medicines  
362 prescribed for the prevention of CVD, it is intuitive to develop and trial a questionnaire in the  
363 same population. However, as the literature-identified barriers discussed in these focus  
364 groups were sourced from a variety of LTCs, it is likely that the adherence barriers will also  
365 be applicable to medication non-adherence in other LTCs. Further work is necessary to  
366 confirm this and to establish how adherence barriers vary for acute conditions.

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368

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**Table 1: Summary of participant characteristics for consultation exercises**

<b>Participant characteristics</b>	<b>Measure</b>	<b>Consultation exercise one (n = 5)</b>	<b>Consultation exercise two (n=9)</b>
Male gender	Number (%)	3 (60%)	5 (55.5%)
Age (years)	Median (IQR)	70.0 (45.5, 76.5)	62.0 (54.0, 75.5)
Exempt from prescription charges	Number (%)	3 (60%)	6 (66.7%)
Number of regularly prescribed medicines	Median, (IQR)	3 (1, 5)	2 (2, 6)
Employed by the university	Number (%)	2 (40%)	1 (11.1%)

**Table 2: Summary of adherence barriers mapped to each domain of the original TDF**

<b>TDF Domain</b>	<b>Adherence barriers mapped to this domain</b>
Knowledge	<ul style="list-style-type: none"> <li>• Not knowing how to order prescriptions or about services that facilitate this process</li> <li>• Not knowing how to collect prescriptions or about services that facilitate this process</li> <li>• Having insufficient information about medicines e.g. how they work, why they were prescribed, side effects and benefits</li> <li>• Not knowing how (and when) to take medicines as prescribed</li> </ul>
Skills	<ul style="list-style-type: none"> <li>• Physical inability to take medicines as prescribed e.g. swallowing difficulties and problems accessing medicines from packaging</li> <li>• Cognitive inability to take medicines as prescribed e.g. inability to read and/or understand instructions</li> <li>• Inability to identify and differentiate between different medicines</li> <li>• Lack of organisational and forward planning skills (not having a system in place to help manage medicines)</li> </ul>
Beliefs about capabilities	<ul style="list-style-type: none"> <li>• Lack of confidence in ability to adhere and manage medicines e.g. feeling regimen is too complex</li> <li>• Lack of confidence to overcome difficulties with medicines taking e.g. experience of side effects</li> <li>• Perceived inability to cope with medicines related changes</li> </ul>
Beliefs about consequences	<ul style="list-style-type: none"> <li>• Fear that medicines will be (are) harmful</li> <li>• Belief that medicines cannot be trusted</li> </ul>

	<ul style="list-style-type: none"> <li>• Doubting the efficacy of medicines</li> <li>• Not believing that there is a need for treatment</li> <li>• Denial of illness or non-acceptance of diagnosis</li> <li>• Decision making process justified belief about consequences (or lack of consideration of consequences) e.g. preference for alternative remedies</li> </ul>
Motivation and Goals	<ul style="list-style-type: none"> <li>• Not perceiving medicines taking as a priority</li> <li>• Lack of intention to adhere</li> <li>• Lack of motivation to adhere</li> </ul>
Goal Conflicts*	<ul style="list-style-type: none"> <li>• Cost of medicines (having to choose between paying for a prescription and something else)</li> <li>• Having a busy lifestyle (e.g. work and travel) and other priorities (e.g. family commitments or meal times) which impede medicines taking at specific times</li> <li>• Being too busy to order and collect prescriptions/having other priorities which impede ordering and collecting medicines</li> </ul>
Memory, attention & decision processes	<ul style="list-style-type: none"> <li>• Forgetting to take medicines</li> <li>• Forgetting to order/collect medicines from pharmacy</li> <li>• Lack of attention in medicines taking e.g. making errors or forgetting due to distractions</li> </ul>
Environmental context and resources	<ul style="list-style-type: none"> <li>• Problems with pharmacy/GP surgery e.g. not stocking medicines, lost prescriptions, failed orders etc.</li> <li>• Difficulties getting to pharmacy/GP surgery to collect prescriptions</li> <li>• Changes to environment or daily routine which impede medicines taking</li> </ul>
Social influences	<ul style="list-style-type: none"> <li>• Fear of judgement, discrimination or social stigma</li> <li>• Cultural and religious norms and expectations</li> <li>• Lack of trust in prescriber</li> <li>• Lack of social support</li> </ul>
Emotion	<ul style="list-style-type: none"> <li>• Experience of negative emotions associated with medicines taking e.g. frustration or embarrassment</li> <li>• Perceiving medicines taking as a negative reminder of illness/condition</li> <li>• Perceiving medicines taking as a burden</li> </ul>
Social/professional role & identity	<i>No adherence barriers mapped to this domain</i>
Behavioural regulation	<i>No adherence barriers mapped to this domain</i>
Nature of the behaviour	<i>No adherence barriers mapped to this domain</i>

\* A newly created domain to reflect adherence barriers that did otherwise not fit