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Identifying behavior change techniques for inclusion in a complex intervention targeting antipsychotic prescribing to nursing home residents with dementia.

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Implications

Practice: Sixteen behavior change techniques have been identified, that may be used as the basis for behavior change and quality improvement interventions by clinicians targeting inappropriate antipsychotic prescribing to nursing home residents with dementia.

Policy: Policymakers should consider developing suitable systems to enable prescribers to compare their own antipsychotic prescribing practices, to that of their peers, in a meaningful manner.

Research: The systematic and detailed approach undertaken to identify appropriate BCTs in this study, could be used as an example for other interventions.

Identifying behavior change techniques for inclusion in a complex intervention targeting antipsychotic prescribing to nursing home residents with dementia.

Abstract

Background:

Nursing home residents with dementia are commonly prescribed antipsychotics despite the associated increased risk of harms. Interventions to optimize prescribing practice have been found to be effective in the short-term, but there is a lack of evidence to support sustainability of effects, along with a lack of theory, public involvement and transparency in the intervention development process.

Purpose:

Using theory has been advocated as a means of improving intervention sustainability. The aim of this study was therefore to identify behavior change techniques (BCTs) for inclusion in a complex intervention targeting antipsychotic prescribing to nursing home residents with dementia.

Methods:

A comprehensive approach to identifying a long list of all potential BCTs from three different sources was undertaken. The most appropriate BCTs were then selected through a two-round Delphi consensus survey with a broad range of experts (n=18 panellists). Advisory groups of people with dementia, family carers, and professional stakeholders provided feedback on the final BCTs included.

Results:

After two Delphi survey rounds, agreement was reached on 22 BCTs. Further refinement of the selected BCTs based on advisory group and panellists' feedback, along with use of the APEASE criteria (Affordability, Practicability, Effectiveness, Acceptability, Side effects/safety and Equity) resulted in a final list of 16 BCTs.

Conclusion:

The next step in intervention development will be to identify the most appropriate mode of delivery of the 16 BCTs identified for inclusion. The study provides a case-example of a systematic approach to incorporating evidence with stakeholder views in the identification of appropriate BCTs.

Introduction

Antipsychotics are commonly prescribed to nursing home residents with dementia for the management of behavioral and psychological symptoms of dementia (BPSD) [1-4]. However, antipsychotics have limited effectiveness for treating BPSD and are associated with an increased risk of mortality, stroke and other serious side effects [5, 6]. Non-pharmacologic interventions are recommended as the first line treatment for BPSD, with antipsychotics only recommended for severe symptoms, where there is significant patient distress or risk of harm, or when non-pharmacologic interventions have failed [7-9].

A 2014 systematic review determined that many types of interventions were effective at reducing inappropriate antipsychotic prescribing to nursing home residents with dementia in the short-term [10]. These interventions were categorized as educational programs (n=11 studies), outreach services, where specialists visited the nursing homes (n=2 studies), medication reviews (n=4 studies) and multicomponent interventions (n=5 studies) [10]. However, the review authors noted that there was a lack of evidence to support sustainability of effects. In addition, we identified a distinct lack of theory, patient and public involvement (PPI) and transparency in the intervention development processes in the included studies [10].

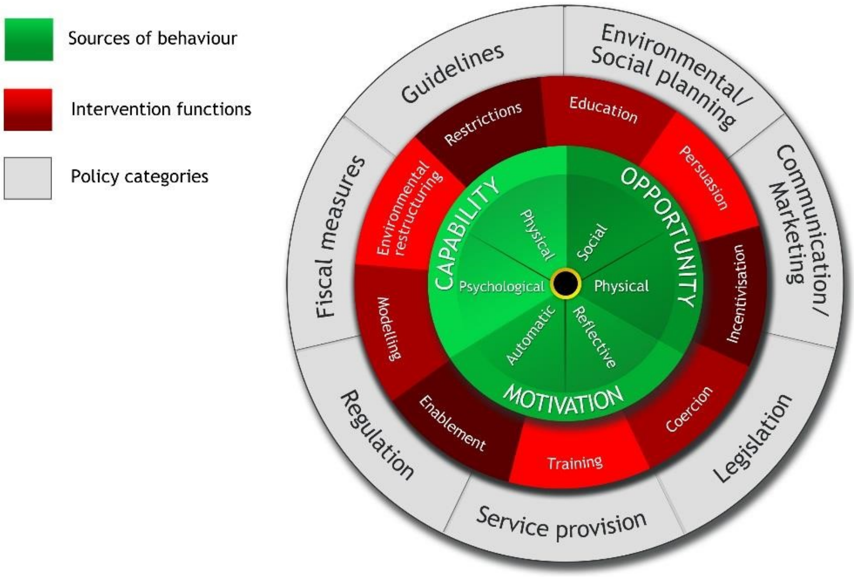
It has been argued that interventions aimed at changing healthcare professional behaviors may not have had the desired long-term effects due to the lack of theory in the development of the intervention [11]. Evidence suggests that interventions that make extensive use of theory may have larger effects on behavior than those that use less or no theory [12]. The explicit use of theory can help us to better understand the key elements of the intervention, the participants and the context. Moreover, it can provide a generalizable framework, inform the development, delivery and evaluation processes, and permit an exploration of potential causal mechanisms [13].

There is an increasing evidence base to suggest that PPI and the incorporation of stakeholder views can enhance the quality and appropriateness of research [14]. Furthermore, from an ethical perspective, involving those who might potentially be affected by the findings in research has been strongly advocated [15].

In terms of research transparency, there has been a concerted effort in recent times to improve the reliability, utility and impact of health research, while reducing research waste, through more transparent and accurate reporting [16]. Inadequate reporting of interventions may have serious consequences for clinical practice, research replication, policy making and patients, if readers cannot determine how an intervention was developed and implemented [17].

Taken together, these research issues suggest the need for a systematic, transparent approach, incorporating PPI and stakeholder input in the intervention development process. The Behavior Change Wheel (BCW) is one systematic approach for applying behavioral theory to complex intervention development [18]. The BCW guidance on developing behavior change interventions was developed by synthesizing existing frameworks for intervention development according to three criteria: comprehensiveness, coherence, and a clear link to an overarching model of behavior (Figure 1).

Figure 1: The behavior change wheel [19]


Sources of behaviour
Intervention functions
Policy categories
CAPABILITY
OPPORTUNITY
MOTIVATION
Physical
Psychological
Social
Physical
Automatic
Reflective
Education
Persuasion
Incentivisation
Coercion
Training
Enablement
Modelling
Environmental restructuring
Restrictions
Guidelines
Environmental/ Social planning
Communication/ Marketing
Legislation
Service provision
Regulation
Fiscal measures

Essentially the BCW provides the intervention designer with theory-informed tools and techniques to help understand and change behavior in a step-by-step and transparent manner [18]. There are three main stages to the BCW. The first stage involves understanding the behavior through the conduct of a thorough analysis of the behavior and the context in which it occurs. Once a target behavior has been identified, the BCW provides guidance on identifying what needs to shift to bring about change (i.e. a ‘behavioral diagnosis’ is conducted) and mapping these determinants to intervention functions, the broad categories of ways an intervention can change behavior, and policy options. The final stage involves identifying content and implementation options. A core component of the final stage is to identify the most appropriate behavior change techniques (BCTs) for the planned intervention. BCTs are defined as the active component of an intervention designed to change behavior, and are essential for intervention transparency and future replication of interventions [20]. A comprehensive list of 93 BCTs and associated definitions exists as a standardized language known as the BCT Taxonomy version 1 (BCTTv1) [20]. By providing a standardized language to describe intervention content, BCTs facilitate the translation of interventions into practice at scale.

Identifying appropriate BCTs requires the incorporation of an understanding of influences on behavior and existing literature, with the views of key stakeholders, to ensure the intervention is context-appropriate, evidence-based, and can be translated into practice. Various methods to identify the most appropriate BCTs have been described [21]. Although there is currently no clear guidance on the optimal method, using expert consensus groups (such as Delphi surveys) and/or guidance materials matching BCTs to behavioral determinants feature prominently throughout the literature [22-26].

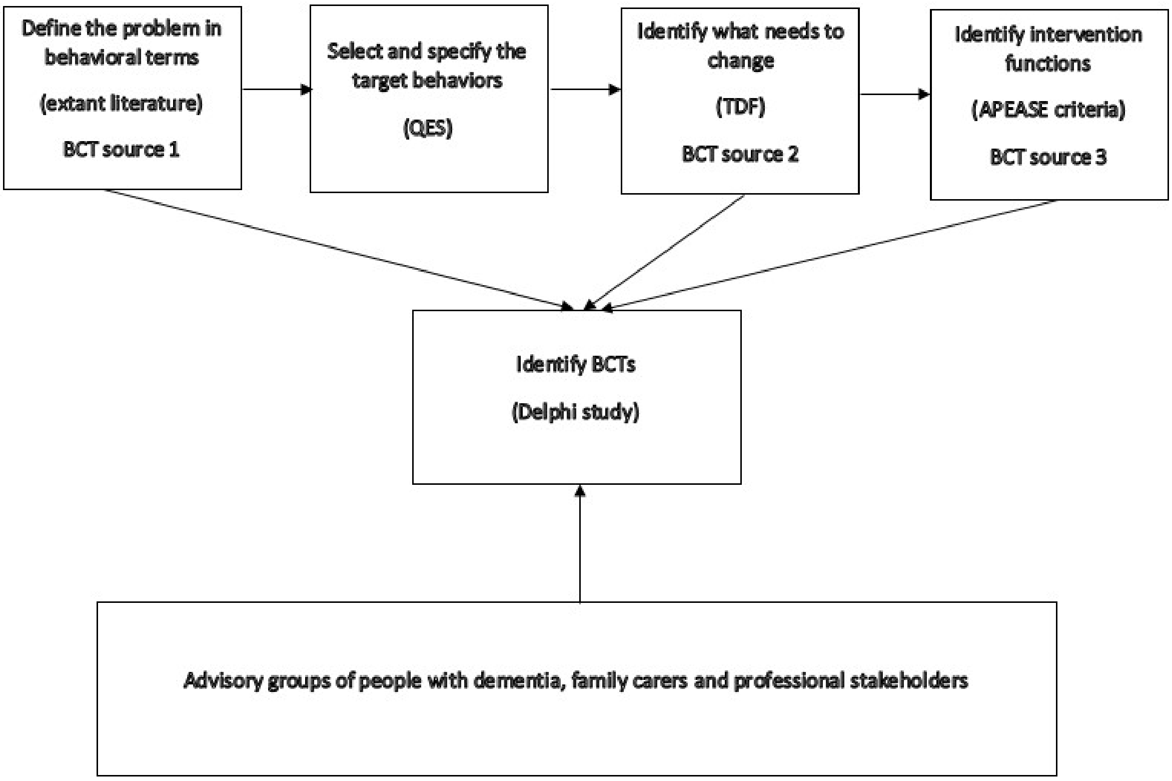
A Delphi survey is defined as a *"group facilitation technique that seeks to obtain consensus on the opinions of experts through a series of structured questionnaires (or rounds)"* [27]. Previous studies have used Delphi surveys to achieve consensus from stakeholders, on which BCTs are potentially suitable for inclusion in behavior change interventions [26, 28, 29]. However, the approaches used differed significantly across studies, even for the same behavior. For example, with regards to smoking behaviors, one study retrieved 55 BCTs linked to the determinants of waterpipe smoking from the literature, divided these 55 BCTs into three broad intervention groups, and then 14 panellists ranked each BCT in order of perceived importance, within each of the three intervention groups [28]. Another study took a very different approach at identifying suitable BCTs for inclusion in an intervention to reduce smoking during pregnancy, through a three-round Delphi survey with 44 panellists [29]. Round-one asked panellists to rate the 'influence' and 'difficulty' of 34 pre-identified barriers and facilitators using a 5-point Likert scale, and gathered panellists' suggestions on ways to address these. Rounds two and three sought further consensus on the barriers and facilitators and on 'appropriateness' of the panellists' suggestions. The suggestions were then coded for BCTs by the research team after the Delphi study was completed [29]. Hence even within similar behavior change contexts, there are significant differences in the approaches undertaken to identify BCTs. Therefore, there is a need to better standardize, and report, the approach to BCT identification so that future researchers can replicate and improve upon this process.

The aim of this study was to identify BCTs for inclusion in a complex intervention targeting antipsychotic prescribing behaviors (appropriate requesting by nurses and prescribing by general practitioners [GPs]). The study is part of a larger project which aims to develop an evidence-based, theoretically informed complex intervention to sustainably improve the appropriateness of antipsychotic prescribing to nursing home residents with dementia, using the BCW approach, with stakeholder engagement, and PPI throughout. The study also provides a case-example of a systematic approach to incorporating evidence with stakeholder views in the identification of appropriate BCTs which may be of use to the development of interventions across behaviors and contexts.

Methods

The current study focused on the process of identifying BCTs for inclusion in a complex intervention targeting appropriate requesting and prescribing of antipsychotics to nursing home residents with dementia, in Ireland (Figure 2). To provide context for this process, an overview of the development of this complex intervention is described, followed by the detailed methods of the current study.

Figure 2: The steps (and sources/methods) involved in identifying behavior change techniques for inclusion in a complex intervention


Define the problem in behavioral terms
(extant literature)
BCT source 1
Select and specify the target behaviors
(QES)
Identify what needs to change
(TDF)
BCT source 2
Identify intervention functions
(APEASE criteria)
BCT source 3
Identify BCTs
(Delphi study)
Advisory groups of people with dementia, family carers and professional stakeholders

APEASE = Affordability, Practicability, Effectiveness, Acceptability, Side effects/ safety, Equity; BCT = Behavior Change Technique; QES = Qualitative Evidence Synthesis; TDF = Theoretical Domains Framework

Overview of development of complex intervention

We broadly followed the BCW approach [18] to intervention development as operationalized by Sinnott *et al.* [23]. These researchers conducted a qualitative evidence synthesis (QES) and semi-structured interviews in order to gain a deeper understanding of the behavior, prior to identifying BCTs through an expert panel consensus meeting. Sinnott *et al.* argued that the conduct of these qualitative studies generated much needed data on the research problem and was a strength of the approach undertaken [23].

Intervention development began by conducting a QES exploring the complex influences on decision-making regarding antipsychotic prescribing to nursing home residents with dementia, using meta-ethnography (Figure 2)[30]. One of our key findings was the need to target both the main requesters (i.e. nursing staff) and prescribers (i.e. GPs) of antipsychotics when designing any intervention. A follow-on qualitative study using the Theoretical Domains Framework (TDF), an integrative framework of influences on behavior developed by synthesizing multiple behavior change theories, explored the determinants of appropriate requesting and prescribing behaviors across the 14 TDF domains [31]. From this study, the predominant TDF domains were identified, highlighting what needs to change for the desired behaviors to occur, and indicating some potential intervention options (Figure 2). The largely deductive approach used for the qualitative study complemented the inductive approach of the QES. The next step in developing an intervention was to identify appropriate BCTs and this leads us onto our current study.

Current study

The current study targeted the Irish nursing home setting, where most of the care is provided by on-site nurses and healthcare assistants, with regular visits from physicians (GPs and/or specialists) who are generally based off-site. We undertook a comprehensive approach to identifying all potential BCTs (‘long list’) from three sources (Figure 2) and then selected the most appropriate BCTs for our intervention using a Delphi consensus survey with a broad range of experts. The QES was not considered a source of BCTs due to its bottom-up, metaethnographic approach, but rather it informed the TDF-based qualitative interview study. Designing an intervention with the best possible potential for future implementation was a key part of the process, and we aimed to engage and catalyze dialogue between the researchers, practitioners and members of the public in identifying the intervention content. Therefore, as a core component of our intervention development process for the project, we established PPI advisory groups, one with people with dementia, and one with family carers, with whom we consulted on an ongoing basis.

The PPI advisory group meetings with people with dementia were co-facilitated by the primary author and a member of the Alzheimer Society of Ireland and used participatory approaches to support members to get involved, including flipcharts, coloured cards and assistance with writing. Four sessions occurred in total. The meetings with family members were less structured, and although three face-to-face group meetings took place, most of the interactions were via phone, email or letters. Alongside our PPI advisory groups, we separately consulted with professional stakeholders (three GPs, one consultant geriatrician, two consultant psychiatrists of old age, three nurses and two pharmacists) who were involved in providing care to nursing home residents with dementia. These consultations tended to be less structured than that of the PPI groups and occurred throughout the intervention development process. For example, these consultations took place in-person (as a small group or one-to-one), or else via phone or email. Ethics approval was provided by the local research ethics committee (ECM 4X 19/01/16).

Generation of 'Long List' of BCTs

Three sources were used to create a 'long list' of BCTs (Figure 2):

Source 1: BCT intervention content of the 22 studies [32-54] included in a 2014 systematic review [10]. This systematic review examined interventions to reduce inappropriate prescribing of antipsychotics to nursing homes with dementia and was selected as we considered it to be the most comprehensive and highest quality review in this area. BCTs from each intervention study directed at our target behaviors (appropriate requesting and prescribing of antipsychotics) were coded by the primary author using the BCTTv1 [20]. The primary author had completed online and face-to-face training in BCTTv1. All BCTs that were coded in at least two studies were added to the 'long list'. This requirement of two prior uses aimed to minimize inclusion of erroneous one-off BCTs due to the often-suboptimal nature of intervention reporting, and to account for the inherent interpretive nature of BCT coding.

Source 2: Mapping of predominant TDF domains to the BCTs [31]. The TDF consists of 14 domains and provides a comprehensive, theory-informed approach to identifying the determinants which influence behaviors [55]. The TDF also aligns with the first stage of the BCW [18]. In our previous qualitative study with local healthcare providers and family carers, we used the TDF to identify what factors need to change in order to achieve the desired change in antipsychotic prescribing behaviors i.e. a 'behavioral diagnosis' was undertaken. For this qualitative study, the predominant TDF domains and determinants influencing these complex prescribing behaviors were identified [31]. Nine predominant TDF domains were identified: *Behavioral regulation; Beliefs about capabilities; Beliefs about consequences; Emotion; Environmental context and resources; Knowledge; Memory, attention, and decision processes; Social influences; and Social/professional role and identity [31]*. These TDF domains were then mapped to the relevant BCTs from the BCTTv1 guided by methods described by Cadogan *et al.* [56, 57].

A mapping tool developed by Cane *et al.* [58] was used as the primary guiding document and provided clear links between 12 (of the 14) TDF domains and the BCTs from BCTTv1. Notable omissions are with regard to the *Memory, attention and decision-processes* and *Social/professional role and identity* TDF domains which are not mapped to any BCTs using this tool. This is because in the original mapping study by Cane *et al.*, experts did not consistently allocate any BCT to these two domains [58]. To circumvent this problem, an older mapping matrix developed by Michie *et al.* [59] was used to map these two TDF domains to the BCTs. This particular matrix [59] was developed prior to the establishment of the BCTTv1 [20], hence there are differences in terms of the BCT labels and definitions between these two matrices [58, 59]. However, there is also substantial overlap between these different versions of BCTs. Hence for the purpose of clarity, the few BCTs that were identified using the older matrix were converted to their nearest BCTTv1 equivalent.

Source 3: Mapping of intervention functions to the BCTs. Intervention functions are defined as *"broad categories of means by which an intervention can change behavior*" [18]. The 'behavioral diagnosis' from our qualitative study, [31] helped us to specify what exactly needed to change in order to bring about the desired behavior, and using BCW matrices we were able to identify the range of intervention functions most likely to be effective in achieving this change [18]. To help us select the most appropriate intervention functions, our research team (the five authors of this paper) used the APEASE criteria (affordability, practicability, effectiveness, acceptability, side effects and equity) to identify the functions relevant to this intervention. Sustainability issues were also discussed by the research team, for example, we considered whether the intervention sites could or would continue to engage with the proposed intervention functions after we had completed our research.

The primary author also used the APEASE criteria with a range of professional stakeholders, and in a less formal manner with the PPI advisory group members, for example asking, *"What type of intervention would you like to see, and why?"* Specifically, we intentionally did not go through the APEASE criteria systematically with PPI advisory group members, as we felt that the questions might be too academic for some members. Instead potential interventions options were described, and this would prompt a broader discussion between members. The recordings from these sessions were used to inform the ongoing intervention development process at all stages. Points raised by the PPI advisory groups were discussed with the professional stakeholders at a later stage, and vice versa. Using BCW guidance [18], we then mapped our selected intervention functions to the most frequently used BCTs for each relevant intervention function.

At the end of this process, BCTs from all three sources were collated into a 'long list' alongside their definitions and operationalized examples within the context of antipsychotic prescribing to nursing home residents with dementia. Two of the research team members generated this list to ensure that all BCTs could be operationalized for the purpose of our intervention, and that the examples remained true to their respective BCT definition.

Consensus-approach to identifying BCTs

Using the approach reported by Millar *et al.* as a guide [60], we conducted an online tworound Delphi survey with a range of experts to reach consensus on the most appropriate BCTs for our planned intervention. This approach was selected due to the clear and transparent methods described for gaining consensus on interventions in a similar care setting (i.e. nursing homes).

Notably, our Delphi survey was distinct from the PPI process, as the former sought to achieve a level of consensus specifically for identifying BCTs, whereas the latter sought to inform the intervention development process as a whole, via involvement and engagement, and occurred over a much longer period of time (Figure 2). Panellists were recruited, both internally from within PPI and stakeholder advisory groups and externally, based on meeting at least one of the following criteria:

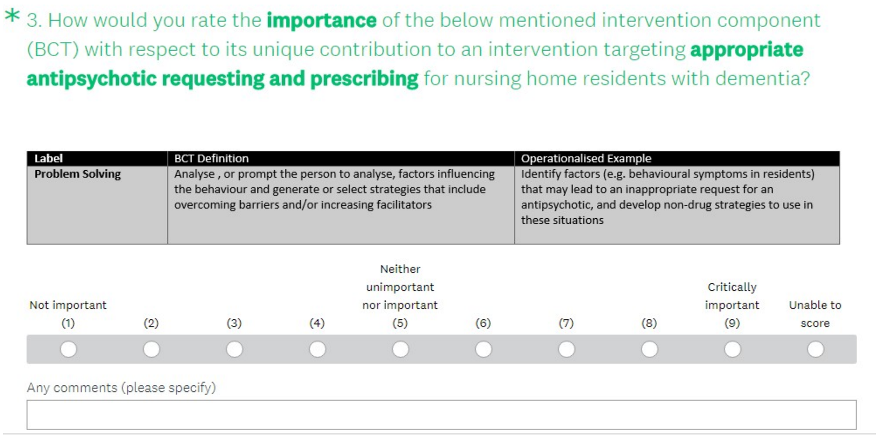
- knowledge or experience of antipsychotic prescribing in dementia
- expertise in behavior change or implementation science □

carer of a person with dementia.

All panellists that agreed to participate were emailed a link to the survey and given a deadline of 3-4 weeks to complete each round, with a reminder email sent as necessary. Only the panellists who completed the first round were invited to the second round.

From our previous research, we concluded that the intervention should target both the prescriber (GP) and requester (nurse), and this was outlined in the Delphi survey instructions (Figure 3) [30]. However, we did not explicitly anchor the panellists towards GPs or nurses, as we were open to broadening our targets based on the feedback from panellists. Furthermore, this feedback informed discussions with the research team to consider important system level barriers and facilitators, and whether different BCTs may be required for different intervention targets.

Figure 3: Example screenshot from an item in the first round



* 3. How would you rate the **importance** of the below mentioned intervention component (BCT) with respect to its unique contribution to an intervention targeting **appropriate antipsychotic requesting and prescribing** for nursing home residents with dementia?

Label	BCT Definition	Operationalised Example
Problem Solving	Analyse , or prompt the person to analyse, factors influencing the behaviour and generate or select strategies that include overcoming barriers and/or increasing facilitators	Identify factors (e.g. behavioural symptoms in residents) that may lead to an inappropriate request for an antipsychotic, and develop non-drug strategies to use in these situations

Not important (1)	(2)	(3)	(4)	Neither unimportant nor important (5)	(6)	(7)	(8)	Critically important (9)	Unable to score
○	○	○	○	○	○	○	○	○	○

Any comments (please specify)

Each of the two rounds were sent to the panellists using an online survey tool (SurveyMonkey®, California, US). Panellists were asked to rate how important they perceived each BCT with respect to its unique contribution to an intervention targeting appropriate antipsychotic requesting and prescribing, for nursing home residents with dementia. Panellists were provided with the BCT label, definition and an operationalized example.

Panellists were instructed to score the importance of each BCT on a Likert scale ranging from 1 (*not important*) to 9 (*critically important*). Panellists were also able to select *'unable to score'* if they felt they could not offer any opinion on that particular BCT [61] (Figure 3). Panellists were also provided with room for additional comments after every BCT and were invited at the end of the first round to suggest additional BCTs which they considered to be important. These suggested BCTs were collated at the end of the first round and added into the second round.

Consensus for a BCT being included in the intervention was defined as ≥ 70% of panellists scoring 7-9 and < 15% scoring 1-3. Exclusion was defined as ≥ 70% scoring 1-3 and < 15% scoring 7-9, in line with the methods described by Millar *et al*. [60]. This scoring system originated from the recommendations of the *Grading of Recommendations Assessment, Development and Evaluation* (GRADE) Working Group [61]. The second-round survey only contained BCTs for which no consensus had been reached, along with some additional new BCTs which had been suggested by panellists. Anonymized group scores from round-one were presented beside the BCTs, and panellists were asked to consider this feedback when rescoring. At the end of round-two, BCTs that still did not meet consensus were excluded. Data were analyzed descriptively using Microsoft Excel 2013 (WA, USA).

Qualitative feedback provided by the panellists was analyzed thematically and informed the second round of the Delphi study. Following the consensus step, to ensure the selected BCTs were appropriate for the Irish context and feasible within the limited resources of the planned intervention, the research team applied the APEASE criteria and considered sustainability issues, one last time, to determine the final set of BCTs.

The qualitative feedback provided by the panellists, along with input from the PPI and stakeholder groups also informed the intervention development more broadly.

Results

Generation of 'Long List' of BCTs

Source 1 (systematic review): Twenty-three unique BCTs were identified by coding the intervention content of the 22 studies included in the 2014 systematic review [10]. Of these 23 BCTs, 18 were coded in at least two studies, and hence were added to the 'long list' (Supplementary Table S.1). The three most prevalent BCTs among included studies were #4.1 *Instruction on how to perform a behavior* in 15 studies [32, 34, 36-40, 42, 44, 46, 49-51, 53, 54], #1.4 *Action planning* in 14 studies [32, 34-36, 40, 41, 44-48, 52-54] and #1.2 *Problem solving* in 13 studies [32, 36-39, 41, 44-46, 48, 50, 53, 54].

Source 2 (qualitative study): Mapping of our nine predominant TDF domains (as identified from our qualitative study [31]) to the BCTs using the Cane matrix [58] resulted in the identification of 32 BCTs. The Michie matrix [59] identified four BCTs (*Planning, Implementation; Self-monitoring; Social processes of encouragement, pressure, support; and Prompts, triggers, cues*). These four BCTs were converted to their nearest BCTTv1 equivalents of #1.4 *Action planning*, #2.3 *Self-monitoring of behavior*, #3.1 *Social support (unspecified*) and #7.1 *Prompts/cues* respectively.

Source 3 (mapping intervention functions to the BCTs): Linking our nine predominant TDF domains to BCW intervention functions [18], all nine intervention functions were determined to be potentially relevant. Using the APEASE criteria among our research group, with PPI and stakeholder input and considering sustainability issues, we included the following five intervention functions; *Education*, *Persuasion*, *Training*, *Environmental restructuring* and *Modelling* (Supplementary Table S.2). When asked, our PPI advisory group felt strongly that education was key to changing behaviors, and hence should be a central part of any intervention. Using BCW guidance [18], we mapped these five selected intervention functions to the most frequently used BCTs for each respective intervention function, thereby identifying 12 BCTs.

In total, 42 unique BCTs across 15 BCT clusters were identified from the three different sources and were included in our 'long list', after removal of 24 duplicate BCTs (Supplementary Table S.3). Initial screening of these 42 BCTs resulted in one BCT being removed (#2.6 *Biofeedback)*, as it was agreed that this BCT was inoperable within the context of any possible intervention. Hence 41 BCTs were included in our finalized 'long list' and were operationalized with examples for the purpose of the Delphi survey (Supplementary Table S.4).

Consensus-approach to identifying BCTs

A broad range of stakeholders (n=19) from three countries (Ireland, United Kingdom and Canada) were invited to participate in the Delphi survey; 18 agreed to participate and 16 completed both rounds. The 18 panellists included implementation scientists or behavior change experts (n=3), GPs (n=3), nurses (n=3), pharmacists (n=3), consultant psychiatrists of old age (n=2), psychologists with health services research expertise (n=2), a consultant geriatrician (n=1), and a carer (n=1). The carer and one nurse did not complete the second round. Panellists were advised that the examples provided were not necessarily indicative of any planned intervention, nor were we necessarily advocating them. Rather the examples served the purpose of understanding the meaning of these BCTs in the context of a hypothetical intervention.

At the end of the first round of the Delphi study, 12 of the 41 BCTs met the inclusion criteria and none met the exclusion criteria. Five new BCTs were included in round 2 based on panellists' suggestions (#1.5 *Review behavior goal(s),* #1.6 *Discrepancy between current behavior and goal*, #8.3 *Habit formatio*n, #13.2 *Framing/re-framing* and #13.3 *Incompatible beliefs*). These were added to the 29 BCTs for which consensus was not reached.

BCTs that focused on positive attitudes and working together as a team, such as #1.2 *Problem solving, #*1.4 *Action planning, #*12.2 *Restructuring the social environment* and #13.1 *Identification of self as role model* were viewed favorably by panellists. Regarding BCT #12.2, one panellist commented:

> *"An important point as the social influence on prescribing is likely to be significant and change will require that all involved are in agreement with a resident's care plan."*

Conversely BCTs that had negative connotations such as #5.5. *Anticipated regret* and #16.1 *Imaginary punishment*, were considered highly inappropriate, unacceptable and potentially unethical:

> *"This form of punishment will likely not be acceptable in the health system."*

Hence 34 BCTs were circulated in round-two, of which 10 then met the inclusion criteria and two met the exclusion criteria. Therefore, at the end of both rounds, 22 BCTs met the inclusion criteria and two BCTs met the exclusion criteria (Table 1).

Table 1: BCTs meeting inclusion and exclusion criteria after two Delphi rounds

Included BCT Label	**Mean Delphi score**	**Median Delphi Score**	**Respondents scoring 7-9 ‘critically important’ (%)**	**Respondents scoring 1-3 ‘not important’ (%)**
1.1 Goal setting (behavior)†	6.64	7	78.6	14.3
1.2 Problem Solving†	8.56	9	93.75	0
1.4 Action Planning†	8.19	9	93.75	0
1.5 Review behavior goal(s)	7.14	7	85.7	0
1.6 Discrepancy between current behavior and goal	7.36	7	78.6	0
2.2 Feedback on behavior†	7	7	81.25	6.25
4.1 Instruction on how to perform a behavior†	7.29	7.5	78.58	7.14
4.2 Information about antecedents†	7.27	7	73.33	0
5.1 Information about health consequences	7.64	9	78.6	7.1
6.1 Demonstration of the behavior†	7.64	8	78.6	7.1
6.2 Social Comparisons†	7.46	8	76.9	0
7.1 Prompts/cues†	7.5	7	78.6	0
8.1 Behavioral practice/rehearsal	7.29	8	71.4	0
8.2 Behavior Substitution†	7.8	8	86.7	0
8.3 Habit formation	7.5	8	85.7	0
9.1 Credible Source†	7.47	8	73.3	0
12.1 Restructuring the physical environment	7.21	7.5	78.6	7.1
12.2 Restructuring the social environment	7.14	7	78.6	0
12.5 Adding objects to the environment†	7.73	8	86.7	0
13.1 Identification of self as a role model	6.93	7	71.4	0
13.2 Framing/re-framing	6.86	7	71.4	14.3
15.3 Focus on past success	7.29	7.5	71.4	0

Excluded BCT Label	Mean Delphi score	Median Delphi Score	Respondents scoring 7-9 ‘critically important’ (%)	Respondents scoring 1-3 ‘not important’ (%)
12.3 Avoidance/reducing exposure to cues for the behavior	2.21	1	7.1	78.6
16.1 Imaginary punishment	2.5	2	7.1	71.4

BCTs = Behavior Change Techniques; † = Met inclusion criteria in the first round.

Applying the APEASE criteria as a research team to these 22 BCTs and considering sustainability issues, resulted in a finalized list of 16 BCTs from 10 BCT clusters (Table 2).

Table 2: Use of APEASE criteria to finalize behavior change techniques

BCT	Label	Affordability	Practicability	Effectiveness and cost effectiveness	Acceptability	Side effects/ safety	Equity	Decision Yes/No	Reasons for exclusion
1.1	Goal setting (behavior)	✓	×	✓	×	×	✓	No	Feedback from panellists was generally skeptical. National or regional data on antipsychotic prescribing patterns in nursing home residents with dementia is not readily available in Ireland, hence this BCT is not practicable. Furthermore, there may be some safety concerns about indiscriminately reducing antipsychotic prescribing levels.
1.2	**Problem Solving**	✓	✓	✓	✓	✓	✓	Yes	
1.4	**Action Planning**	✓	✓	✓	✓	✓	✓	Yes	
1.5	Review behavior goal(s)	✓	×	✓	×	×	✓	No	As 1.1
1.6	Discrepancy between current behavior and goal	✓	×	✓	×	×	✓	No	As 1.1
2.2	Feedback on behavior	✓	×	✓	×	×	✓	No	As 1.1
4.1	**Instruction on how to perform a behavior**	✓	✓	✓	✓	✓	✓	Yes	
4.2	**Information about antecedents**	✓	✓	✓	✓	✓	✓	Yes	
5.1	**Information about health consequences**	✓	✓	✓	✓	✓	✓	Yes	
6.1	**Demonstration of the behavior**	✓	✓	✓	✓	✓	✓	Yes	

6.2	Social Comparisons	✓	✗	✓	✗	✗	✓	No	As 1.1 In addition, feedback suggested that comparator data needs to be matched for each individual prescriber in order to be useful (which is not feasible)
7.1	**Prompts/cues**	✓	✓	✓	✓	✓	✓	Yes	
8.1	**Behavioral practice/ rehearsal**	✓	✓	✓	✓	✓	✓	Yes	
8.2	**Behavior Substitution**	✓	✓	✓	✓	✓	✓	Yes	
8.3	**Habit formation**	✓	✓	✓	✓	✓	✓	Yes	
9.1	**Credible Source**	✓	✓	✓	✓	✓	✓	Yes	
12.1	Restructuring the physical environment	✗	✗	✓	✓	✓	✓	No	Restructuring the physical environment for the purpose of this time and budget-constrained intervention, would not be affordable or practicable.
12.2	**Restructuring the social environment**	✓	✓	✓	✓	✓	✓	Yes	
12.5	**Adding objects to the environment**	✓	✓	✓	✓	✓	✓	Yes	

13.1	**Identification of self as a role model**	✓	✓	✓	✓	✓	✓	Yes	
13.2	**Framing/reframing**	✓	✓	✓	✓	✓	✓	Yes	
15.3	**Focus on past success**	✓	✓	✓	✓	✓	✓	Yes	

BCT = Behavior Change Technique

Qualitative feedback from the panellists influenced our decision-making. Generally, feedback towards all goal setting BCTs was met with skepticism. Specifically, in relation to the BCT #1.1 *Goal setting (behavior)*, some panellists felt that setting targets for antipsychotic prescribing reductions may not have the intended consequence:

> *"This is not helpful - prescribing needs to be appropriate, not necessarily reduced. You might have no reduction, after a goal of 10% reduction, and staff would become demoralized, even though a good process (exists)."*

Although the BCT #6.2 *Social comparison* was rated relatively highly in terms of importance for changing prescribing behaviors (Table 1), several panellists expressed concerns that unless the prescribing data were matched to each physician's local patient population, then comparing their prescribing to that of their peers was not necessarily beneficial. Currently, there are no such systems in place at a regional or national level in Ireland to allow prescribers to compare their antipsychotic prescribing practices to their peers. Moreover, there were some concerns that the prescribers may be potentially identifiable from any de-novo local dataset, and hence there was some reluctance to engage in audit and feedback:

> *"Importance depends on comparator selected: physicians may be more likely to identify with local comparators than national (although may be feasibility issues with local comparators)."*

Therefore, goal setting and social comparison BCTs were judged to have acceptability, practicability and safety issues according to the APEASE criteria, and were excluded by the research team (Table 2). The reasons for exclusion of all six BCTs at this stage are outlined in Table 2.

Discussion

This paper describes the process of identifying BCTs for inclusion in a complex intervention aimed at sustainably reducing inappropriate antipsychotic prescribing to nursing home residents with dementia. By using the BCW approach, and detailing our process, we have identified BCTs in a transparent manner and have thus enabled replication of our process by other researchers. Hence, the method described here to identify appropriate BCTs could be used as an example for other interventions. Our findings also have implications for practice, as the BCTs identified may be used as the basis for behavior change and quality improvement interventions by GPs and nurses working in the nursing home setting.

A systematic review and meta-analysis of BCTs in deprescribing interventions across contexts was published in 2018 by Hansen *et al.* [62]. Of 1,561 articles identified by the authors, 25 studies were included in this review, identifying 28 BCTs and 13 BCT clusters targeting deprescribing behaviors. The most frequently coded BCTs among included studies were #4.1 *Instruction on how to perform a behavior* (n=16), #9.1 *Credible source* (n=16) and #2.2 *Feedback on behavior* (n=14). There was a large overlap between the BCTs we identified through coding the systematic review by Thompson-Coon *et al.* (n=18 BCTs) [10] and those identified in the systematic review by Hansen *et al*. (n=28 BCTs) [62], despite the lack of overlapping studies between the two systematic reviews. For example, of the 10 BCTs identified by Hansen et al. and not initially identified by us, five of these were later identified through other sources of BCTs. The five remaining BCTs that were not identified by us through this process were unlikely to be included in the final intervention for various reasons. For example, panellists' responses suggested that some BCTs from the *goals and planning, feedback and monitoring* or *comparison of behavior* clusters would not be feasible in an Irish nursing home setting, due to the lack of routine feedback on antipsychotic prescribing practices. However, due to evidence to support the effectiveness of audit and feedback strategies [63], policymakers should consider developing suitable systems to enable prescribers to compare their own antipsychotic prescribing levels to that of their peers, in a meaningful manner.

Although previous studies have used Delphi surveys to identify BCTs for inclusion in behavior change interventions [26, 28, 29], key questions remain with regards to how best to select the most appropriate BCTs for a planned intervention. A standardized approach to selecting BCTs (such as the one undertaken in the current study) should be developed and agreed upon, to provide guidance for intervention developers and researchers. Additionally, more research is required to determine the most efficient approach to identifying and testing which BCTs lead to sustainable behavior change and ultimately better patient outcomes. One of the key strengths of this study was the transparent use of innovative methods to identify BCTs. By using this systematic and transparent approach we believe that we have contributed to the evolving science of complex intervention development. By retrieving potential BCTs from three different sources informed by previous research [10, 30, 31], and by involving a wide range of individuals in this process, we believe that we have used a comprehensive approach to identify the most appropriate BCTs for our planned intervention. Of particular benefit to further developing our intervention was the elicitation of stakeholders' views on certain BCTs, through the Delphi survey, PPI and stakeholder advisory groups. These views have helped to contextualize some of the key issues relevant to the Irish nursing home setting and have reinforced the importance of education and teamwork.

We argue that the precise qualitative methodologies adopted by intervention developers should suit the research questions rather than follow any strict protocol. For example, we used a deductive, TDF-based approach for our interview study [31]. Whereas Sinnott *et al.* (who also used the BCW [23]) used an inductive, grounded theory approach for their interview study [64]. Both approaches informed our respective intervention development processes, thereby indicating that either approach may be appropriate depending on the research questions asked.

One of the limitations of our study was the constrained involvement of people with dementia and carers in our Delphi survey. The carer who attempted the Delphi survey (along with some of the participating healthcare professionals) found the language of BCTs excessively academic. We had considered involving more PPI advisory group members in the Delphi survey; however, it is likely that the same situation would have arisen and may have resulted in undue stress in those individuals. In hindsight, their involvement in this particularly academic BCT identification process may not have been appropriate. Although we held several participatory meetings with PPI advisory group members, even more face-to-face time describing the possible intervention options and using participatory techniques such as card sorting and direct ranking may have been a more appropriate method of co-creating an intervention [65]. Alternatively, the approach used by Fergie et al. may have been more accommodating as it enables panellists to rank the importance of various options and to discuss potential solutions, in plain English, and only after consensus is reached are the findings coded by the researchers using BCTs [29]. However, time constraints prevented us from attempting these alternative approaches. Though we may have unsuccessfully involved PPI advisory group members in commenting on the precise components of a provider-facing intervention, the members created a rich narrative around their values and preferences that will be crucial in implementing the complex intervention. The challenge of meaningfully involving patients and public in research is an important issue to address as there are unique insights and mutual benefits that can only be gained by truly involving people directly affected by a condition [15, 66]. More evidence is required to help researchers understand how best to meaningfully involve people with dementia and carers in the development of theoryinformed interventions.

The next step in our project involves identifying the mode of delivery for our intervention, in addition to the sequencing and packaging of our selected intervention functions and BCTs. Inappropriate antipsychotic prescribing to nursing home residents with dementia has become a topical subject in recent times due to increased media scrutiny [67]. Many different interventions and strategies have been developed recently in an attempt to curb this inappropriate prescribing, both at local and national levels, including a repeat prescribing tool for GPs [68], a program combining staff training, social interaction, and antipsychotic prescribing guidance [69] and public reporting of antipsychotic prescribing levels in nursing homes [70].

While the focus of the current research was at the behavioral level, the successful implementation of the intervention will also require a consideration of the systems level and wider context. The issue of appropriate prescribing could also benefit from drawing more broadly from the implementation science literature, for example exploring the issue as an example of the ‘de-implementation’ of harmful practice [71]. From our previous qualitative research [30, 31], it was evident that multifaceted approaches are needed in order to achieve sustainable improvements. It is therefore important to consider the full range of potential modes of delivering our intervention, including the suitability of various theoretical approaches used in implementation science, before deciding on the most appropriate for our particular target behaviors, population groups and setting [18]. For example, though we have identified education should be a core component of our intervention, we need to determine how best to deliver educational interventions, using which theory, and alongside what, to achieve sustainable results.

Conclusion

Sixteen BCTs were identified for inclusion in a complex intervention targeting GP and nursing antipsychotic prescribing and requesting behaviors to nursing home residents with dementia, through an expert consensus process. More research is required to help researchers understand how best to meaningfully involve people with dementia and carers in the development of a theory-informed intervention, and how best to select BCTs for complex interventions. The systematic and detailed approach undertaken to identify appropriate BCTs in this study, could be used as an example for other interventions.

References

1. Janus SI, van Manen JG, IJzerman MJ, Zuidema SU: Psychotropic drug prescriptions in Western European nursing homes. *International psychogeriatrics.* 2016, 28(11):17751790.
2. Walsh KA, O'Regan NA, Byrne S, Browne J, Meagher DJ, Timmons S: Patterns of psychotropic prescribing and polypharmacy in older hospitalized patients in Ireland: the influence of dementia on prescribing. *International psychogeriatrics.* 2016, 28(11):1807-1820.

3. Kirkham J, Sherman C, Velkers C, Maxwell C, Gill S, Rochon P, Seitz D: Antipsychotic Use in Dementia:Is There a Problem and Are There Solutions? *The Canadian Journal of Psychiatry.* 2017, 62(3):170-181.

4. Jennings AA, Foley T, Walsh KA, Coffey A, Browne JP, Bradley CP: General practitioners' knowledge, attitudes and experiences of managing behavioural and psychological symptoms of dementia: a mixed methods systematic review. *International journal of geriatric psychiatry.* 2018:1-14.

5. Kales HC, Gitlin LN, Lyketsos CG: Assessment and management of behavioral and psychological symptoms of dementia. *bmj.* 2015, 350(7):h369.

6. Maust DT, Kim HM, Seyfried LS, Chiang C, Kavanagh J, Schneider LS, Kales HC: Antipsychotics, other psychotropics, and the risk of death in patients with dementia: number needed to harm. *JAMA psychiatry.* 2015, 72(5):438-445.

7. Reus VI, Fochtmann LJ, Eyler AE, Hilty DM, Horvitz-Lennon M, Jibson MD, Lopez OL, Mahoney J, Pasic J, Tan ZS: The American Psychiatric Association practice guideline on the use of antipsychotics to treat agitation or psychosis in patients with dementia. *American Journal of Psychiatry.* 2016, 173(5):543-546.

8. National Institute for Health and Clinical Excellence (NICE): Dementia: assessment, management and support for people living with dementia and their carers. In. London, UK: NICE; 2018.

9. Department of Health: Appropriate prescribing of psychotropic medication for noncognitive symptoms in people with dementia (NCEC National Clinical Guideline No. 21). In. Available at: https://www.gov.ie/en/collection/c9fa9a-national-clinicalguidelines/; 2019.

10. Thompson-Coon J, Abbott R, Rogers M, Whear R, Pearson S, Lang I, Cartmell N, Stein K: Interventions to reduce inappropriate prescribing of antipsychotic medications in people with dementia resident in care homes: a systematic review. *Journal of the American Medical Directors Association.* 2014, 15(10):706-718.

11. Michie S, Johnston M, Abraham C, Lawton R, Parker D, Walker A: Making psychological theory useful for implementing evidence based practice: a consensus approach. *BMJ Quality & Safety.* 2005, 14(1):26-33.

12. Webb T, Joseph J, Yardley L, Michie S: Using the internet to promote health behavior change: a systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of medical Internet research.* 2010, 12(1):e4.

13. The Improved Clinical Effectiveness through Behavioural Research Group (ICEBeRG): Designing theoretically-informed implementation interventions. *Implementation Science.* 2006, 1(1):4.

14. Brett J, Staniszewska S, Mockford C, Herron-Marx S, Hughes J, Tysall C, Suleman R: Mapping the impact of patient and public involvement on health and social care research: a systematic review. *Health Expectations.* 2014, 17(5):637-650.

15. Gove D, Diaz-Ponce A, Georges J, Moniz-Cook E, Mountain G, Chattat R, Øksnebjerg L, Dementia EWGoPw: Alzheimer Europe's position on involving people with dementia in research through PPI (patient and public involvement). *Aging & mental health.* 2018, 22(6):723-729.

16. Simera I, Moher D, Hirst A, Hoey J, Schulz KF, Altman DG: Transparent and accurate reporting increases reliability, utility, and impact of your research: reporting guidelines and the EQUATOR Network. *BMC Medicine.* 2010, 8(1):24.
17. Altman DG, Moher D: Importance of transparent reporting of health research. *Guidelines for reporting health research: A user's manual.* 2014:3-13.
18. Michie S, Atkins L, West R: The behaviour change wheel: a guide to designing interventions. UK: Silverback Publishing; 2014.
19. Michie S, Van Stralen MM, West R: The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation science.* 2011, 6(1):42.
20. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, Eccles MP, Cane J, Wood CE: The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of behavioral medicine.* 2013, 46(1):81-95.
21. Michie S, West R, Sheals K, Godinho CA: Evaluating the effectiveness of behavior change techniques in health-related behavior: a scoping review of methods used. *Translational Behavioral Medicine.* 2018, 8(2):212-224.
22. Mc Sharry J, Murphy P, Byrne M: Implementing international sexual counselling guidelines in hospital cardiac rehabilitation: development of the CHARMS intervention using the Behaviour Change Wheel. *Implementation Science.* 2016, 11(1):134.
23. Sinnott C, Mercer SW, Payne RA, Duerden M, Bradley CP, Byrne M: Improving medication management in multimorbidity: development of the MultimorbiditY COllaborative Medication Review And DEcision making (MY COMRADE) intervention using the Behaviour Change Wheel. *Implementation Science.* 2015, 10(1):132.
24. Craig LE, Taylor N, Grimley R, Cadilhac DA, McInnes E, Phillips R, Dale S, O'Connor D, Levi C, Fitzgerald M: Development of a theory-informed implementation intervention to improve the triage, treatment and transfer of stroke patients in emergency departments using the Theoretical Domains Framework (TDF): the T 3 Trial. *Implementation Science.* 2017, 12(1):88.
25. Cadogan CA, Ryan C, Francis JJ, Gormley GJ, Passmore P, Kerse N, Hughes CM: Development of an intervention to improve appropriate polypharmacy in older people in primary care using a theory-based method. *BMC health services research.* 2016, 16(1):661.
26. Vestjens L, Kempen GI, Crutzen R, Kok G, Zijlstra GR: Promising behavior change techniques in a multicomponent intervention to reduce concerns about falls in old age: a Delphi study. *Health education research.* 2015, 30(2):309-322.
27. Hasson F, Keeney S, McKenna H: Research guidelines for the Delphi survey technique. *Journal of advanced nursing.* 2000, 32(4):1008-1015.
28. O'Neill N, Dogar O, Jawad M, Kellar I, Kanaan M, Siddiqi K: Which Behavior Change Techniques May Help Waterpipe Smokers to Quit? An Expert Consensus Using a Modified Delphi Technique. *Nicotine & Tobacco Research.* 2016, 20(2):154-160.
29. Fergie L, Campbell KA, Coleman-Haynes T, Ussher M, Cooper S, Coleman T: Stop smoking practitioner consensus on barriers and facilitators to smoking cessation in pregnancy and how to address these: A modified Delphi survey. *Addictive Behaviors Reports.* 2019, 9:100164.

30. Walsh KA, Dennehy R, Sinnott C, Browne J, Byrne S, McSharry J, Coughlan E, Timmons S: Influences on decision-making regarding antipsychotic prescribing in nursing home residents with dementia: A systematic review and synthesis of qualitative evidence. *Journal of the American Medical Directors Association.* 2017, 18(10):897. e891-897. e812.

31. Walsh KA, Sinnott C, Fleming A, Mc Sharry J, Byrne S, Browne J, Timmons S: Exploring Antipsychotic Prescribing Behaviors for Nursing Home Residents With Dementia: A Qualitative Study. *JAMDA.* 2018, 19(11):948-958. e912.

32. Ray WA, Blazer DG, 2nd, Schaffner W, Federspiel CF: Reducing antipsychotic drug prescribing for nursing home patients: a controlled trial of the effect of an educational visit. *Am J Public Health.* 1987, 77(11):1448-1450.

33. Schultz BM, Gambert SR: Minimizing the use of psychoactive medications in the institutionalized elderly. *Clinical Gerontologist: The Journal of Aging and Mental Health.* 1991.

34. Avorn J, Soumerai SB, Everitt DE, Ross-Degnan D, Beers MH, Sherman D, Salem-Schatz SR, Fields D: A randomized trial of a program to reduce the use of psychoactive drugs in nursing homes. *The New England journal of medicine.* 1992, 327(3):168-173.

35. Rovner BW, Edelman BA, Cox MP, Shmuely Y: The impact of antipsychotic drug regulations on psychotropic prescribing practices in nursing homes. *The American journal of psychiatry.* 1992, 149(10):1390-1392.

36. Ray WA, Taylor JA, Meador KG, Lichtenstein MJ, Griffin MR, Fought R, Adams ML, Blazer DG: Reducing antipsychotic drug use in nursing homes. A controlled trial of provider education. *Arch Intern Med.* 1993, 153(6):713-721.

37. Meador KG, Taylor JA, Thapa PB, Fought RL, Ray WA: Predictors of antipsychotic withdrawal or dose reduction in a randomized controlled trial of provider education. *J Am Geriatr Soc.* 1997, 45(2):207-210.

38. Heal C, McCracken A: Review of psychotropic medications and application of problem solving approaches to behavioural management in a dementia specific facility. *Geriaction.* 1998, 16:7-9.

39. Schmidt I, Claesson CB, Westerholm B, Nilsson LG, Svarstad BL: The impact of regular multidisciplinary team interventions on psychotropic prescribing in Swedish nursing homes. *J Am Geriatr Soc.* 1998, 46(1):77-82.

40. Earthy A, Collins J, Wong S, Myckatyn M: Ensuring the Appropriate Use of Neuroleptics in LTC A clinical investigation was designed to promote the appropriate use of neuroleptic medications in a long-term care facility. *Canadian Nursing Home.* 2000, 11(2):5-10.

41. Ballard C, Powell I, James I, Reichelt K, Myint P, Potkins D, Bannister C, Lana M, Howard R, O'Brien J *et al*: Can psychiatric liaison reduce neuroleptic use and reduce health service utilization for dementia patients residing in care facilities. *Int J Geriatr Psychiatry.* 2002, 17(2):140-145.

42. Hagen BF, Armstrong-Esther C, Quail P, Williams RJ, Norton P, Le Navenec CL, Ikuta R, Osis M, Congdon V, Zieb R: Neuroleptic and benzodiazepine use in long-term care in urban and rural Alberta: characteristics and results of an education intervention to ensure appropriate use. *Int Psychogeriatr.* 2005, 17(4):631-652.

43. Schneider LS, Dagerman KS, Insel P: Risk of death with atypical antipsychotic drug treatment for dementia: meta-analysis of randomized placebo-controlled trials. *Jama.* 2005, 294(15):1934-1943.

44. Fossey J, Ballard C, Juszczak E, James I, Alder N, Jacoby R, Howard R: Effect of enhanced psychosocial care on antipsychotic use in nursing home residents with severe dementia: cluster randomised trial. *Bmj.* 2006, 332(7544):756-761.

45. Dahl LJ, Wright R, Xiao A, Keeven A, Carr DB: Quality improvement in long term care: the psychotropic assessment tool (PAT). *J Am Med Dir Assoc.* 2008, 9(9):676-683.

46. Monette J, Champoux N, Monette M, Fournier L, Wolfson C, du Fort GG, Sourial N, Le Cruguel JP, Gore B: Effect of an interdisciplinary educational program on antipsychotic prescribing among nursing home residents with dementia. *Int J Geriatr Psychiatry.* 2008, 23(6):574-579.

47. Morrison A: Antipsychotic prescribing in nursing homes: an audit report. *Qual Prim Care.* 2009, 17(5):359-362.

48. Patterson SM, Hughes CM, Crealey G, Cardwell C, Lapane KL: An evaluation of an adapted U.S. model of pharmaceutical care to improve psychoactive prescribing for nursing home residents in northern ireland (fleetwood northern ireland study). *J Am Geriatr Soc.* 2010, 58(1):44-53.

49. Testad I, Ballard C, Bronnick K, Aarsland D: The effect of staff training on agitation and use of restraint in nursing home residents with dementia: a single-blind, randomized controlled trial. *The Journal of clinical psychiatry.* 2010, 71(1):80-86.

50. Westbury J, Jackson S, Gee P, Peterson G: An effective approach to decrease antipsychotic and benzodiazepine use in nursing homes: the RedUSe project. *Int Psychogeriatr.* 2010, 22(1):26-36.

51. Khan F, Curtice M: Non-pharmacological management of behavioural symptoms of dementia. *Br J Community Nurs.* 2011, 16(9):441-449.

52. Chakraborty A, Linton CR: Antipsychotic prescribing in dementia patients in care homes: proactive in-reach service improved quality of care. *Int J Geriatr Psychiatry.* 2012, 27(10):1097-1098.

53. Vida S, Monette J, Wilchesky M, Monette M, Friedman R, Nguyen A, Dastoor D, Cristache G, Sourial N, Tremblay L *et al*: A long-term care center interdisciplinary education program for antipsychotic use in dementia: program update five years later. *Int Psychogeriatr.* 2012, 24(4):599-605.

54. Monette J, Monette M, Sourial N, Vandal AC, Wolfson C, Champoux N, Fletcher J, Savoie ML: Effect of an interdisciplinary educational program on antipsychotic prescribing among residents with dementia in two long-term care centers. *Journal of Applied Gerontology.* 2013, 32(7):833-854.

55. Cane J, O'Connor D, Michie S: Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation science.* 2012, 7(1):37.

56. Cadogan CA, Ryan C, Francis JJ, Gormley GJ, Passmore P, Kerse N, Hughes CM: Improving appropriate polypharmacy for older people in primary care: selecting components of an evidence-based intervention to target prescribing and dispensing. *Implementation Science.* 2015, 10(1):161.

57. Patton DE, Cadogan CA, Ryan C, Francis JJ, Gormley GJ, Passmore P, Kerse N, Hughes CM: Improving adherence to multiple medications in older people in primary care: Selecting intervention components to address patient-reported barriers and facilitators. *Health Expectations.* 2018, 21(1):138-148.

58. Cane J, Richardson M, Johnston M, Ladha R, Michie S: From lists of behaviour change techniques (BCTs) to structured hierarchies: comparison of two methods of developing a hierarchy of BCTs. *British Journal of Health Psychology.* 2015, 20(1):130150.

59. Michie S, Johnston M, Francis J, Hardeman W, Eccles M: From theory to intervention: mapping theoretically derived behavioural determinants to behaviour change techniques. *Applied psychology.* 2008, 57(4):660-680.

60. Millar AN, Daffu-O’Reilly A, Hughes CM, Alldred DP, Barton G, Bond CM, Desborough JA, Myint PK, Holland R, Poland FM: Development of a core outcome set for effectiveness trials aimed at optimising prescribing in older adults in care homes. *Trials.* 2017, 18(1):175.

61. Guyatt GH, Oxman AD, Kunz R, Atkins D, Brozek J, Vist G, Alderson P, Glasziou P, FalckYtter Y, Schünemann HJ: GRADE guidelines: 2. Framing the question and deciding on important outcomes. *Journal of clinical epidemiology.* 2011, 64(4):395-400.

62. Hansen CR, O'Mahony D, Kearney PM, Sahm LJ, Cullinan S, Huibers CJA, Thevelin S, Rutjes AWS, Knol W, Streit S *et al*: Identification of behaviour change techniques in deprescribing interventions: a systematic review and meta-analysis. *British Journal of Clinical Pharmacology.* 2018, 84(12):2716-2728.

63. Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman AD: Audit and feedback: effects on professional practice and healthcare outcomes. *The Cochrane database of systematic reviews.* 2012(6):Cd000259.

64. Sinnott C, Hugh SM, Boyce MB, Bradley CP: What to give the patient who has everything? A qualitative study of prescribing for multimorbidity in primary care. *The British journal of general practice : the journal of the Royal College of General Practitioners.* 2015, 65(632):e184-191.

65. McMenamin R, Tierney E, MacFarlane A: Using a participatory learning and action (PLA) research approach to involve people with aphasia as co-researchers in service evaluation: an analysis of co-researchers’ experiences. *Aphasiology.* 2018, 32(sup1):142-144.

66. Pizzo E, Doyle C, Matthews R, Barlow J: Patient and public involvement: how much do we spend and what are the benefits? *Health Expectations.* 2015, 18(6):1918-1926.

67. Ivers NM, Taljaard M, Giannakeas V, Reis C, Williams E, Bronskill S: Public reporting of antipsychotic prescribing in nursing homes: population-based interrupted time series analyses. *BMJ Quality &amp; Safety.* 2019, 28(2):121-131.

68. Jennings AA, Guerin N, Foley T: Development of a tool for monitoring the prescribing of antipsychotic medications to people with dementia in general practice: a modified eDelphi consensus study. *Clinical interventions in aging.* 2018, 13:2107.

69. Ballard C, Corbett A, Orrell M, Williams G, Moniz-Cook E, Romeo R, Woods B, Garrod L, Testad I, Woodward-Carlton B *et al*: Impact of person-centred care training and person-centred activities on quality of life, agitation, and antipsychotic use in people

with dementia living in nursing homes: A cluster-randomised controlled trial. *PLOS Medicine.* 2018, 15(2):e1002500.

70. Maust DT, Kim HM, Chiang C, Kales HC: Association of the Centers for Medicare & Medicaid Services' National Partnership to Improve Dementia Care With the Use of Antipsychotics and Other Psychotropics in Long-term Care in the United States From 2009 to 2014. *JAMA internal medicine.* 2018, 178(5):640-647.

71. Upvall MJ, Bourgault AM: De-implementation: A concept analysis. *Nursing Forum.* 2018, 53(3):376-382.

Table S.1: Behavior Change Techniques identified in the 22 interventional studies included in the systematic review by Thompson-Coon et al.

Study (year)	1.1	1.2	1.3	1.4	2.2	2.3	2.4	3.1	3.2	3.3	4.1	4.2	5.1	5.3	6.1	6.2	7.1	8.1	8.2	9.1	12.1	12.2	12.5
Ray (1987)		✓		✓							✓		✓	✓					✓	✓			
Schultz (1991)									✓												✓	✓	
Avorn (1992)				✓							✓		✓						✓	✓			
Rovner (1992)				✓	✓									✓						✓			
Ray (1993)	✓	✓	✓	✓					✓		✓		✓		✓			✓		✓			
Meador (1997)	✓	✓							✓		✓		✓	✓	✓					✓			
Heal (1998)		✓				✓	✓				✓		✓		✓								
Schmidt (1998)		✓						✓			✓			✓								✓	
Earthy (2000)				✓	✓						✓		✓	✓			✓						✓
Ballard (2002)		✓		✓					✓			✓										✓	
Hagen (2005)											✓			✓			✓			✓			

Fossey (2006)	✓	✓		✓	✓				✓		✓	✓		✓	✓					✓		✓	
Study (year)	**1.1**	**1.2**	**1.3**	**1.4**	**2.2**	**2.3**	**2.4**	**3.1**	**3.2**	**3.3**	**4.1**	**4.2**	**5.1**	**5.3**	**6.1**	**6.2**	**7.1**	**8.1**	**8.2**	**9.1**	**12.1**	**12.2**	**12.5**
Dahl (2008)		✓	✓	✓		✓											✓					✓	✓
Monette (2008)		✓	✓	✓	✓				✓		✓		✓	✓			✓			✓		✓	
Morrisson (2009)	✓			✓		✓											✓						✓
Patterson (2010)		✓		✓	✓														✓			✓	
Westbury (2010)		✓			✓						✓		✓			✓	✓			✓		✓	
Testad (2010)								✓			✓			✓									
Khan (2011)	✓								✓	✓	✓	✓	✓		✓					✓		✓	
Chakraboorty (2012)	✓			✓		✓																✓	
Vida (2012)		✓		✓	✓						✓	✓	✓	✓						✓			
Monette (2013)		✓	✓	✓	✓				✓		✓		✓	✓			✓			✓		✓	
Total no. of BCTs	6	13	4	14	8	4	1	2	8	1	15	4	11	11	5	1	7	1	3	12	1	11	3

1.1 = Goal setting (behavior); 1.2 = Problem solving; 1.3 = Goal setting (outcome); 1.4 = Action planning; 2.2 = Feedback on behavior; 2.3 = Self-monitoring of behavior; 2.4 = Self-monitoring of outcome(s) of behavior; 3.1 = Social support (unspecified); 3.2 = Social support (practical); 3.3 = Social support (emotional); 4.1 =

Instruction on how to perform the behavior; 4.2 = Information about antecedents; 5.1 = Information about health consequences; 5.3 = Information about social and environmental consequences; 6.1 = Demonstration of the behavior; 6.2 = Social comparison; 7.1 = Prompts/cues; 8.1 = Behavioral practice/rehearsal; 8.2 = Behavior substitution; 9.1 = Credible source; 12.1 = Restructuring the physical environment; 12.2 = Restructuring the social environment; 12.5 = Adding objects to the environment

Table S.2: Use of APEASE criteria to exclude irrelevant intervention functions

BCW Intervention Functions	Affordability	Practicability	Effectiveness and cost effectiveness	Acceptability	Side effects/ safety	Equity	Decision Yes/No	Reasons for exclusion
Coercion (Creating an expectation of punishment or cost)	✓	×	✓	×	×	✓	No	Creating an expectation of punishment or cost was not acceptable to any stakeholder. There were also concerns regarding the practicability of implementing such an intervention and also regarding the potential safety issues regarding not prescribing antipsychotics.
Education (increasing knowledge or understanding)	✓	✓	✓	✓	✓	✓	Yes	
Enablement (Increasing means/ reducing barriers to increase capability or opportunity	✓	×	✓	✓	✓	✓	No	Increasing means/reducing barriers to increase capability or opportunity was acceptable to all stakeholders. However operationalization of this intervention function (e.g. information technologies) was not seen to be practicable for this intervention. Was also considered to be not sustainable.
Environmental Restructuring (changing the physical or social context)	✓	✓	✓	✓	✓	✓	Yes	
Incentivization (Creating an expectation of reward)	×	✓	✓	×	✓	✓	No	Utilizing an incentivization function was not judged to be affordable due to budgetary constraints. Some stakeholders also believed that it was not ethical to incentivize GPs/nurses to conduct a behavior that they should be doing anyway, hence it was not acceptable by those in management. Was also considered to be not sustainable.
Modelling (providing an example for people to aspire to or imitate)	✓	✓	✓	✓	✓	✓	Yes	

Persuasion (using communication to induce	✓	✓	✓	✓	✓	✓	Yes	
positive or negative feelings or stimulate action)								
Restriction (Using rules to reduce the opportunity to engage in the target behavior)	✓	×	✓	×	×	✓	No	Restriction was not acceptable to any stakeholder as it would ‘limit agency on the part of the target group’. There were also concerns regarding the practicability of implementing such an intervention and also regarding the potential safety issues regarding not prescribing antipsychotics.
Training (imparting skills)	✓	✓	✓	✓	✓	✓	Yes	

BCW = Behavior Change Wheel; APEASE = Affordability, Practicability, Effectiveness, Acceptability, Side effects/ safety, Equity

Table S.3: The 'Long List' of BCTs and source(s)

The 'Long List' of BCTs (label)	1. Intervention Content (systematic review)	2(a). TDF domains via Cane matrix (qualitative study)	2(b). TDF domains via Michie matrix (qualitative study)	3. Intervention Functions: BCW guidance (APEASE criteria)
1.1 Goal setting (behavior)	✓			
1.2 Problem solving	✓			
1.3 Goal setting (outcome)	✓			
1.4 Action planning	✓		✓	
2.2 Feedback on behavior	✓	✓		✓
2.3 Self-monitoring of behavior	✓	✓	✓	✓
2.6 Biofeedback		✓		
2.7 Feedback on outcome(s) of behavior				✓
3.1 Social support (unspecified)	✓	✓	✓	
3.2 Social support (practical)	✓	✓		
3.3 Social support (emotional)		✓		
4.1 Instruction on how to perform a behavior	✓			✓
4.2 Information about antecedents	✓	✓		
5.1 Information about health consequences	✓	✓		✓
5.2 Salience of consequences		✓		
5.3 Information about social and environmental consequences	✓	✓		✓
5.4 Monitoring of emotional consequences		✓		
5.5 Anticipated regret		✓		
5.6 Information about emotional consequences		✓		
6.1 Demonstration of the behavior	✓	✓		✓
6.2 Social comparison		✓		
6.3 Information about others' approval		✓		
7.1 Prompts/cues	✓	✓	✓	✓
7.2 Cue signalling reward		✓		

8.1 Behavioral practice/ rehearsal				✓
8.2 Behavior substitution	✓			
9.1 Credible source	✓			✓
9.2 Pros and cons		✓		
9.3 Comparative imagining of future outcomes		✓		
10.4 Social reward		✓		
10.11 Future punishment		✓		
11.2 Reduce negative emotions		✓		
12.1 Restructuring the physical environment		✓		✓
12.2 Restructuring the social environment	✓	✓		
12.3 Avoidance/reducing exposure to cues for the behavior		✓		
12.5 Adding objects to the environment	✓			✓
13.1 Identification of self as role model		✓		
15.1 Verbal persuasion about capability		✓		
15.3 Focus on past success		✓		
16.1 Imaginary punishment		✓		
16.2 Imaginary reward		✓		
16.3 Vicarious consequences		✓		
Total number of BCTs identified*	**18**	**32**	**4**	**12**

*Total number of BCTs identified = 66. After removal of duplicate BCTs (n=24), this resulted in 42 unique BCTs.

Table S4: Operationalized BCT examples for the purpose of online Delphi study

Label	BCT Definition	Operationalised Example
1.1 Goal setting (behavior)	Set or agree on a goal defined in terms of the behavior to be achieved	Nursing home staff/GPs set a goal to reduce the total number of residents who are prescribed an antipsychotic over 3 months
1.2 Problem Solving	Analyze, or prompt the person to analzse, factors influencing the behavior and generate or select strategies that include overcoming barriers and/or increasing facilitators	Identify factors (e.g. behavioral symptoms in residents) that may lead to an inappropriate request for an antipsychotic, and develop non-drug strategies to use in these situations
1.3 Goal setting (outcome)	Set or agree on a goal defined in terms of a positive outcome of wanted behavior	Nursing home staff/GPs set a goal to reduce the number of falls in residents, as a result of reduced antipsychotic usage
1.4 Action Planning	Prompt detailed planning of performance of the behavior (must include at least one of context, frequency, duration and intensity).	Encourage nursing home staff to develop a plan of how and when non-drug intervention will be attempted first-line
2.2 Feedback on behavior	Monitor and provide informative or evaluative feedback on performance of the behavior	Inform nursing home staff/GPs of how many residents with dementia, under their care, are prescribed antipsychotics monthly
2.3 Self-monitoring of behavior	Establish a method for the person to monitor and record their behavior(s) as part of a behavior change strategy	Ask nursing home staff to document every time they request an antipsychotic medication for a resident
2.7 Feedback on outcome of behavior	Monitor and provide feedback on the outcome of performance of the behavior	Inform GPs of how many residents with dementia under their care who are prescribed antipsychotics, had a fall, monthly
3.1 Social Support (unspecified)	Advise on, arrange or provide social support (e.g. from friends, relatives, colleagues,' buddies' or staff) or non-contingent praise or reward for performance of the behavior. It includes encouragement and counselling, but only when it is directed at the behavior	Ask GPs to reinforce/praise nursing staff for completing the assessment tool, before requesting an antipsychotic

3.2 Social Support (practical)	Advise on, arrange, or provide practical help (e.g. from friends, relatives, colleagues, ‘buddies’ or staff) for performance of the behavior	Advise nursing home staff to identify a colleague who they can seek help from when completing an assessment tool for residents with behavioral symptoms

Label	BCT Definition	Operationalised Example
3.3 Social Support (emotional)	Advise on, arrange, or provide emotional social support (e.g. from friends, relatives, colleagues, ‘buddies’ or staff) for performance of the behavior	Advise nursing home staff to identify a colleague who they can seek emotional support from if a particularly distressing behavior occurs/reoccurs as a result of not requesting or prescribing an antipsychotic
4.1 Instruction on how to perform a behavior	Advise or agree on how to perform the behavior (includes ‘Skills training’)	Provide written information to GPs on how to deprescribe an antipsychotic, in the form of an algorithm
4.2 Information about antecedents	Provide information about antecedents (e.g. social and environmental situations and events, emotions, cognitions) that reliably predict performance of the behavior	Advise nursing staff to record on the assessment tool, details of situations or events that occurred leading to antipsychotic prescriptions
5.1 Information about health consequences	Provide information (e.g. written, verbal, visual) about health consequences of performing the behavior	Provide written and oral information to GPs and Nursing home staff regarding the side effects of antipsychotics
5.2 Salience of consequences	Use methods specifically designed to emphasize the consequences of performing the behavior with the aim of making them more memorable (goes beyond informing about consequences)	Provide nursing home staff with a sensationalized newspaper headline depicting the negative consequences of antipsychotic prescribing in residents with dementia
5.3 Information about the social and environmental consequences	Provide information (e.g. written, verbal, visual) about social and environmental consequences of performing the behavior Note: consequences can be for any target, not just the recipient(s) of the intervention;	Provide written information to GPs and Nursing home staff regarding the costs of antipsychotics
5.4 Monitoring of emotional consequences	Prompt assessment of feelings after attempts at performing the behavior	Advise nursing home staff to record how they feel after requesting (or not requesting) an antipsychotic for a resident with behavioral symptoms
5.5 Anticipated Regret	Induce or raise awareness of expectations of future regret about performance of the unwanted behavior	Ask nursing staff/GPs to assess the degree of regret they will feel if they request/prescribe antipsychotics inappropriately

Label	BCT Definition	Operationalised Example
5.6 Information about emotional consequences	Provide information (e.g. written, verbal, visual) about emotional consequences of performing the behavior	Provide visual information on the positive emotions experienced by nursing home staff when non-pharmacological interventions were used successfully
6.1 Demonstration of the behavior	Provide an observable sample of the performance of the behavior, directly in person or indirectly e.g. via film, pictures, for the person to aspire to or imitate	Demonstrate to nursing staff how to use the assessment form using a pre-recorded video
6.2 Social Comparison	Draw attention to others' performance to allow comparison with the person's own performance	Show the GPs the proportion of nursing home residents with dementia nationally who were prescribed antipsychotics, and compare with their own data
6.3 Information about others' approval	Provide information about what other people think about the behavior. The information clarifies whether others will like, approve or disapprove of what the person is doing or will do	Tell the Nursing home staff that people with dementia and family carers strongly disapprove of the use of antipsychotics, except in certain situations
7.1 Prompts/cues	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behavior. The prompt or cue would normally occur at the time or place of performance	Place an assessment tool in the residents care plan as a reminder to complete, every time the resident exhibits behavioral symptoms
7.2 Cue signalling reward	Identify an environmental stimulus that reliably predicts that reward will follow the behavior	Advise nursing home staff that they will be rewarded for completing the assessment tool for residents with dementia, but will receive no reward for completing the tool in residents without dementia
8.1 Behavioral practice/rehearsal	Prompt practice or rehearsal of the performance of the behavior one or more times in a context or at a time when the performance may not be necessary, in order to increase habit and skill	Prompt nursing home staff to practice using the assessment tool based on a case study in a classroom setting
8.2 Behavior substitution	Prompt substitution of the unwanted behavior with a wanted or neutral behavior	Prompt nursing home staff to suggest non-drug alternatives instead of prescribing antipsychotics
9.1 Credible Source	Present verbal or visual communication from a credible source in favour of or against the behavior	Delivery of an educational session on appropriate antipsychotic prescribing from a pharmacist who is an expert in this area

9.2 Pros and Cons	Advise the person to identify and compare reasons for wanting (pros) and not wanting to (cons) change the behavior	Ask nursing home staff to list and compare the advantages and disadvantages of antipsychotic prescribing in people with dementia
9.3 Comparative imagining of future outcomes	Prompt or advise the imagining and comparing of future outcomes of changed versus unchanged behavior	Prompt GPs to imagine and compare likely or possible outcomes in the future, should current levels of inappropriate antipsychotic prescribing continue versus reduced levels of inappropriate prescribing
10.4 Social Reward	Arrange verbal or non-verbal reward if and only if there has been effort and/or progress in performing the behavior	Congratulate nursing home staff every time they complete the assessment tool
10.11 Future punishment	Inform that future punishment or removal of reward will be a consequence of performance of an unwanted behavior (may include fear arousal) (includes ‘Threat’)	Inform nursing staff/GPs that inappropriate requesting/prescribing of antipsychotics may result in public shaming/censuring by HIQA and/or the media
11.2 Reduce negative emotions	Advise on ways of reducing negative emotions to facilitate performance of the behavior (includes ‘Stress Management’)	Advise nursing home staff on the use of stress management skills to reduce anxiety associated with not using antipsychotics in residents
Label	**BCT Definition**	**Operationalised Example**
12.1 Restructuring the physical environment	Change, or advise to change the physical environment in order to facilitate performance of the wanted behavior or create barriers to the unwanted behavior (other than prompts/cues, rewards and punishments)	Advise to paint the doors of the wards to prevent wandering/exitseeking behaviors in residents and hence reduce the need for antipsychotics
12.2 Restructuring the social environment	Change, or advise to change the social environment in order to facilitate performance of the wanted behavior or create barriers to the unwanted behavior (other than prompts/cues, rewards and punishments)	Advise nurses to complete the assessment tool in conjunction with healthcare assistants, family members, GPs and residents (where appropriate)
12.3 Avoiding/reducing exposure to cues for the behavior	Advise on how to avoid exposure to specific social and contextual/physical cues for the behavior, including changing daily or weekly routines	Advise GPs to limit ward rounds to once weekly to reduce face-toface time with nursing home staff, and hence restrict the amount of inappropriate requests for antipsychotics
12.5 Adding objects to the environment	Add objects to the environment in order to facilitate performance of the behavior	Provide assessment tools to the wards to enable appropriate requesting of antipsychotics

13.1 Identification of self as role model	Inform that one's own behavior may be an example to others	Inform nursing home staff that if they complete the assessment tool every time a resident exhibits a behavior, this may encourage other staff to start using the tool
15.1 Verbal persuasion about capability	Tell the person that they can successfully perform the wanted behavior, arguing against self-doubts and asserting that they can and will succeed	Tell the GP that they can successfully improve the appropriateness of their antipsychotic prescribing despite the challenges that exist
15.3 Focus on past success	Advise to think about or list previous successes in performing the behavior (or parts of it)	Advise the nursing home staff to describe occasions where nondrug strategies worked and antipsychotics were not needed
16.1 Imaginary punishment	Advise to imagine performing the unwanted behavior in a real-life situation followed by imagining an unpleasant consequence (includes 'Covert sensitisation')	Advise nursing home staff/GP to imagine inappropriate requesting/prescribing of antipsychotics followed by pubic shaming and censuring by the media and HIQA
16.2 Imaginary reward	Advise to imagine performing the wanted behavior in a real-life situation followed by imagining a pleasant consequence (includes 'Covert conditioning')	Advise nursing home staff/GP to imagine not prescribing antipsychotics followed by an improvement in residents behavioral symptoms and their quality of life
16.3 Vicarious consequences	Prompt observation of the consequences (including rewards and punishments) for others when they perform the behavior	Draw attention to the negative media attention other GPs have received for prescribing antipsychotics inappropriately