DALHOUSIE UNIVERSITY

This is the accepted, post-print, version of the following article:

Isenor JE, Bai I, Cormier R, Helwig M, Reeve E, Whelan AM, Burgess S, Martin-Misener R, Kennie-Kaulbach N. Deprescribing Interventions in Primary Health Care Mapped to the Behaviour Change Wheel: A Scoping Review. Res Social Adm Pharm. 2021* Jul;17(7):1229-1241. https://doi.org/10.1016/j.sapharm.2020.09.005

***Available online 22 September 2020**

Deprescribing Interventions in Primary Health Care Mapped to the Behaviour Change Wheel: A Scoping Review

Jennifer E. Isenor[a], Isaac Bai[a], Rachel Cormier[a], Melissa Helwig[b], Emily Reeve[a,c,d], Anne Marie Whelan[a], Sarah Burgess[e], Ruth Martin-Misener[f], Natalie Kennie-Kaulbach[a].

[a] College of Pharmacy, Dalhousie University, 5968 College Street, Halifax, NS, Canada
[b] W.K. Kellogg Health Sciences Library, Dalhousie University, Halifax NS, Canada
[c] Quality Use of Medicines and Pharmacy Research Centre, School of Pharmacy and Medical Sciences, Division of Health Sciences, University of South Australia, Adelaide, SA, Australia
[d] Geriatric Medicine Research, Faculty of Medicine, Dalhousie University and Nova Scotia Health Authority, Halifax, NS, Canada
[e] Pharmacy Department, Nova Scotia Health Authority, Halifax, NS, Canada
[f] School of Nursing, Dalhousie University, 5869 University Avenue, Halifax, NS, Canada

Corresponding Author
Dr. Jennifer E. Isenor
College of Pharmacy, Dalhousie University
5968 College Street
PO Box 15000
Halifax, Nova Scotia B3H 4R2 Canada
Email: jennifer.isenor@dal.ca
Phone: (902) 494-8916

Deprescribing Interventions in Primary Health Care Mapped to the Behaviour Change Wheel: A Scoping Review

Abstract

Background: Polypharmacy and inappropriate medication use are an increasing concern. Deprescribing may improve medication use through planned and supervised dose reduction or stopping of medications. As most medication management occurs in primary health care, which is generally described as the first point of access for day-to-day care, deprescribing in primary health care is the focus on this review.

Objective: This scoping review aimed to identify and characterize strategies for deprescribing in primary health care and map the strategies to the Behaviour Change Wheel (BCW).

Methods: A scoping review was conducted that involved searches of six databases (2002 to 2018) and reference lists of relevant systematic reviews and included studies. Studies that described and evaluated deprescribing strategies in primary health care were eligible. Two independent reviewers screened articles and completed data charting with charting verified by a third. Deprescribing strategies were mapped to the intervention functions of the BCW and linked to specific Behaviour Change Techniques (BCT).

Results: Searches yielded 6871 citations of which 43 were included. Nineteen studies were randomized, 24 were non-randomized. Studies evaluated deprescribing in terms of medication changes, feasibility, and prescriber/patient perspectives. Deprescribing strategies involved various professionals (physicians, pharmacists, nurses), as well as patients and were generally multifaceted. A wide range of intervention functions were identified, with 41 BCTs mapped to ***Environmental restructuring***, 38 BCTs mapped to ***Enablement***, and 34 BCTs mapped to ***Persuasion***.**Conclusions:** Deprescribing strategies in primary health care have used a variety of BCTs to address individual professionals (e.g. education) as well as strategies that addressed the practice setting, including support from additional team members (e.g. pharmacists, nurses and patients). Further research is warranted to determine comparative effectiveness of different BCTs, which can help facilitate implementation of deprescribing strategies, thereby reducing polypharmacy, in primary health care.

Keywords: Deprescribing; primary health care; behaviour change wheel

1. Introduction

With an aging population across all healthcare settings, polypharmacy (often defined as being on five or more medications) and inappropriate medication use are becoming increasing concerns [1,2]. A linear relationship has been well established between the number of medications the patient is taking and drug related problems (DRPs), such as adverse drug reactions (ADRs) [3]. As a majority of the population reside in the community, the primary health care setting is a potential target for addressing medication use. In fact, some studies have shown that one in five medications may be inappropriate (the potential risks outweigh the potential benefits in the individual) in the primary health care setting [1,4]. One way to target polypharmacy and inappropriate medication use is with deprescribing medications. Deprescribing has been defined as the "planned and supervised process of dose reduction or stopping of medication(s) that may be causing harm or are no longer providing benefit" with the goal of reducing medication burden and harm, while maintaining or improving quality of life [5]. The term deprescribing began appearing in the literature around 2002 and deprescribing has been shown to reduce inappropriate medication use and known adverse drug reactions and likely reduces healthcare costs and improves quality of life and adherence [6,7]. Deprescribing may also decrease hospitalizations and mortality, however, further research is required [4,8–10].

There are a variety of different deprescribing strategies that have been investigated including medication reviews, decision support tools, and medication class specific and non-class specific deprescribing guidelines [11–14]. Strategies have been led by various team members, including physicians, pharmacists, patients or multidisciplinary teams and have been studied in community, hospital, and long-term care settings in several countries [15–17]. Most strategies examined in the literature are complex and multifaceted with few studies using a single approach [18]. A number of systematic reviews have evaluated the effects of deprescribing strategies on improving polypharmacy and health outcomes [10,15,18–20]. These reviews however are limited by differences in study setting, variation in outcomes studied, and the unavailability of detailed strategy descriptions and behaviour change theory application.

Polypharmacy and inappropriate medication use are complex issues with many contributory factors (e.g. multiple prescribers, clinical inertia, limitations on healthcare providers' time, patient resistance, etc.) [21]. Deprescribing is a behaviour that may in part address these issues. As deprescribing is a complex behaviour, it is important to consider the behavioural frameworks of practice change, such as the Behaviour Change Wheel (BCW), when trying to implement deprescribing into practice [22,23]. The BCW is an evidence-based framework that has previously been used to develop and evaluate strategies related to medication use, such as appropriate prescribing, appropriate antibiotic use, and deprescribing [20,24–28].

When using the BCW to address behaviour change, the first step is to understand a behaviour that one wants to change (i.e. such as deprescribing) by defining the problem in behaviour terms, then selecting and specifying the target behaviour, then identifying what needs to be changed [29]. The next step is to broadly identify categories of means by which an intervention can change a

behaviour, known as the ***Intervention Function*** in the BCW. Once intervention functions are identified, then specific content of the interventions are considered; these are known as the *Behaviour Change Techniques* (BCTs) and defined as "an active component of an intervention designed to change behaviour." [23,29,30]. For example, the broad intervention function of ***Education*** can include the following specific content components (BCTs): *feedback on behaviour, information about health consequences*, and *feedback on outcome(s) of the behaviour*. BCTs may be associated with more than one intervention function, for example the BCT of *Feedback on behaviour* is associated with the intervention functions of ***Education*** and ***Persuasion***.

Previously published reviews and systematic reviews summarizing deprescribing interventions that have included studies in all health care settings, demonstrated significant heterogeneity in study designs and outcomes and have minimally classified these using behaviour change theory [10,15,20]. Deprescribing interventions in settings other than primary health care may not translate well due to differences in individuals providing care and practice and system organization. To improve future implementation of deprescribing strategies in the primary health care setting, categorization of existing studies as they relate to behaviour change by way of a scoping review is required. The purpose of this scoping review was to describe deprescribing strategies used in the primary health care setting and to classify the specific BCTs associated with the strategies.

2. Methods

The protocol and final scoping review methods were developed by the research team based on the methods published by Arksey and O'Malley with reporting informed by the PRISMA Extension for Scoping Reviews [31,32].

The search strategy was developed in PubMed by a health librarian using a combination of index terms and keywords around deprescribing and primary health care. For primary health care terms, a slightly adjusted version (to include professionals beyond physicians, such as pharmacists and nurses) of the Primary Health Care Search Filter from the Primary Health Care Research & Information Service was used [33,34]. The initial search strategy was reviewed by both the team and a second librarian.

Once finalized, the search strategy was translated by the team librarian for use with other bibliographic databases of interest. All databases were searched from January 2002 to June 2018 and included PubMed, Embase, Cumulative Index to Nursing and Allied Health (CINAHL), PsycINFO, Scopus and Web of Science. (PubMed Search Strategy is found in Supplementary Materials Table S5)

2.1 Eligibility criteria

Eligibility criteria were defined using the 'Population, Intervention, Comparison, Outcomes, Study designs, Timeframe' (PICOST) components [35].

Population: Studies had to take place in the primary health care setting, or in combination with another setting if separate results were available for the primary health care group. For the purpose of this review the primary health care setting included health care services provided in

the community, ambulatory or first level of contact for personal health care services. Studies conducted exclusively in hospitals, long-term care, or institutional care were excluded. No additional restrictions were imposed on the population (e.g. age groups) and the primary study population could be patients or care providers in the primary health care setting.

Interventions: Studies that focused primarily on deprescribing, which was defined as the planned and supervised process of dose reduction or stopping the medication(s) that may be causing harm or are no longer causing benefit [5], were included. Studies that used terminology (other than deprescribing) including but not limited to tapering, discontinuation, or dose reduction of inappropriate medications or medication withdrawal, were also included in this scoping review.

Comparators: Usual care, other interventions or no intervention were eligible for inclusion.

Outcomes: The following outcomes were determined a priori as eligible for inclusion, including number of medications before and after (which may have included terms like 'potentially inappropriate prescribing (PIP)', 'Drugs to Avoid in the Elderly (DAEs)' or 'Potentially Inappropriate Medication (PIMs)'); feasibility of the deprescribing intervention, and patient/provider feedback on the intervention/experience.

Study Designs: Any study that included an evaluation component of the deprescribing strategy was eligible for inclusion. Study types could include experimental (randomized studies), quasi-experimental (controlled before and after), observational studies, qualitative studies, and systematic reviews.

Timeframe: Studies published since 2002 were included as this is the approximate time in which the term 'deprescribing' was first used in publications [7]. In addition, as the focus was on the primary health care setting, which has had considerable changes over time, studies older than 2002 may not have the same applicability.

Publication Characteristics: Studies available in full text in English were included.

2.2 Study Selection

Screening was conducted in duplicate by members of the review team (NKK, JEI, ES, MH, SB, RC) using Covidence© software at all stages (title/abstract screening followed by full text review) [36]. Conflicts were resolved through discussion and a third reviewer if needed. The screening parameters were tested with all reviewers screening 10 studies and comparing the results. The screening results appeared consistent, so screening was continued as planned with resolution of conflicts completed with a third reviewer when needed. Once screening was completed, reference lists of included studies were reviewed to identify additional relevant citations. Scopus was also used to look for studies which had cited the included studies. Any additional studies identified were uploaded to Covidence and screened adhering to the screening methods described above.

2.3 Data Charting

The final data charting table was developed by the review team with input from the full team and piloted with five articles before being finalised. Data charting focused on publication information (title, authors, journal, year of publication), context information (study location, study design, study length, objective, participants and setting), details on the deprescribing strategy, study outcomes, and results (including feasibility and qualitative evaluation). Data charting from the final included studies was done by one team member (ES, RC, or IB) and verified by a second team member (NKK, JEI, or MH). When conflicts arose, a group of at least three team members discussed the conflict and came to consensus.

2.4 Data Coding and Synthesis

Data coding was completed using the following two step process. To contextualize the findings in terms of behaviour change, the first step was mapping the deprescribing strategies to the intervention functions (e.g. *Enablement*, *Education*) of the BCW [29]. In the second step, the associated BCTs were reviewed and those that most accurately represented the strategies were identified (e.g. for *Enablement*, some associated BCTs are *Social support (practical)* and *Goal setting*). Many BCTs are associated with more than one intervention function within the BCW, so studies could have BCTs assigned that were included in more than one intervention function when appropriate (e.g. the BCT *Prompts/cues* is found within the intervention functions of *Education* and *Environmental restructuring)*. An a priori decision was made to map deprescribing strategies to BCTs to better describe and categorize the wide range employed, as intervention functions do not provide the same granularity. The coding was conducted independently by two team members (ES, RC, or IB); disagreements were resolved by a third team member (NK or JI) and final review and consensus were confirmed by three team members (JI, NK, IB). To avoid duplicate use of the word "intervention" and to be consistent with the language of the BCW, the term "strategies" was used when describing how deprescribing was completed in studies (i.e. the intervention being trialled). Once the strategy was mapped to the BCW, it was then referred to as the "intervention" function of the BCW. Additional coding was completed on deprescribing strategies to describe the types of people involved in the strategy. The five groups of participants identified in the studies were general practitioners (GP) (also known as family physicians in some jurisdictions), pharmacists, nurses (which encompassed both nurse practitioners and specialist nurse advisors), patients, and researchers (considered in this review as participants of deprescribing if they had direct interaction with patients). The groups of participants were further subcategorized into "agents", indicating that the participant was a component of the strategy (i.e. involved in delivering the intervention) and "targets", indicating the strategy was aimed at the participant. The synthesis focused on describing the general study characteristics (e.g. targets, agents, mediations involved) and the frequency of intervention functions and associated BCTs. Sub-studies such as follow-up studies [37,38], economic evaluations [39,40], process evaluation [41], and sub-group analysis [42] were excluded from the intervention functions and BCTs frequency counts to avoid double counting.

3. Results

3.1 Search Results

The search retrieved 13947 records from the databases, reference lists of relevant systematic reviews and of included studies. Once 7076 duplicates were eliminated, title or abstract screening was conducted on 6871 records. Full-text screening was conducted on 205 with a total of 43 articles meeting the specified inclusion and exclusion criteria (Figure 1).

Figure 1: Study flow diagram of study selection process and reasons for exclusions

3.2 Study Characteristics

There were 18 experimental studies, 13 quasi-experimental studies, eight observational studies, three qualitative study, one mixed methods, and no systematic reviews included in the scoping review. None of the studies were funded by pharmaceutical companies/industry, 27 noted non-industry sources (such as government or not for profit) [12,17,37–61], 12 did not report on funding sources [62–73] and 4 reported they were not funded [74–77]. Study summaries are in Table 1. Twenty-eight studies focused on reducing polypharmacy by targeting "potentially inappropriate prescribing" (PIP), "Drugs to Avoid in the Elderly" (DAEs) or "Potentially Inappropriate Medications" (PIMs) [12,38–41,43–55,60–63,66–68,74–76]. The remaining 15 studies focused on a single class of medications, specifically benzodiazepines (11 studies [17,37,42,56–59,69–71,77]) and proton pump inhibitors (PPIs; 4 studies [64,65,72,73]). The majority of the studies (N=31, "N" denotes the number of studies) focused on older adults (e.g. 60 years and older) [12,17,38–56,60–63,66–68,70,74,75] with a few studies targeting patients of any age taking a specific drug class (e.g. PPIs) [17,37,42,56–59,64,65,69–73,77].

Table 1: Summary of Individual Study Characteristics

Deprescribing strategies in the included articles were evaluated in terms of prescriber behaviour, feasibility, healthcare utilization, cost and prescriber/patient perspectives. Many studies evaluated multiple outcomes, therefore totals are greater than 43, with the most common outcomes evaluated being: stopping of potentially inappropriate medications (PIMs) (N=16) [12,38,41,44–48,51,53,60,62,63,66,68,74]; stopping of specific inappropriate medications (e.g. benzodiazepine: N=11 [17,37,42,56–59,69–71,77], PPI: N=4 [64,65,72,73]); number of medications before and after (N=11) [12,40,49,52–54,61,63,67,75,76]; feasibility (N=2) [50,55]; cost outcomes/drug expenditure (N=2) [39,40]; and healthcare utilization (N=1) [61]. The following qualitative outcomes were studied: facilitators and barriers of deprescribing (N=2) [41,43]; reasons for not adhering to recommendations provided by a deprescribing tool (N=1) [48]; and feedback from physicians about deprescribing tool (N=1) [53].

Deprescribing strategies also varied by types of people involved in the strategy. GPs were found to be the main target of the strategies in the included studies (N=41) [12,17,37–68,70–75,77]. Pharmacists were most often the agent of deprescribing strategies (N=17) [12,38–

41,43,44,53,60,61,66,67,69–71,74,76], while there was minimal nurse involvement as either targets or agents (N=2 [57,76] and N=1 [66], respectively). Patients were routinely both the target and the agent in the studies that focused on benzodiazepine or PPI deprescribing. Researchers had an active role in deprescribing in only one study, where they served as the agent for the strategy.

Most studies (N=35) [12,17,37–42,44–47,49,53,54,56–66,68–75,77] showed positive outcomes based on the primary outcomes of the individual studies (e.g., reduction in medications). Of these 35 studies, 21 had a statistically significant positive outcome [12,17,37,40,41,44,46,53,56–61,63,64,68–70,73,75], 3 were positive but not statistically significant [39,42,54] and 11 were positive but did not complete an analysis of statistical significance [38,45,47,49,62,65,66,71,72,74,77]. Studies evaluating deprescribing of specific drugs, such as benzodiazepines (N=11) [17,37,42,56–59,69–71,77] and PPIs (N=4) [64,65,72,73], were all associated with positive outcomes. Of the studies that found a statistically significant benefit, there was an equal distribution of both the single strategy and multifaceted deprescribing strategies.

3.3 Behaviour Change Techniques

Frequency of intervention functions and associated BCTs identified, with brief descriptions of specific deprescribing strategies [29], are presented in Table 2. The most common intervention functions were ***Environmental restructuring*** (n=41, "n" denotes the frequency of BCTs) [12,17,43–51,53–59,61–66,68–70,72–75,77], ***Enablement*** (n=38) [12,17,43,44,49,50,52–57,59–61,64–67,70,71,74–77] and ***Persuasion*** (n=34) [17,43–47,50,53–56,58,60,64–66,68,70,72,73,75] (many studies included more than one intervention function, therefore totals greater than the total number of studies). ***Coercion*** ("Creating an expectation of punishment or cost") [29] and ***Restriction*** ("Using rules to reduce the opportunity to engage in the target behaviour") [29] were the only intervention functions not found in the studies. The most predominant BCTs were *Adding objects to the environment* (as associated with ***Environmental restructuring***, n=25 [12,43–51,53,54,58,61,63,65,68,69,72,74,75]), *Social Support (practical)* (as associated with ***Enablement***, n=23 [12,17,43,44,53–57,59–61,64–67,70,71,74–77]), *Instruction on how to perform a Behaviour* (as associated with ***Training***, n=21 [17,43–47,51–56,58,59,64,68,70,72,73,77]), *Information about health consequences* (as associated with ***Persuasion*** and ***Education***, n=16 for each [27,36,37,40,41,46,54,59,60,62,64,68,70,73,76]), and *Prompts/cues* (as associated with ***Environmental restructuring***, n=16 [17,43,44,50,51,55–57,59,62,64,66,70,72,73,77]). Most studies used multiple BCTs (n=38) [12,17,43–47,49–61,64–68,70–75,77] with only 5 studies [48,62,63,69,76] using a single BCT. Combinations of BCTs were varied and not consistent between studies with no specific combination used in more than two studies.

Table 2: Frequency of Intervention Functions of the Behaviour Change Wheel (BCW) and Associated Behaviour Change Techniques (BCTs) with Brief Description of Strategies Identified in the Literature

Discussion

This review identified 43 studies that evaluated deprescribing strategies in primary health care settings. Most of the studies involved older adults as the patient population [12,17,38–56,60–63,66–68,70,74,75] and used multi-faceted strategies [12,17,43–47,49–61,64–68,70–75,77]. Seventeen studies used pharmacists as agents to support physicians with deprescribing activities [12,38–41,43,44,53,60,66,67,69–71,74,76]. Many studies did not assess the statistical significance of results; however, most studies showed a positive impact on the outcome of interest (as defined by the study), such as a decreased number of medications, successful cessation of a targeted medication, and feasibility of inclusion of the strategy within the primary health care setting. Overall, it appeared that most studied deprescribing strategies in primary health care will result in a modest improvement in medication use, such as a small decrease in number of medications used.

Most included studies were completed in older adults (60 years of age and older) [12,17,38–56,60–63,66–68,70,74,75] which was expected given that polypharmacy increases with age [2,84]. Some studies addressed polypharmacy in general through medication reviews and others focused on specific medications, such as PPIs [64,65,72,73] or benzodiazepines [17,37,42,56–59,69–71,77]. It is not known which of these two approaches is most effective to improve clinical outcomes [85]. It is likely that both may be helpful when considering implementation of deprescribing strategies across a population or setting.

Using a behavioural change lens may improve the identification of specific strategies when developing future deprescribing interventions. This analysis identified the categories of means by which an intervention can change a behaviour (intervention function) and the specific content of the interventions, or BCTs, employed in the primary health care setting. Many identified studies used the intervention function ***Environmental restructuring***, which aims to change the physical or social context of the environment in order to support a change in the behaviour. With many of those studies utilizing two of the most commonly identified BCTs in this study: *Adding objects to the environment* and *Prompts/cues.* Examples of *Adding objects to the environment* included the addition of evidence-based medication lists or checklists for assessing appropriateness of prescriptions (e.g. STOPP [79]/START [80], Beers List [81], IPET [83]) [12,45–48,51,53,61,63,68,69,72,74], or deprescribing algorithms [43,44,54,61,75] to the practice site, or provision of patient focused information leaflets on deprescribing [43,44,54,58,65]. Examples of *Prompts/cues*, include electronic medical record pop-ups for patients who met criteria [51,72] and reminder posters/letters [17,55–57,59,62,64,70,73,77]. *Adding objects to the environment* and *Prompts/cues* may address multiple barriers to deprescribing previously identified in qualitative studies, such as a lack of knowledge around deprescribing and knowing when to deprescribe [86–88]. Additionally, *Prompts/cues* that involve the patient, not only involve them in the process and empower them in their care but may also impact previously identified concerns by primary health care providers around maintaining relationships and communicating with patients [86–88]. This strategy removes the barrier of the clinician initiating the discussion out of fear of damaging the doctor-patient relationship if the patient initiates the conversation around deprescribing.

As a lack of knowledge around deprescribing and knowing when to deprescribe have commonly been cited as barriers to deprescribing [86–88], it was not surprising to see that additional strategies to overcome these barriers were identified. Some strategies identified included *Instruction on how to Perform a Behaviour* (as associated with ***Training***) that either focused on clinicians or patients. Patients were provided with instructions on how to taper off medications or given instructions on how to discuss medication concerns with their prescribers. Similar instruction was provided to clinicians, including training on how to deprescribe as well as how to communicate in a patient-centred manner. Additionally, academic detailing on how to perform medication reviews was provided to clinicians. In some cases knowledge that was chosen as part of the intervention to change behaviour was *Information about health consequences* (as associated with ***Persuasion*** and ***Education***) [27,36,37,40,41,46,54,59,60,62,64,68,70,73,76]. Some specific examples include the provision of information to patients about treatment burden and polypharmacy [17,43,44,56,58,64,65,70,72] and others focused on materials directed at prescribers about the associated risk of inappropriate prescribing [45,50,54,55,60,68,73]. The inclusion of training strategies that target patients and clinicians could be added to practice and may be an area for future study to determine if combined strategies targeting both groups together improves deprescribing effectiveness.

Previous studies have also identified lack of time, competing demands, and lack of support to deprescribe as barriers by general practitioners [21,86,88,89]. This review found many studies that may address this issue through ***Enablement***, which increases means/reduces barriers to increase capability or opportunity, specifically through the BCT of *Social Support (practical).* Studies included the involvement of others to support general practitioners with deprescribing, including pharmacists and other clinic support staff [86–88]. Forty percent of studies involved pharmacists leading deprescribing activities; most often they led medication reviews and made recommendations to prescribers. However, there are opportunities to consider the addition of other staff, such as nursing, pharmacy technicians and administrative personnel to assist with obtaining full medication lists from patients prior to a clinic appointment [12,43,44,53,60,61,67,70,74,76]. Nurses were infrequently involved in the studies found. Although the role of nurse practitioners and specialist nurses may be increasing in the primary health care setting, it may be too recent for many studies to have focused on nurses. The lack of nursing involvement represents an important gap in the literature. Some studies targeted patients to lead the process by visiting their general practitioner to discuss deprescribing, which provides social support (the patient in this case) and also a cue for the clinician to deprescribe [17,55–57,59,64,70,77]. In several studies, often those focusing on benzodiazepines or PPIs, patient information leaflets were developed and delivered directly to patients to enhance their understanding of the benefit and risk of deprescribing and then encouraging them to discuss deprescribing with their primary health care provider. The findings of this scoping review highlight the benefits of primary health care providers being supported by other team members, including patients, to facilitate deprescribing.

No BCTs were identified for the intervention functions of ***Coercion*** and ***Restriction*** which was not surprising. The expectation of punishment or cost (***Coercion***) for not deprescribing would likely not be acceptable to healthcare professionals and challenging to enforce. Attempts at ***Restriction***, such as formularies limiting prescribing may be possible for specific medications (e.g. PPIs or benzodiazepines); however, it is unlikely to be suitable for deprescribing in general.

However, there may be opportunities to allow initial prescriptions when indicated and limit continued use without ongoing monitoring (e.g. PPI post gastrointestinal bleed requiring reassessment).

Due to heterogeneity between study designs, populations, outcome measures, and evaluation methods used, it is unclear if the identified BCTs are the most effective strategies for deprescribing, or are just those perceived by researchers to be the most effective and/or practical. A recently published systematic review focusing on BCTs in deprescribing interventions found no direct pattern between individual BCTs and effectiveness [20]. The systematic review only included randomized controlled trials in older adults and included all healthcare settings. This scoping review focused on primary health care, did not limit to RCTs (so more strategies were identified), and provided additional details on intervention functions and BCTs. As such, it complements the findings of the systematic review while providing further support that the optimal BCTs (or combination of BCTs) for deprescribing are not known. Further research is warranted to determine comparative effectiveness of different BCTs in primary health care, which can help facilitate implementation of deprescribing strategies in this setting.

As this was a scoping review, a risk of bias assessment was not conducted. As most studies were not randomized controlled trials, a high risk of bias by study design alone is expected. Another potential limitation is the categorization of BCTs. As many deprescribing strategies were not well described, additional BCTs may have been used but were not identified through the details published. Although categorization of BCTs requires some degree of interpretation, we attempted to minimize this through independent categorization and consensus building using the published BCT definitions [72]. Additional limitations included not searching the grey literature and the exclusion of non-English language studies.

Conclusions

To our knowledge this was the first scoping review on deprescribing strategies in primary health care and the first to map the results of the scoping review through the intervention functions of the BCW to the BCTs. This analysis could help inform potential intervention functions to target specific BCTs that can be used to develop or implement deprescribing. Many studies included BCTs that addressed individual clinicians, such as education, and also included strategies that addressed the practice setting such as prompts and/or deprescribing algorithms in electronic medical records and support from additional team members, such as pharmacists, nurses and patients. Although several BCTs and intervention functions were found to be commonly used either alone or in combination, most studies used multiple BCTs and considering the complexity of deprescribing it may be worth considering using more than one BCT. However, there was little evidence to support any individual strategies or specific multi-faceted approaches over others and therefore gaps remain. Further research is required to determine which BCTs (alone or in combination) are most effective in facilitating deprescribing in primary health care. The results of this scoping review can be used in consideration of the local context (e.g. identified facilitators and barriers) to assist with future deprescribing implementation strategies in primary health care.

Table 1:

Table 1: Summary of Individual Study Characteristics

Study and Country	Study Design	Sample Size Mean Age (SD/Range) % Female		Primary Outcome Measure	Study Strategy
Cadogan, 2018[55] Northern Ireland	Feasibility Study	10 73.1 (4.04/68-78) 60		Feasibility (qualitative)	GPs education video with simulated patient. Patients invited to schedule medication reviews with GPs. Weekly meetings with staff (including GPs, practice nurses, pharmacists).
Caffiero, 2017[60] USA	Retrospective Cohort Study	Intervention: 226 72.2 (6.2/NR) 60.6	Control: 8,833 73.1 (6.9/NR) 70.6	Proportion of patients with another dispensing of the specified DAEs	A clinical pharmacist conducted medication reviews with patients by phone and made recommendations to prescribers.
Campins, 2017[61] Spain	Randomized controlled trial	Intervention: 252 79.16 (5.50/NR) 60.3	Control: 251 78.78 (5.46/NR) 57.4	Number of patients with at least 1 drug discontinuation at 3 months	Clinical pharmacists reviewed all prescribed drugs using GP-GP algorithm[78] and STOPP[79]/START[80]. Pharmacists discussed recommendations with physicians which were then discussed with the patient.
Campins, 2019[40]* Spain	Randomized controlled trial	Intervention:245 NR (NR/NR)	Control: 245 NR (NR/NR)	Percentage decrease in drug expenditure	Economic analysis of Campins, 2017[61]

		NR	NR		
Clyne, 2013[43] Ireland	Qualitative study with a pilot study	N/A N/A N/A		Qualitative outcome	GPs conducted medication reviews, provided written details of the outcome of the review and participated in a short qualitative semi-structured interview.
Clyne, 2015[44] Ireland	Cluster-randomized controlled trial	Intervention: 99 77.1 (4.9/NR) 44.4	Control: 97 76.4 (4.8/NR) 48.5	Proportion of patients on PIPs	Academic detailing with a pharmacist on medication review process and treatment algorithms. Medication reviews were performed by GPs with web-based treatment algorithms. Information leaflets on PIPs and alternatives were provided to patients at visits.
Clyne, 2016[41]† Ireland	Mixed methods	N/A N/A N/A		1. Study process evaluation (quantitative results) 2. Qualitative outcome	Process evaluation of Clyne, 2015[44]
Clyne, 2016[38]‡ Ireland	Cluster-randomized controlled trial (Follow up)	Intervention: 95 NR NR	Control: 91 NR NR	Proportion of patients on PIPs	One year follow-up of Clyne, 2015[44]
de Gier, 2011[77] Netherlands	Randomized controlled trial (Follow up)	194 70.8 (12.2/NR) 65.5		Percentage of benzodiazepine abstinence	A letter regarding discontinuation of benzodiazepine was sent to patients by GPs. Patients were invited to participate in group psychotherapy and provided with a benzodiazepine tapering recommendation.
Early, 2017[76] USA	Pre/post test (single group)	14 (8 of which were analyzed NR		Recommendation acceptance rate	Pharmacist conducted medication reviews and provided recommendations to nurse practitioners.

		NR			
Fried, 2017[54] USA	Randomized controlled trial	Intervention:64 NR NR	Control: 64 NR NR	Proportion of patients who achieved the highest Patient Assessment of Care for Chronic Conditions (PACIC) rating	A web-based application was used to evaluate medication appropriateness using automated algorithms and reports were provided to prescribers before patient visits. A simplified report was provided to patients before their consultation with brief coaching on how to utilize the report to discuss with prescriber.
Garfinkel, 2018[75] Israel	Prospective cohort study	Intervention:122 83.4 (5.3/NR) 64	Control: 55 80.3 (6.3/NR) 64	Number of medications stopped	Researcher conducted medication review using treatment algorithm and provided results to prescribers.
Gibert, 2018[68] France	Pre/post test (single group)	172 83.5 (4.9/NR) 63.4		Proportion of patients with a reduction of PIMs after the intervention	A training course on how to use the STOPP criteria[79] was provided and GPs were asked to use the criteria to perform medication reviews during a consultation with renewal of prescriptions.
Gillespie, 2017[39]§ Ireland	Cluster-randomized controlled trial	Intervention: 99 77.1 (4.9/NR) 44.4	Control: 97 76.4 (4.8/NR) 48.5	Healthcare costs per patient	Cost-effectiveness evaluation of Clyne, 2015[44]
Gorgels, 2005[59] Netherlands	Prospective cohort study	Intervention (Group 1): 1707 63.1 (14.1/NR) 73.1	Intervention (Group 2): 555 62.5 (16.0/NR) 73.0	1. Number of prescribed daily doses at 21 months 2. Number of patients who discontinued benzodiazepine	A letter on gradually discontinuing benzodiazepine use was sent to patients by GPs. A written invitation was sent to the patients with or without an evaluation offer

		Intervention (Group 3): 1152 63.4 (13.1/NR) 73.2	Control: 1821 64.9 (NR/NR) 72.9		to arrange appointment with GP to evaluate benzodiazepine use 3 months later.
Heather, 2004[57] England	Randomized controlled trial	Intervention (Group 1): 88 NR (NR/NR) NR	Intervention (Group 2): 95 NR (NR/NR) NR	Reduction in benzodiazepine intake between the 6-month period before and after intervention	Intervention group 1: an invitation letter was sent to patients to see their GP for a medication review. GP provided guidance on the consultation by the researcher. Information regarding benzodiazepines and sleeping problems were given to patients. Intervention group 2: a letter signed by GP was sent to patients to suggest reducing benzodiazepine use.
		Control: 89 NR NR			
Hurmuz, 2018[74] Netherlands	Pre/post test (single group)	126 76 (7.4/NR) 58.7		Number of potentially inappropriate drugs per patient at 3 months	Pharmacist conducted medication review based on STOPP criteria[79]. Results of review were communicated to GP. Pharmacist and GP set up treatment plan for patient and GP implemented and monitored plan.
Keith, 2013[46] Italy	Prospective quality improvement	Intervention:78,482 75.6 (7.3/NR) 59.2	Control: 81,597 75.4 (7.2/NR) 58.2	Incidence rate of PIM exposure before and after intervention	A PIM list developed by an expert panel. PIM incidence data and a PIM substitute medications brochure were sent to GPs. Case studies around PIMs were developed and presented to GPs.

Krol, 2004[64] Netherlands	Cluster-randomized controlled trial	Intervention: 63 at baseline 59 after 12 weeks 54 after 20 weeks NR 62	Control: 50 at baseline 45 after 12 weeks 44 after 20 weeks NR (NR/NR) 56	The number of patients who had stopped their PPI use or reduced the prescription dose at 12 and 20 weeks after the intervention.	An information leaflet suggesting reducing or stopping proton pump inhibitors (PPIs) (including how to do it) was sent to patients by GPs.
Kwint, 2017[67] Netherlands	Cross-sectional study (single group)	89 NR NR		1. Number of implemented recommendations for discontinuation of medications 2. Number of recommendations aimed at dose reduction	Pharmacists invited patients to the GP practice or visited them at home for an interview focused on health-related goals including patient's complaints possibly due to adverse effects. Recommendations for medication changes were discussed in a face-to-face meeting with the pharmacist and GP and implemented by shared decision making with the patient.
Lesende, 2013[48] Spain	Cross-sectional study (single group)	100 77.2 (5.7/NR) 64		Recommendation acceptance rate	Researchers conducted medication reviews using the STOPP[79]/START[80] criteria, and results were communicated to GPs.
Lopatto, 2014[47] Italy	Pre/post test (single group)	111,282 75.29 (8.34/NR) 57.9		Incidence rate of PIM exposure before and after intervention	Follow up assessment of sustainability of intervention used in Keith, 2013[46] once intervention discontinued.
Martin, 2017[42]|| Canada	Cluster-randomized controlled trial	All participants: 261 74.4 (6.3/NR) 71.6		Number of patients with complete discontinuation of benzodiazepine	Assessment of whether cognitive status affected comprehension and success of Tannenbaum, 2014[17]

Martin, 2017[70] Canada	Cluster-randomized controlled trial	Intervention: 92 NR NR	Control: 85 NR NR	Benzodiazepine discontinuation rates	See Tannenbaum, 2014[44]. The intervention group also included an evidence-based pharmaceutical opinion sent to prescribing physicians by community pharmacists.
McCarthy, 2017[50] Northern Ireland	Uncontrolled pilot study (single group)	10 NR NR		Qualitative outcome (feasibility)	A patient finder tool (SPPiRE) was developed to allow GPs to easily identify all their patients aged ≥65 years and prescribed ≥15 repeat medicines. A training video on how to conduct medication reviews using the software, evidence on polypharmacy, common PIP in older people, and guidance on supporting patients to express their priorities was sent to GPs.
Milos, 2013[12] Sweden	Pre/post test (single group)	Intervention: 182 87.0 (5.8/NR) 75.8	Control: 187 87.7 (5.5/NR) 75.9	Change in the proportion of patients taking PIMs compared to baseline	Pharmacists performed medication reviews without personal patient contact, based on medication list, blood work, and assessment forms filled out by nurses. Recommendations were documented in EMR, and communicated to physician through team rounds, written contact, personal contact, or telephone.
Montero-Balosa, 2015[66] Spain	Pre/post test (single group)	420 74 (NR/NR) 69		Reduction in potential security problems (PSP^) post-intervention (two semi-annual interventions)	Clinical sessions with primary health care teams were held by a primary care pharmacist, a general practitioner or a nurse. Patients with PSPs were identified, feedback was given to the physicians for patients requiring a medication review, and relevant information concerning current clinical evidence were e-mailed to all the participants.

Murie, 2012[65] Scotland	Pre/post test (single group)	166 63.3 (Median) (14.1/32-89) 55.4		Proportion of patients reduced or stopped PPI use at 12 months	Patients were invited to participate in a 20-minute dyspepsia clinic appointment with a specialist nurse advisor and a shared management plan to reduce or stop PPI use was developed.
Price, 2017[51]{ Canada	Cluster-randomized controlled trial	Intervention: 16 GPs NR NR	Control: 12 GPs NR NR	Change in rates of PIPs	The STOPP criteria[79] was integrated into the EMR, and an alert on the EMR would pop-up if a patient meeting the criteria was seen.
Rognstad, 2013[45]{ Norway	Cluster randomized controlled trial	Intervention: 250 GPs 51 (NR/NR) 30	Control: 199 GPs 49 (NR/NR) 33	Change in number of PIPs before and after intervention	GPs were recruited as peer academic detailers (PAD). PADs conducted two academic detailing sessions with participating GPs. Individual reports on PIP prescribing patterns, assessed using explicit criteria, were sent to GPs with suggestions for alternative medications. A workshop was held three months after the second academic detailing.
Roig, 2017[71] Spain	Pre/post test (single group)	125 (40 with >6 months of benzodiazepine/Z-drugs) 79.5 (75.8-84) 75		Deprescribing rates	Primary care pharmacist performed medication review and communicated results to GP. The primary health care team (GP, nurse, pharmacist, patient) decided on the deprescribing procedure together.
Schäfer, 2018[52] Germany	Cluster-randomized controlled trial	Intervention: 299 73.3 (4.8/NR) 50.5	Control: 305 73.5 (5.0/NR) 58.7	Change in the mean number of medications taken	Three training sessions regarding how to perform narrative-based consultation were provided to GPs using simulated patients. GPs held three 30-minute conversations outside of routine consultation with patients concerning their goals on medication, goal

					attainment, and treatment targets for the future.
Seng, 2015[69] Singapore	Pre/post test (single group)	146 NR NR		1. Benzodiazepine usage at 6- and 12-months post-intervention 2. Anticholinergic usage at 6- and 12-months post-intervention	Psychiatric outpatients were assessed by clinical pharmacists using a Medication Appropriateness Index checklist. Pharmacists performed structured medication counselling sessions with interventions to help patients reduce their usage of benzodiazepines and anticholinergics.
Shahid, 2016[73] USA	Pre/post test (single group)	10 NR NR		Total number of PPI prescriptions post-intervention	Education was provided to medical residents regarding guidelines for PPI use and associated risk of inappropriate prescribing by routine discussions in morning conferences, reminder posters, and re-evaluation by attending physicians when prescribed.
Starner, 2009[62] USA	Pre/post test (single group)	10,364 NR NR		Number of DAE claims	Letters were mailed to prescribers with patients who had a claim for 1 or more DAEs.
Tannenbaum, 2012[56]# Canada	Prospective cohort study (single group)	50 75 (7/NR) 75		Proportion of patients correctly answered questions about the long-term safety of benzodiazepine use	A written knowledge transfer tool (the EMPOWER brochure) around benzodiazepines was developed and validated by a panel of geriatric pharmacists and distributed to patients.

Tannenbaum, 2014[17] Canada	Cluster-randomized controlled trial	Intervention: 148 75 (6.5/65-91) 70.3	Control: 155 74.6 (6.2/65-95) 68.4	Benzodiazepine discontinuation at 6 months	The EMPOWER brochure (see Tannenbaum, 2012[56]) was sent to patients on benzodiazepines for 3 months or more to encourage them to discuss deprescribing with their physician and/or pharmacist.
Vandenberg, 2018[53]{ USA	Pre/post test (single group)	24 NR NR		Number of new PIMs per 100 patient visits	PCPs and pharmacists participated in academic detailing delivered by a geriatrician, geriatric pharmacist, and gerontologist. The 2012 Beers List[81] was used to define PIM. PCPs were encouraged to recommend complex patients to pharmacists for individual review and pharmacists were trained to use an EMR template for the review. Individual PIM prescribing data feedback reports were mailed to PCPs and the geriatrician and geriatric pharmacist met with them to discuss the reports.
van Summeren, 2017[49] Netherlands	Pre/post test (single group)	59 83 (NR/IQR 81-86) 50.8		Proposed medication change	Patients used a tool (OPT tool)[82] to indicate their priorities and goals for medications prior to consultation with GP. GP then used the tool for medication review.
Vicens, 2014[58] Spain	Cluster-randomized controlled trial	Intervention (Group 1): 191 65 (Median) (NR/IQR 56-72) 74.3	Intervention (Group 2): 168 65 (Median) (NR/IQR 56-72) 73.6	Number of patients discontinued benzodiazepine at 6 months	GPs attended workshops on structured interviews, managing benzodiazepine discontinuation, and optimal gradual dose reduction. Information regarding benzodiazepine use and its risks were provided to patients. GPs in intervention group 1 attended an additional workshop on follow-up visits and patients in group 1 were
		Control: 173			

		62 (Median) (NR/IQR 54-70) 67.8			scheduled GP visits every two to three weeks until the end of benzodiazepine tapering.
Vicens, 2016[37]** Spain	Cluster-randomized controlled trial	Intervention (Group 1): 191 65 (Median) (NR/IQR 56-72) 74.3	Intervention (Group 2): 168 65 (Median) (NR/IQR 56-72) 73.6	Number of patients discontinued benzodiazepine at 36 months	Three year follow-up of Vicens, 2014[58]
		Control: 173 62 (Median) (NR/IQR 54-70) 67.8			
Walsh, 2010[63] Ireland	Prospective randomized study (single group)	50 73 (NR/65-86) 56		Mean number of medications	A 10-minute medication review using the British National Formulary 2007 edition and the IPET[63] was conducted by a GP. A follow up appointment was arranged with the patient's usual GP following any change to medication and any changes were discussed with the GP.
Walsh, 2016[72] Canada	Prospective quality improvement study (single group)	46 59 (NR/28-89) NR		Number of patients had their PPI deprescribed post-intervention	A standard EMR reminder was sent to PCP of eligible patients to remind them of an upcoming opportunity to reassess PPI. The PPI deprescribing tool was uploaded into the patients' EMR as another reminder. Patient handout regarding risks of long-term PPI use was given during visits.

Table 1 Abbreviations: DAE: drugs to avoid in the elderly; EMR: electronic medical record; GP: general practitioner; GP-GP Algorithm: the Good Palliative-Geriatric Practice (GPGP) algorithm; IPET: Improved Prescribing in the Elderly Tool; N/A: not applicable; NR: not reported; PACIC: Patient Assessment of Care for Chronic Conditions; PCP: Primary care provider; PDD: prescribed daily dose; PIM: potentially inappropriate medication; PIP: potentially inappropriate prescription; PPI: proton pump inhibitor; PSP: potential security [safety] problems; SPPiRE: Supporting prescribing in older people with multimorbidity and significant polypharmacy in primary care; START: Screening tool to alert to right treatment; STOPP: Screening tool of older people's prescriptions

*An economic evaluation of Campins, 2017 [61].

†A process evaluation of Clyne, 2015 [44].

‡A follow-up study of Clyne, 2015 [44].

§An economic evaluation of Clyne, 2015 [44].

^ *PSP Defined as: 1. concomitant use of an antihypertensive drug with a non-steroidal anti-inflammatory drug, anticoagulant or antithrombotic drug or 2. use of two or more benzodiazepines

||A post-hoc analysis of Tannenbaum, 2014 [17].

{Patient demographics were not reported. Only demographics of participated health care professionals were reported.

#The intervention group in this study was the intervention group in another randomized controlled trial.

**A follow-up study of Vicens, 2014 [58].

Table 2: Frequency of Intervention Functions of the Behaviour Change Wheel (BCW) and Associated Behaviour Change Techniques (BCTs) with Brief Description of Strategies Identified in the Literature

Intervention functions *Definition*	**BCTs[a]** **(n)**	**Brief Description of Strategies**
Environmental restructuring **(n=41)** *Changing the physical or social context*	12.5 Adding objects to the environment (n=25)	Evidence-based medication lists or checklists were used to assess appropriateness of prescriptions (e.g. STOPP [79]/START [80], Beers List [81], IPET [83]). (n=13) [12,45,69,72,74,46–48,51,53,61,63,68]
		Algorithms were used for deprescribing (eg. GP-GP algorithm [78], the Garfinkel algorithm [75]). (n=5) [43,44,54,61,75]
		Patient information leaflets were given to patients that described why the potentially inappropriate prescriptions (PIPs) were inappropriate and outlined alternatives (n=5) [43,44,54,58,65]
		Use of a patient finder tool to select candidates for deprescribing. (n=1) [50]
		Use of a tool to identify patients' treatment priorities to make decisions on deprescribing. (n=1) [49]
	7.1 Prompts/cues (n=16)	Invitational letters or patient information leaflets outlining potential medication harms and deprescribing strategies were sent to patients on specific medications (benzodiazepines, proton pump inhibitors (PPI)) to prompt them to visit their prescriber. (n=8) [17,55–57,59,64,70,77]
		Prescription reports were generated to identify patients who were targets for deprescribing through certain criteria (e.g. age 65 and above on five or more medications, on PPI for longer than eight weeks). (n=4) [43,44,50,66]
		EMR pop-ups for patients who met certain criteria (e.g. STOPP) (n=1) [51]
		A standard EMR prompt was sent to GPs of eligible patients to remind them of an upcoming opportunity to reassess PPI. The PPI deprescribing tool was uploaded into the patients' EMR as another reminder. Patient handout was saved in eligible patients' EMRs for printing at visit (n=1) [72]
		Reminder posters about deprescribing of PPI were set up in workplace. (n=1) [73]

		Mailing letters to prescribers who have patients on one or more potentially inappropriate prescriptions (PIPs). (n=1) [62]
***Enablement* (n=38)** *Increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)*	3.2 Social support (practical) (n=23)	Pharmacist performed medication reviews and provided recommendations to prescribers. (n=10) [12,43,44,53,60,61,67,70,74,76]
		Patient initiated deprescribing process by visiting their GP. (n=8) [17,55–57,59,64,70,77]
		Clinical sessions with primary health care teams held by a primary care pharmacist and a GP to identify patients with PIMs. (n=1) [66]
		Support staff conducted patient assessment by telephone three days prior to patient's clinic visit. (n=1) [54]
		Multidisciplinary primary health care team (pharmacist, physician, nurse and patient) decided the deprescription procedure. (n=1) [71]
		Researcher performed medication reviews and provided recommendations to prescribers. (n=1) [75]
		A dyspepsia clinic was set up and run by a specialized nurse advisor who deprescribed PPIs. (n=1) [65]
	1.4 Action planning (n=5)	Prescribers and support health care professionals (pharmacists, nurses, staff) made explicit deprescribing treatment plans for eligible individuals. (n=3) [55,71,74]
		GPs scheduled three consultations at different intervals to talk about patient priorities and goals, goal attainment, and treatment targets for the future. (n=1) [52]
		A shared plan was developed with patients on reducing PPI usage. (n=1) [65]
	8.2 Behavioural substitution (n=4)	Suggestions of therapeutic substitutes for deprescribed medications. (n=4) [17,56,65,70]
	3.1 Social support (unspecified) (n=2)	Using patients' treatment priorities to make decisions on deprescribing. (n=2) [49,50]

	1.1 Goal setting (n=2)	GP's held talks with patients outside of routine consultation concerning priorities and goals in terms of their medication. (n=2) [52,67]
	1.2 Problem solving (n=1)	Geriatrician and geriatric clinical pharmacist met face to face with each GP to review his or her first feedback form and collaborate on additional strategies to reduce potentially inappropriate medication (PIM) prescribing. (n=1) [53]
	3.3 Social support (emotional) (n=1)	Group psychotherapy to help patients discontinue benzodiazepines. (n=1) [77]
***Persuasion* (n=34)** *Using communication to induce positive or negative feelings or stimulate action*	5.1 Information about health consequences (n=16)	Information was given to patients about treatment burden and polypharmacy. (n=9) [17,43,44,56,58,64,65,70,72]
		Information sent to prescribers about associated risk of inappropriate prescribing. (n=7) [45,50,54,55,60,68,73]
	9.1 Credible source (n=8) [43–45,50,53,66,70,75][45,48,57–59,65,69,74]	Academic detailing delivered by a pharmacist or a prescriber on how to conduct a medication review. (n=4) [43–45,53]
		E-mailing of relevant information concerning current clinical evidence to all the participating clinicians. (n=1) [66]
		Video presented to participating clinicians containing evidence-based information. (n=1) [50]
		Results of medication reviews sent to prescribers with literature references. (n=1) [75]
		Evidence-based pharmaceutical opinion sent by the pharmacist to the prescribing physician. (n=1) [70]
	5.2 Salience of consequences (n=4) [17,55,56,70][16,51,52,69]	Patient information leaflet with peer-champion stories sent to patients to encourage GP visit for discussion of deprescribing. (n=3) [17,56,70]
		Training video sent to GP's including feedback from both a practising GP and a simulated patient emphasising the positive outcomes of the consultation. (n=1) [55]
	2.2 Feedback on behaviour (n=4)	Report of prescribers' individual prescribing patterns throughout the intervention period. (n=4) [45–47,53]

	6.2 Social comparison (n=4)	Reports were sent to GPs regarding their prescribing of PIPs, which included comparisons to the averages of all participating GPs. (n=4) [45–47,53]
***Training* (n=24)** *Imparting skills*	4.1 Instruction on how to perform a behaviour (n=21)	Tapering schedules given to patients (n=6) [17,56,59,70,72,77]
		Academic detailing delivered by a pharmacist or a prescriber on how to conduct a medication review. (n=4) [43–45,53]
		GPs trained to perform structured, patient-centred interviews. (n=3) [52,58,64]
		Clinicians shown how to use a tool designed for deprescribing. (n=3) [51,68,73]
		Case studies surrounding the use of the most prevalent PIPs presented to GPs. (n=2) [46,47]
		A simulated training video sent to GPs on how to prescribe polypharmacy appropriately. (n=1) [55]
		Patients given brief coaching on how to discuss medication concerns with prescribers. (n=1) [54]
		GPs gave advice to patients on how to reduce the use of PPI and when to seek help from healthcare providers. (n=1) [64]
	6.1 Demonstration of the behaviour (n=2)	A simulated training video sent to GPs on how to prescribe polypharmacy appropriately. (n=1) [55]
		SPPiRE training video: demonstrated how to perform a SPPiRE medication review. (n=1) [50]
	8.1 Behavioral practice/rehearsal (n=1)	Simulated patients were used in training sessions for GPs to practice how to perform narrative based doctor-patient dialogues reflecting treatment targets and priorities of the patient and how to perform narrative, patient-centred medication reviews. (n=1) [52]
***Education* (n=17)**	5.1 Information about health	Information was given to patients about treatment burden and polypharmacy. (n=9) [17,43,44,56,58,64,65,70,72]

Increasing knowledge or understanding	consequences (n=16)	Information was sent to prescribers about associated risk of inappropriate prescribing. (n=7) [45,50,54,55,60,68,73]
	7.1 Prompts/cues (n=1)	Reminder posters about deprescribing of PPI were set up in workplace. (n=1) [73]
***Incentivisation* (n=3)** *Creating an expectation of reward*	10.6 Non-specific incentive (n=3)	Credit hours awarded for attendance of education events. (n=3) [45–47]
***Modelling* (n=1)** *Providing an example for people to aspire to or imitate*	6.1 Demonstration of the behaviour (n=1)	A simulated training video was sent to participating GPs on how to prescribe polypharmacy appropriately. (n=1) [55]

[a]BCT Definitions found in supplemental materials

Abbreviations: EMR: electronic medical records; GP: General practitioner; GP-GP Algorithm: The Good Palliative-Geriatric Practice (GPGP) algorithm; PIP: Potentially inappropriate prescriptions; PPI: proton pump inhibitors; SPPiRE: Supporting prescribing in older people with multimorbidity and significant polypharmacy in primary care START: Screening tool to alert to right treatment; STOPP: Screening tool of older people's prescriptions

Supplementary Materials (Please contact corresponding author):

Table S1: PRISMA-ScR Checklist

Table S2: Individual Study Strategies, Outcomes and Results

Table S3: PubMed Search Strategy

Supplemental Text: Definitions of Most Commonly Identified Behaviour Change Techniques (BCTs)

Acknowledgements: The authors would like to acknowledge members of the team who have helped throughout the project: Fred Burge and Ellie Salsbury.

Funding: The study was funded through a Dalhousie University Faculty of Health Research Development Grant and grants from the Drug Evaluation Alliance of Nova Scotia (DEANS). The funders had no role in data collection, analysis, data interpretation or in writing or submission of the article.

Author Contributions:

Jennifer E. Isenor: Conceptualization, Methodology, Investigation, Formal analysis, Writing-Original Draft, Writing-Review & Editing, Visualization, Supervision, Funding Acquisition

Isaac Bai: Investigation, Writing-Review & Editing

Rachel Cormier: Investigation, Writing-Original Draft, Writing-Review & Editing

Melissa Helwig: Conceptualization, Methodology, Investigation, Formal analysis, Writing-Review & Editing

Emily Reeve: Conceptualization, Methodology, Formal analysis, Writing-Review & Editing

Anne Marie Whelan: Conceptualization, Methodology, Formal analysis, Writing-Review & Editing

Sarah Burgess: Conceptualization, Investigation, Formal analysis, Writing-Review & Editing

Ruth Martin-Misener: Conceptualization, Formal analysis, Writing-Review & Editing

Natalie Kennie-Kaulbach: Conceptualization, Methodology, Investigation, Formal analysis, Writing-Original Draft, Writing-Review & Editing, Visualization, Supervision, Funding Acquisition

Compliance of Ethical Standards
Informed consent and ethics approval were not applicable.

Conflicts of Interest: All authors declare that they have no conflicts of interest in relation to this project.

References:

1. Opondo D, Eslami S, Visscher S, de Rooij SE, Verheij R, Korevaar JC, et al. Inappropriateness of Medication Prescriptions to Elderly Patients in the Primary Care Setting: A Systematic Review. Simpson C, editor. PLoS One. 2012;7:e43617.

2. Slabaugh SL, Maio V, Templin M, Abouzaid S. Prevalence and risk of polypharmacy among the elderly in an outpatient setting: a retrospective cohort study in the Emilia-Romagna region, Italy. Drugs Aging. 2010;27:1019–28.

3. Viktil KK, Blix HS, Moger TA, Reikvam A. Polypharmacy as commonly defined is an indicator of limited value in the assessment of drug-related problems. Br J Clin Pharmacol. 2007;63:187–95.

4. Reeve E, Thompson W, Farrell B. Deprescribing: A narrative review of the evidence and practical recommendations for recognizing opportunities and taking action. Eur J Intern Med. 2017;38:3–11.

5. Farrell B, Pottie K, Rojas-Fernandez CH, Bjerre LM, Thompson W, Welch V. Methodology for Developing Deprescribing Guidelines: Using Evidence and GRADE to Guide Recommendations for Deprescribing. Quinn TJ, editor. PLoS One. 2016;11:e0161248.

6. Woodward MC. Deprescribing: Achieving Better Health Outcomes for Older People through Reducing Medications. J Pharm Pract Res. 2003;33:323–8.

7. Reeve E, Gnjidic D, Long J, Hilmer S. A systematic review of the emerging definition of 'deprescribing' with network analysis: implications for future research and clinical practice. Br J Clin Pharmacol. 2015;80:1254–68.

8. Reeve E, Ong M, Wu A, Jansen J, Petrovic M, Gnjidic D. A systematic review of interventions to deprescribe benzodiazepines and other hypnotics among older people. Eur J Clin Pharmacol. 2017;73:927–35.

9. Thompson W, Reeve E, Moriarty F, Maclure M, Turner J, Steinman MA, et al. Deprescribing: Future directions for research. Res Soc Adm Pharm. 2019;15:801–5.

10. Page AT, Clifford RM, Potter K, Schwartz D, Etherton-Beer CD. The feasibility and effect of deprescribing in older adults on mortality and health: a systematic review and meta-analysis. Br J Clin Pharmacol. 2016;82:583–623.

11. Niehoff KM, Rajeevan N, Charpentier PA, Miller PL, Goldstein MK, Fried TR. Development of the Tool to Reduce Inappropriate Medications (TRIM): A Clinical Decision Support System to Improve Medication Prescribing for Older Adults. Pharmacother J Hum Pharmacol Drug Ther. 2016;36:694–701.

12. Milos V, Rekman E, Bondesson Å, Eriksson T, Jakobsson U, Westerlund T, et al. Improving the Quality of Pharmacotherapy in Elderly Primary Care Patients Through Medication Reviews: A Randomised Controlled Study. Drugs Aging. 2013;30:235–46.

13. Thompson W, Hogel M, Li Y, Thavorn K, O'Donnell D, McCarthy L, et al. Effect of a Proton Pump Inhibitor Deprescribing Guideline on Drug Usage and Costs in Long-Term Care. J Am Med Dir Assoc. 2016;17:673.e1-673.e4.

14. Rodríguez-Pérez A, Alfaro-Lara ER, Albiñana-Perez S, Nieto-Martín MD, Díez-Manglano J, Pérez-Guerrero C, et al. Novel tool for deprescribing in chronic patients with multimorbidity: List of Evidence-Based Deprescribing for Chronic Patients criteria. Geriatr Gerontol Int. 2017;17:2200–7.

15. Johansson T, Abuzahra ME, Keller S, Mann E, Faller B, Sommerauer C, et al. Impact of strategies to reduce polypharmacy on clinically relevant endpoints: a systematic review and meta-analysis. Br J Clin Pharmacol. 2016;82:532–48.

16. Gnjidic D, Couteur DG Le, Kouladjian L, Hilmer SN, Le Couteur DG, Kouladjian L, et al. Deprescribing Trials: Methods to Reduce Polypharmacy and the Impact on Prescribing and Clinical Outcomes. Clin Geriatr Med. 2012;28:237–53.

17. Tannenbaum C, Martin P, Tamblyn R, Benedetti A, Ahmed S. Reduction of inappropriate benzodiazepine prescriptions among older adults through direct patient education: The EMPOWER cluster randomized trial. JAMA Intern Med. 2014;174:890–8.

18. Cooper JA, Cadogan CA, Patterson SM, Kerse N, Bradley MC, Ryan C, et al. Interventions to improve the appropriate use of polypharmacy in older people: a Cochrane systematic review. BMJ Open. 2015;5:e009235.

19. Tjia J, Velten SJ, Parsons C, Valluri S, Briesacher BA. Studies to Reduce Unnecessary Medication Use in Frail Older Adults: A Systematic Review. Drugs Aging. 2013;30:285–307.

20. Hansen CR, O'Mahony D, Kearney PM, Sahm LJ, Cullinan S, Huibers CJAJA, et al. Identification of behaviour change techniques in deprescribing interventions: a systematic review and meta-analysis. Br J Clin Pharmacol. 2018;84:2716–28.

21. Anderson K, Stowasser D, Freeman C, Scott I. Prescriber barriers and enablers to minimising potentially inappropriate medications in adults: a systematic review and thematic synthesis. BMJ Open. 2014;4:e006544.

22. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. Implement Sci. 2012;7:37.

23. Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implement Sci. 2011;6:42.

24. Richardson M, Khouja CL, Sutcliffe K, Thomas J. Using the theoretical domains framework and the behavioural change wheel in an overarching synthesis of systematic reviews. BMJ Open. 2019;9:e024950.

25. Beyene K, Aspden T, Sheridan J. Using the Behaviour Change Wheel to explore potential strategies for minimising harms from non-recreational prescription medicine sharing. Res Soc Adm Pharm. 2019;15:130–44.

26. Sargent L, McCullough A, Del Mar C, Lowe J. Using theory to explore facilitators and barriers to delayed prescribing in Australia: a qualitative study using the Theoretical Domains Framework and the Behaviour Change Wheel. BMC Fam Pract. 2017;18:20.

27. Batura N, Cuevas C, Khan M, Wiseman V. How effective and cost-effective are behaviour change interventions in improving the prescription and use of antibiotics in low-income and

middle-income countries? A protocol for a systematic review. BMJ Open. 2018;8:e021517.

28. Rawson TM, Moore LSP, Tivey AM, Tsao A, Gilchrist M, Charani E, et al. Behaviour change interventions to influence antimicrobial prescribing: a cross-sectional analysis of reports from UK state-of-the-art scientific conferences. Antimicrob Resist Infect Control. 2017;6:11.

29. Michie S, Atkins L, West R. The Behaviour Change Wheel: A Guide to Designing Interventions. 1st ed. UK: Silverback Publishing; 2014.

30. 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. Br J Health Psychol. 2015;20:130–50.

31. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol. 2005;8:19–32.

32. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–73.

33. Flinders University. The Primary Health Care Research and Information Service (PHCRIS) [Internet]. [cited 2020 Jun 6]. Available from: https://www.flinders.edu.au/fhmri-primary-health-care-research-and-information-service

34. Flinders University. PHC Search Filter [Internet]. [cited 2020 Jun 6]. Available from: https://www.flinders.edu.au/fhmri-primary-health-care-research-and-information-service/phc-search-filter

35. Stone PW. Popping the (PICO) question in research and evidence-based practice. Appl Nurs Res. 2002;15:197–8.

36. Covidence systematic review software [Internet]. Melbourne, Australia: Veritas Health Innovation; Available from: www.covidence.org

37. Vicens C, Sempere E, Bejarano F, Socias I, Mateu C, Fiol F, et al. Efficacy of two interventions on the discontinuation of benzodiazepines in long-term users: 36-month follow-up of a cluster randomised trial in primary care. Br J Gen Pract. 2016;66:e85–91.

38. Clyne B, Smith SM, Hughes CM, Boland F, Cooper JA, Fahey T. Sustained effectiveness of a multifaceted intervention to reduce potentially inappropriate prescribing in older patients in primary care (OPTI-SCRIPT study). Implement Sci. Implementation Science; 2016;11:1–8.

39. Gillespie P, Clyne B, Raymakers A, Fahey T, Hughes CM, Smith SM. REDUCING POTENTIALLY INAPPROPRIATE PRESCRIBING FOR OLDER PEOPLE IN PRIMARY CARE: COST-EFFECTIVENESS OF THE OPTI-SCRIPT INTERVENTION. Int J Technol Assess Health Care. 2017;33:494–503.

40. Campins L, Serra-Prat M, Palomera E, Bolibar I, Martínez MÀ, Gallo P. Reduction of pharmaceutical expenditure by a drug appropriateness intervention in polymedicated elderly subjects in Catalonia (Spain). Gac Sanit. 2019;33:106–11.

41. Clyne B, Cooper JA, Hughes CM, Fahey T, Smith SM. A process evaluation of a cluster

randomised trial to reduce potentially inappropriate prescribing in older people in primary care (OPTI-SCRIPT study). Trials. Trials; 2016;17:1–15.

42. Martin P, Tannenbaum C. Use of the EMPOWER brochure to deprescribe sedative-hypnotic drugs in older adults with mild cognitive impairment. BMC Geriatr. BMC Geriatrics; 2017;17:37.

43. Clyne B, Clear D, McDonnell R, Fahey T, Smith SM, Bradley MC, et al. Addressing potentially inappropriate prescribing in older patients: Development and pilot study of an intervention in primary care (the OPTI-SCRIPT study). BMC Health Serv Res. 2013;13:1–13.

44. Clyne B, Smith SM, Hughes CM, Boland F, Bradley MC, Cooper JA, et al. Effectiveness of a Multifaceted Intervention for Potentially Inappropriate Prescribing in Older Patients in Primary Care: A Cluster-Randomized Controlled Trial (OPTI-SCRIPT Study). Ann Fam Med. 2015;13:545–53.

45. Rognstad S, Brekke M, Fetveit A, Dalen I, Straand J. Prescription peer academic detailing to reduce inappropriate prescribing for older patients: a cluster randomised controlled trial. Br J Gen Pract. 2013;63:e554–62.

46. Keith SW, Maio V, Dudash K, Templin M, Del Canale S. A Physician-Focused Intervention to Reduce Potentially Inappropriate Medication Prescribing in Older People. Drugs Aging. 2013;30:119–27.

47. Lopatto J, Keith SW, Del Canale S, Templin M, Maio V. Evaluating sustained quality improvements: long-term effectiveness of a physician-focused intervention to reduce potentially inappropriate medication prescribing in an older population. J Clin Pharm Ther. 2014;39:266–71.

48. Lesende IM, Crespo IM, López GM, Zelaia IG, Parra JCA, Goicoechea AM, et al. Potentiality of STOPP/START criteria used in primary care to effectively change inappropriate prescribing in elderly patients. Eur Geriatr Med. 2013;4:293–8.

49. van Summeren JJ, Schuling J, Haaijer-Ruskamp FM, Denig P. Outcome prioritisation tool for medication review in older patients with multimorbidity: a pilot study in general practice. Br J Gen Pract. 2017;67:e501–6.

50. McCarthy C, Clyne B, Corrigan D, Boland F, Wallace E, Moriarty F, et al. Supporting prescribing in older people with multimorbidity and significant polypharmacy in primary care (SPPiRE): a cluster randomised controlled trial protocol and pilot. Implement Sci. Implementation Science; 2017;12:99.

51. Price M, Davies I, Rusk R, Lesperance M, Weber J. Applying STOPP Guidelines in Primary Care Through Electronic Medical Record Decision Support: Randomized Control Trial Highlighting the Importance of Data Quality. JMIR MedInf. 2017;5:38–48.

52. Schäfer I, Kaduszkiewicz H, Mellert C, Löffler C, Mortsiefer A, Ernst A, et al. Narrative medicine-based intervention in primary care to reduce polypharmacy: results from the cluster-randomised controlled trial MultiCare AGENDA. BMJ Open. 2018;8:e017653.

53. Vandenberg AE, Echt K V., Kemp L, McGwin G, Perkins MM, Mirk AK. Academic Detailing with Provider Audit and Feedback Improve Prescribing Quality for Older Veterans. J Am Geriatr Soc. 2018;66:621–7.

54. Fried TR, Niehoff KM, Street RL, Charpentier PA, Rajeevan N, Miller PL, et al. Effect of the Tool to Reduce Inappropriate Medications on Medication Communication and Deprescribing. J Am Geriatr Soc. 2017;65:2265–71.

55. Cadogan C, Ryan C, Gormley GJ, Francis JJ, Passmore P, Kerse N, et al. A feasibility study of a theory-based intervention to improve appropriate polypharmacy for older people in primary care. Pilot Feasibility Stud. 2018;4:23.

56. Tannenbaum, C; Tamblyn R, Ahmed S. Consumer-Targeted Drug Information to Reduce Inappropriate Prescriptions: Feedback from Older Adults and Preliminary Effectiveness. J Am Geriatr Soc. 2012;60:S1–242.

57. Heather N, Bowie A, Ashton H, McAvoy B, Spencer I, Brodie J, et al. Randomised controlled trial of two brief interventions against long-term benzodiazepine use: outcome of intervention. Addict Res Theory. 2004;12:141–54.

58. Vicens C, Bejarano F, Sempere E, Mateu C, Fiol F, Socias I, et al. Comparative efficacy of two interventions to discontinue long-term benzodiazepine use: cluster randomised controlled trial in primary care. Br J Psychiatry. 2014;204:471–9.

59. Gorgels WJMJ, Oude Voshaar RC, Mol AJJ, van de Lisdonk EH, van Balkom AJLM, van den Hoogen HJM, et al. Discontinuation of long-term benzodiazepine use by sending a letter to users in family practice: a prospective controlled intervention study. Drug Alcohol Depend. 2005;78:49–56.

60. Caffiero N, Delate T, Ehizuelen MD, Vogel K. Effectiveness of a Clinical Pharmacist Medication Therapy Management Program in Discontinuation of Drugs to Avoid in the Elderly. J Manag Care Spec Pharm. 2017;23:525–31.

61. Campins L, Serra-Prat M, Gózalo I, López D, Palomera E, Agustí C, et al. Randomized controlled trial of an intervention to improve drug appropriateness in communitydwelling polymedicated elderly people. Fam Pract. 2017;34:36–42.

62. Starner CI, Norman SA, Reynolds RG, Gleason PRP. Effect of a Retrospective Drug Utilization Review on Potentially Inappropriate Prescribing in the Elderly. Am J Geriatr Pharmacother. 2009;7:11–9.

63. Walsh EK, Cussen K. "Take ten minutes": a dedicated ten minute medication review reduces polypharmacy in the elderly. Ir Med J. 2010;103:236–8.

64. Krol N, Wensing M, Haaijer-Ruskamp F, Muris JWMM, Numans ME, Schattenberg G, et al. Patient-directed strategy to reduce prescribing for patients with dyspepsia in general practice: a randomized trial. Aliment Pharmacol Ther. 2004;19:917–22.

65. Murie J, Allen J, Simmonds R, de Wet C. Glad you brought it up: a patient-centred programme to reduce proton-pump inhibitor prescribing in general medical practice. Qual Prim Care. 2012;20:141–8.

66. Montero-Balosa, MC; Palma-Morgado, D; Leon-Almenara, MA; Real, FS-D; Sagrista-Gonzalez, M; Fernandez-Urrusuno R. Effectiveness of medication review in patients with polypharmacy. Int J Clin Pharm. 2015;37:277–8.

67. Kwint, Henk-Frans; Mertens BJ, ; Bouvy ML. Impact of deprescribing as part of clinical medication review on polypharmacy of older patients in an integrated primary care setting. Int J Clin Pharm. 2017;39:969–76.

68. Gibert P, Cabaret M, Moulis M, Bosson J-L, Boivin J-E, Chanoine S, et al. Optimizing medication use in elderly people in primary care: Impact of STOPP criteria on inappropriate prescriptions. Arch Gerontol Geriatr. Elsevier; 2018;75:16–9.

69. Seng C, Yiwei N, Pheng L, Abdin E, Subramaniam M, Seng, Chee Kok; Yiwei, Ng; Pheng, Lee Siau; Abdin, Edimansyah; Subramaniam M. Pharmacist-run medication management service to reduce inappropriate benzodiazepine and anticholinergic medication usage over 6 months and 1 year. J Pharm Pract [Internet]. 2015;28:366. Available from: http://journals.sagepub.com/doi/10.1177/0897190015582204

70. Martin P., Tannenbaum C, Tamblyn R., Benedetti A., Ahmed S. D-PRESCRIBE: A randomized cluster controlled trial to reduce inappropriate prescriptions in seniors. Can Pharm J. 2017;150:S14.

71. Roig SO, Gómez-Valent M, Velilla BM, Trias LB, Perich MC i, Torner MG. BENZODIAZEPINES and Z-DRUGS deprescription by a multidisciplinary pharmacotherapy revision focused on the patient. Patient Saf risk Manag. British Medical Journal Publishing Group; 2017. p. A251.1-A251.

72. Walsh K, Kwan D, Marr P, Papoushek C, Lyon WK. Deprescribing in a family health team: a study of chronic proton pump inhibitor use. J Prim Health Care. 2016;8:164–71.

73. Shahid B. Educational Intervention to Reduce Inappropriate Use of Proton Pump Inhibitors in Resident Primary Care Clinic. Am J Gastroenterol. 2016;111:S1284–5.

74. Hurmuz MZM, Janus SIM, van Manen JG. Changes in medicine prescription following a medication review in older high-risk patients with polypharmacy. Int J Clin Pharm. Springer International Publishing; 2018;40:480–7.

75. Garfinkel D. Poly-de-prescribing to treat polypharmacy: efficacy and safety. Ther Adv Drug Saf. 2018;9:25–43.

76. Early N, Bainter B, Hanson L, Henry N, Schmitz E. Collaboration Among a Medicare Advantage Plan, Consultant Pharmacy Group, and Nurse Practitioner Group to Reduce Polypharmacy in High Risk Patients. Consult Pharm. 2017;32:577–608.

77. de Gier NAH, Gorgels WJMJ, Lucassen PLBJ, Oude Voshaar R, Mulder J, Zitman F. Discontinuation of long-term benzodiazepine use: 10-year follow-up. Fam Pract. 2011;28:253–9.

78. Garfinkel D, Mangin D. Feasibility Study of a Systematic Approach for Discontinuation of Multiple Medications in Older Adults. Arch Intern Med. 2010;170.

79. Gallagher P, Ryan C, Byrne S, Kennedy J, O'Mahony D. STOPP (Screening Tool of Older Person’s Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment). Consensus validation. Int J Clin Pharmacol Ther. 2008;46:72–83.

80. Barry PJ, Gallagher P, Ryan C, O'mahony D. START (screening tool to alert doctors to the right treatment) an evidence-based screening tool to detect prescribing omissions in elderly

patients. Age Ageing. 2007;36:632–8.

81. American Geriatrics Society 2012 Beers Criteria Update Expert Panel. American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2012;60:616–31.

82. Fried TR, Tinetti ME, Iannone L, O'Leary JR, Towle V, Van Ness PH. Health outcome prioritization as a tool for decision making among older persons with multiple chronic conditions. Arch Intern Med. 2011;171:1854–6.

83. Naugler CT, Brymer C, Stolee P, Arcese ZA. Development and validation of an improving prescribing in the elderly tool. Can J Clin Pharmacol. 2000;7:103–7.

84. Reason B, Terner M, McKeag AM, Tipper B, Webster G. The impact of polypharmacy on the health of Canadian seniors. Fam Pract. 2012;29:427–32.

85. Reeve E, Shakib S, Hendrix I, Roberts MS, Wiese MD. Review of deprescribing processes and development of an evidence-based, patient-centred deprescribing process. Br J Clin Pharmacol. 2014;78:738–47.

86. Wallis KA, Andrews A, Henderson M. Swimming Against the Tide: Primary Care Physicians' Views on Deprescribing in Everyday Practice. Ann Fam Med. 2017;15:341–6.

87. Conklin J, Farrell B, Suleman S. Implementing deprescribing guidelines into frontline practice: Barriers and facilitators. Res Soc Adm Pharm. 2019;15:796–800.

88. Ailabouni NJ, Nishtala PS, Mangin D, Tordoff JM. Challenges and Enablers of Deprescribing: A General Practitioner Perspective. PLoS One. 2016;11:e0151066.

89. Linsky A, Zimmerman KM. Provider and System-Level Barriers to Deprescribing: Interconnected Problems and Solutions. Public Policy Aging Rep. 2018;28:129–33.