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Supplementary file - Tables S1 - S4

Supplementary tables to the manuscript “IDENTIFICATION OF BEHAVIOUR CHANGE TECHNIQUES IN DEPRESCRIBING INTERVENTIONS: A SYSTEMATIC REVIEW AND META-ANALYSIS”

Table S1 Search strategy

Population	Intervention	Outcome	Filters
Aged, aged 80 and over, adult*, older people, elderly	Deprescriptions, deprescri*, discontinu*, reduc*, ending, stopping	Drug prescriptions, polypharmacy, inappropriate prescribing, prescription*, inappropriate prescriptions, medication*, medicine*	Clinical trial, controlled clinical trial, randomised controlled trial

Database	Search	Results
MEDLINE Dec 14th, 2016	(adult* OR aged OR "older patients" OR "old patients" OR elderly) **AND** ((deprescriptions [MeSH] N2 drug prescriptions [MeSH] OR deprescriptions [MeSH] N2 polypharmacy [MeSH] OR deprescriptions [MeSH] N2 inappropriate prescribing [MeSH] OR deprescriptions [MeSH] N2 prescriptions [MeSH] OR deprescriptions [MeSH] N2 prescription OR deprescriptions [MeSH] N2 polypharmacy OR deprescriptions [MeSH] N2 'inappropriate prescribing' OR deprescriptions [MeSH] N2 'inappropriate prescriptions' OR deprescriptions [MeSH] N2 medication* OR deprescriptions [MeSH] N2 medicine*) OR (deprescri* N2 drug prescriptions [MeSH] OR deprescri* N2 polypharmacy [MeSH] OR deprescri* N2 inappropriate prescribing [MeSH] OR deprescri* N2 prescriptions [MeSH] OR deprescri* N2 prescription OR deprescri* N2 polypharmacy OR deprescri* N2 'inappropriate prescribing' OR deprescri* N2 'inappropriate prescriptions' OR deprescri* N2 medication* OR deprescri* N2 medicine*) OR (discontinu* N2 drug prescriptions [MeSH] OR discontinu* N2 polypharmacy [MeSH] OR discontinu* N2 inappropriate prescribing [MeSH] OR discontinu* N2 prescriptions [MeSH] OR discontinu* N2 prescription OR discontinu* N2 polypharmacy OR discontinu* N2 'inappropriate prescribing' OR discontinu* N2 'inappropriate prescriptions' OR discontinu* N2 medication* OR discontinu* N2 medicine*) OR (reduc* N2 drug prescriptions [MeSH] OR reduc* N2 polypharmacy [MeSH] OR	124

	reduc* N2 inappropriate prescribing [MeSH] OR reduc* N2 prescriptions [MeSH] OR reduc* N2 prescription OR reduc* N2 polypharmacy OR reduc* N2 'inappropriate prescribing' OR reduc* N2 'inappropriate prescriptions' OR reduc* N2 medication* OR reduc* N2 medicine*) OR (ending N2 drug prescriptions [MeSH] OR ending N2 polypharmacy [MeSH] OR ending N2 inappropriate prescribing [MeSH] OR ending N2 prescriptions [MeSH] OR ending N2 prescription OR ending N2 polypharmacy OR ending N2 'inappropriate prescribing' OR ending N2 'inappropriate prescriptions' OR ending N2 medication* OR ending N2 medicine*) OR (stopping N2 drug prescriptions [MeSH] OR stopping N2 polypharmacy [MeSH] OR stopping N2 inappropriate prescribing [MeSH] OR stopping N2 prescriptions [MeSH] OR stopping N2 prescription OR stopping N2 polypharmacy OR stopping N2 'inappropriate prescribing' OR stopping N2 'inappropriate prescriptions' OR stopping N2 medication* OR stopping N2 medicine*)) **Filters applied:** Clinical trial Controlled clinical trial Randomised controlled trial	
Academic Search Complete Dec 14th, 2016	(adult* OR aged OR "older patients" OR "old patients" OR elderly) **AND** ((deprescriptions [MeSH] N2 drug prescriptions [MeSH] OR deprescriptions [MeSH] N2 polypharmacy [MeSH] OR deprescriptions [MeSH] N2 inappropriate prescribing [MeSH] OR	33

	deprescriptions [MeSH] N2 prescriptions [MeSH] OR deprescriptions [MeSH] N2 prescription OR deprescriptions [MeSH] N2 polypharmacy OR deprescriptions [MeSH] N2 'inappropriate prescribing' OR deprescriptions [MeSH] N2 'inappropriate prescriptions' OR deprescriptions [MeSH] N2 medication* OR deprescriptions [MeSH] N2 medicine*) OR (deprescri* N2 drug prescriptions [MeSH] OR deprescri* N2 polypharmacy [MeSH] OR deprescri* N2 inappropriate prescribing [MeSH] OR deprescri* N2 prescriptions [MeSH] OR deprescri* N2 prescription OR deprescri* N2 polypharmacy OR deprescri* N2 'inappropriate prescribing' OR deprescri* N2 'inappropriate prescriptions' OR deprescri* N2 medication* OR deprescri* N2 medicine*) OR (discontinu* N2 drug prescriptions [MeSH] OR discontinu* N2 polypharmacy [MeSH] OR discontinu* N2 inappropriate prescribing [MeSH] OR discontinu* N2 prescriptions [MeSH] OR discontinu* N2 prescription OR discontinu* N2 polypharmacy OR discontinu* N2 'inappropriate prescribing' OR discontinu* N2 'inappropriate prescriptions' OR discontinu* N2 medication* OR discontinu* N2 medicine*) OR (reduc* N2 drug prescriptions [MeSH] OR reduc* N2 polypharmacy [MeSH] OR reduc* N2 inappropriate prescribing [MeSH] OR reduc* N2 prescriptions [MeSH] OR reduc* N2 prescription OR reduc* N2 polypharmacy OR reduc* N2 'inappropriate prescribing' OR reduc* N2 'inappropriate prescriptions' OR reduc* N2 medication* OR reduc* N2 medicine*)	

	OR (ending N2 drug prescriptions [MeSH] OR ending N2 polypharmacy [MeSH] OR ending N2 inappropriate prescribing [MeSH] OR ending N2 prescriptions [MeSH] OR ending N2 prescription OR ending N2 polypharmacy OR ending N2 'inappropriate prescribing' OR ending N2 'inappropriate prescriptions' OR ending N2 medication* OR ending N2 medicine*) OR (stopping N2 drug prescriptions [MeSH] OR stopping N2 polypharmacy [MeSH] OR stopping N2 inappropriate prescribing [MeSH] OR stopping N2 prescriptions [MeSH] OR stopping N2 prescription OR stopping N2 polypharmacy OR stopping N2 'inappropriate prescribing' OR stopping N2 'inappropriate prescriptions' OR stopping N2 medication* OR stopping N2 medicine*)) **AND** ("clinical trial*") OR ("controlled clinical trial*") OR ("randomized controlled trial*") OR ("randomised controlled trial*") OR ("controlled trial")	
Web of Science† Dec 14th, 2016	(adult* OR aged OR "older patients" OR "old patients" OR elderly) **AND** ((deprescri* NEAR/2 "polypharmacy") OR (deprescri* NEAR/2 "inappropriate prescribing") OR (deprescri* NEAR/2 prescription*) OR (deprescri* NEAR/2 medication*) OR (deprescri* NEAR/2 medicine*) OR (discontinu* NEAR/2 polypharmacy) OR (discontinu* NEAR/2 "inappropriate prescribing") OR (discontinu* NEAR/2 prescription*) OR (discontinu* NEAR/2 medication*) OR (discontinu* NEAR/2 medicine*) OR (reduc* NEAR/2 polypharmacy) OR (reduc* NEAR/2 "inappropriate prescribing") OR	642

	(reduc* NEAR/2 prescription*) OR (reduc* NEAR/2 medication*) OR (reduc* NEAR/2 medicine*) OR (ending NEAR/2 polypharmacy*) OR (ending NEAR/2 prescription*) OR (ending NEAR/2 "inappropriate prescribing") OR (ending NEAR/2 medication*) OR (ending NEAR/2 medicine*) OR (reduction NEAR/2 "inappropriate prescribing") OR (stopping NEAR/2 polypharmacy) OR (stopping NEAR/2 "inappropriate prescribing") OR (stopping NEAR/2 prescription*) OR (stopping NEAR/2 medication*) OR (stopping NEAR/2 medicine*)) **AND** ("clinical trial") OR ("controlled clinical trial") OR ("randomized controlled trial") OR ("randomised controlled trial") OR ("controlled trial")	
EMBASE‡ Dec 14th, 2016	('adult'/de OR 'adult' OR 'aged'/de OR 'aged' OR 'older people' OR elderly) **AND** Deprescription NEAR/2 prescription Deprescription NEAR/2 polypharmacy Deprescription NEAR/2 'inappropriate prescribing' Deprescription NEAR/2 medication Deprescription NEAR/2 medicine Discontinu* NEAR/2 prescription Discontinu* NEAR/2 polypharmacy Discontinu*NEAR/2 'inappropriate prescribing' Discontinu* NEAR/2 medication Discontinu* NEAR/2 medicine Reduc* NEAR/2 prescription Reduc* NEAR/2 polypharmacy Reduc* NEAR/2 'inappropriate prescribing' Reduc* NEAR/2 medication Reduc* NEAR/2 medicine Ending NEAR/2 prescription Ending NEAR/2 polypharmacy Ending NEAR/2 'inappropriate prescribing' Ending NEAR/2 medication	645

	Ending NEAR/2 medicine Stopping NEAR/2 prescription Stopping NEAR/2 polypharmacy Stopping NEAR/2 'inappropriate prescribing' Stopping NEAR/2 medication Stopping NEAR/2 medicine **Filters:** 'controlled clinical trial' 'randomized controlled trial'	

†It is not possible to use MeSH terms in Web of Science and the filters available did not match the search strategy, therefore additional keywords were added to the search, i.e. "clinical trials" etc.
‡EMTREE mapping used for all relevant words, i.e. adult, aged, deprescription, prescription, inappropriate prescribing and polypharmacy.

Table S2 *Risk of bias assessment*

Description of risk of bias assessment
Random sequence generation and allocation concealment were judged to be at low risk of bias if methods for both were described in sufficient detail to determine its adequateness. Inadequate sequence generation methods (such as date of entry) and concealment methods were judged to have high risk of bias. Blinding procedures were considered to carry a low risk of bias if the description of the procedure reflected blinding. Absence of blinding or unblinding of participants and personnel were both deemed to introduce high risk of bias. Selective outcome reporting was assessed at low risk of bias if all patient-relevant outcomes described in the methods section were fully addressed in the paper. Incomplete outcome data were typically rated as high risk of bias if the loss of patients to follow-up was ≥20% and rated as low risk if ≤10%. Imbalance in the proportions of patients lost to follow-up between intervention and control groups was also considered to introduce bias. Unclear risk of bias was judged for any study element for which there was insufficient information.
Description of risk of bias categorised as 'other bias' in the assessment
Allard *et al.* (2001) - High risk No information on how the study chose which physician to contact for each patient, i.e. no information of whether it was the primary prescriber or the prescriber who prescribed most of the medications. This may have had an effect on their actions on the recommendations given and their collaboration. Some of the prescribers had patients in both experimental and control group and there may have been a carry-over-effect. However, the study reported that this had no effect on the outcomes. No control for number of prescribers and some patients had multiple prescribers which may have had an effect on the outcomes.
Crotty *et al.* (2004) - Unclear risk The study is a cluster-RCT but the clustering was not accounted for in the data analysis. Rather than analysing the data at cluster-level, the data were analysed at patient-level by pooling the data for the intervention clusters into one group and pooling the data for the control cluster into one group (i.e. one control group and one within-facility control group). The study did not account for correlation between observations for patients in the same cluster.
Fick *et al.* (2004) - Unclear risk During the 6-month follow-up after the end of the study, the study mentioned that: "During our study period, major changes occurred in the primary care physician network, with 78 primary care

providers leaving the network, 129 joining the network….so we did not conduct a further analysis of PIM use at the provider level".
Pitkälä *et al.* (2014) - Low risk There may have been potential contamination if some of the healthcare professionals worked in multiple wards during the study.
Pope *et al.* (2011) - High risk Prior to admission, the suitability of each patient for admission to a continuing-care ward had been assessed by a multidisciplinary panel chaired by a consultant geriatrician. Some medication-related problems may have been solved prior to randomisation. The study commented on this. GPs in the control group had access to specialist geriatric medicine advice on request. The study did not report how often the GPs requested this and what the outcome was. This may have affected the outcomes for the control group and "hidden" the "true" effect of the intervention.
Richmond *et al.* (2010) - High risk The study had underestimated the number of drugs prescribed to patients at the final time point used in the study. As a result, there was a significant difference in the mean number of drugs shown on prescription at the final time point compared with the number over the four previous months (diff=1.14, 95% CI 1.01, 1.27). The number of drugs affects the UK-MAI score (primary outcome), and this appeared to indicate that medication appropriateness had improved at the final follow-up time point. The study commented on this and corrected for this.
Saltvedt *et al.* (2005) - High risk "Suitable patients were screened when there was a free bed in the specialist ward. Eligible patients who had been recently admitted to the department were preferred over those who had been there longer." This could have introduced a selection bias which could have affected the generalisability of the findings to the wider population.
Spinewine *et al.* (2007) - Low risk Because the same physicians were caring for control and intervention patients, contamination of control patients was possible. To assess this bias, two investigators applied the outcome assessment to a random sample of 90 patients to the unit 1 year before the study, i.e. a "historical control group". This could only be done for two of three primary outcome measures.
Tamblyn *et al.* (2003) - Unclear risk The study experienced two problems that influenced the effectiveness of the computer-system intervention, these being co-payments for prescription drugs increased when the study began and many software problems that resulted in information downloaded less often. Another potential bias was the study design using cluster-randomisation. However, the study did account for the clustering in the data analysis: "Physicians were identified as the clustering factor within which rates were examined, and an exchangeable correlation structure was used to take into account the dependence of observations for patients of the same physician." We consider no risk of bias associated with clustering and data analysis.
Tannenbaum *et al.* (2014) - Low risk The study design was a cluster-RCT with community pharmacies as the clusters. When assessing the primary outcome (complete cessation of benzodiazepine use) the study used the participant as the unit of analysis, the community pharmacy as the cluster, an exchangeable correlation coefficient to account for clustering effects of participants within the same cluster.

Table S3 Data extraction form

Author (year)	Country	Setting primary/secondary/tertiary (specified)	Aim

Intervention type (e.g. medication reviews, electronic alerts, education etc.)	Intervention description	Control type (e.g. usual care, different education/training)	Who delivered the intervention? (researcher, pharmacists etc.)
Intervention target person (i.e. whose behaviour was changed/targeted?)	Follow-up duration	Primary outcome	Secondary outcomes
Tool /Measure to identify target/outcome (only for prescribing appropriateness)	Number of participants enrolled in total and for individual arm	N (participants, total)	Gender female (%) (both total, intervention group and control group)
Age of study population (specify mean or median)	Average of Mean (SD)	Ethical considerations (yes/no/cant' tell)	The study conclusion (short!)
Trial design	Where were participants recruited from?	How were participants recruited? (database, telephone etc.)	Sample size calculation/consideration reported (yes/no)
Data collection (i.e. source of information)	Blinding (who was blinded or what process what blinded?)	Randomisation strategy	Eligibility criteria of study subject/patients (who was invited?)
Inclusion criteria (study subjects/patients)	Exclusion criteria (study subjects/patients)	Medication use/prescribing rate at baseline	Number of participants experiencing reduction in number of prescriptions (in all intervention and control groups) Event/Intervention and event/control
Number of participants experiencing reduction in number of medication (in all control and intervention groups)	Number of participants experiencing reduction in number of PIPs/PIMs (in all control and intervention groups)	Change in number of PIPs/Rx/Drugs/Dosages	Change in MAI-score

Healthcare services utilization (hospital admission, GP visits etc.)	ADRs/ADEs prevalence	Medication costs	Other comments on outcomes (if relevant to the review)

Table S4 *Behaviour change techniques taxonomy version 1 (BCTTv1) applied to the included studies and the prevalence of each BCT and BCT cluster [1].*

BCTTv1 cluster	All studies (n=23)	Studies reporting effect (n=9)	Weighted frequency for studies reporting effect	Studies reporting no effect (n=14)	Weighted frequency for studies reporting no effect
1. Goals and planning	**19**	**11**	**28**	**8**	**13**
1.1 Goal setting (behaviour)	1	1	**3**	0	0
1.2 Problem solving	6	3	**8**	3	5
1.3 Goal setting (outcome)	3	2	**5**	1	2
1.4 Action planning	8	4	**10**	4	7
1.5 Review behaviour goal(s)	1	1	**3**	0	0
2. Feedback and monitoring	**29**	**10**	**26**	**19**	**31**
2.1 Monitoring of behaviour by others without feedback	4	2	**5**	2	3
2.2 Feedback on behaviour	14	4	10	10	16
2.3 Self-monitoring of behaviour	3	2	**5**	1	2
2.4 Self-monitoring of outcome(s)	2	0	0	2	3
2.7 Feedback on outcome(s) of behaviour	6	2	5	4	7
3. Social support	**12**	**5**	**13**	**7**	**12**
3.1 Social support (unspecified)	10	5	**13**	5	8
3.2 Social support (practical)	2	0	0	2	3
4. Shaping knowledge	**17**	**7**	**18**	**10**	**16**
4.1 Instruction on how to perform a behaviour	16	7	**18**	9	15
4.3 Re-attribution	1	0	0	1	2
5. Natural consequences	**10**	**5**	**13**	**5**	**8**
5.1 Information about health consequences	8	4	**10**	4	7

5.2 Salience of consequences	1	1	**3**	0	0
5.3 Information about social and environmental consequences	1	0	0	1	2
6. Comparison of behaviour	**4**	**2**	**5**	**2**	**3**
6.1 Demonstration of the behaviour	3	1	3	2	3
6.3 Information about others' approval	1	1	**3**	0	0
7. Associations	**4**	**0**	**0**	**4**	**7**
7.1 Prompts/cues	4	0	0	4	7
8. Repetition and substitution	**6**	**2**	**5**	**4**	**7**
8.1 Behavioural practice/rehearsal	3	1	3	2	3
8.2 Behaviour substitution	3	1	3	2	3
9. Comparison of outcomes	**16**	**7**	**18**	**9**	**15**
9.1 Credible source	16	7	18	9	15
10. Reward and threat	**1**	**0**	**0**	**1**	**2**
10.4 Social reward	1	0	0	1	2
11. Regulation	**1**	**1**	**3**	**0**	**0**
11.1 Pharmacological support	1	1	3	0	0
12. Antecedents	**4**	**2**	**5**	**2**	**3**
12.1 Restructuring the physical environment	1	1	3	0	0
12.5 Adding objects to the environment	3	1	3	2	3
13. Identity	**1**	**1**	**3**	**0**	**0**
13.2 Framing/reframing	1	1	3	0	0

1. Michie S, Richardson MN, Johnston M, Abraham C, Francis J, Hardeman W, et al. The Behaviour Change Tecnique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behaviour Change Interventions. Ann Behav Med. 2013;46:81-95.