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Review Article

Interventions to Reduce Inappropriate Prescribing of Antipsychotic Medications in People With Dementia Resident in Care Homes: A Systematic Review



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A B S T R A C T

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Background: Antipsychotic medications are commonly used to manage the behavioral and psychological symptoms of dementia. Several large studies have demonstrated an association between treatment with antipsychotics and increased morbidity and mortality in people with dementia.

Aims: To assess the effectiveness of interventions used to reduce inappropriate prescribing of antipsychotics to the elderly with dementia in residential care.

Method: Systematic searches were conducted in 12 electronic databases. Reference lists of all included studies and forward citation searching using Web of Science were also conducted. All quantitative studies with a comparative research design and studies in which recognized methods of qualitative data collection were used were included. Articles were screened for inclusion independently by 2 reviewers. Data extraction and quality appraisal were performed by 1 reviewer and checked by a second with discrepancies resolved by discussion with a third if necessary.

Results: Twenty-two quantitative studies (reported in 23 articles) were included evaluating the effectiveness of educational programs (n = 11), in-reach services (n = 2), medication review (n = 4), and multicomponent interventions (n = 5). No qualitative studies meeting our inclusion criteria were identified. Eleven studies were randomized or controlled in design; the remainder were uncontrolled before and after studies. Beneficial effects were seen in 9 of the 11 studies with the most robust study design with reductions in antipsychotic prescribing levels of between 12% and 20%. Little empirical information was provided on the sustainability of interventions.

Conclusion: Interventions to reduce inappropriate prescribing of antipsychotic medications to people with dementia resident in care homes may be effective in the short term, but longer more robust studies are needed. For prescribing levels to be reduced in the long term, the culture and nature of care settings and the availability and feasibility of nondrug alternatives needs to be addressed.

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Antipsychotic medications are often prescribed to manage the behavioral and psychological symptoms of dementia (BPSD). However, several large studies have demonstrated a clear association between

treatment with antipsychotic drugs and increased morbidity and mortality in people with dementia.^{1–3} Treatment guidelines recommend that the first-line management of BPSD should be detailed

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assessment to identify any treatable cause of symptoms (eg, hunger, thirst, pain, infection, loneliness). Furthermore, underlying causes should be treated and alternative nonpharmacological interventions explored before the initiation of antipsychotics.^{4–6} Risperidone is the only antipsychotic licensed in the United Kingdom for this indication, and then only for short-term use. Nevertheless, other antipsychotic agents are often prescribed and used on a long-term basis with infrequent medication review.⁷ BPSD can cause significant carer stress to family members and care home staff that, without intervention, may rapidly lead to acute hospital admission and/or transfer to a more intensive care setting.⁸ Antipsychotic medication may be viewed as an easier option than nonpharmacological alternatives, and the risks are rarely discussed or documented. In 2013, the American Medical Directors Association was involved in identifying the top 5 items that physicians and patients should question in the long-term care setting as part of the American Board of Internal Medicine Foundation's Choosing Wisely Campaign. Item 4 on this list was "Don't prescribe antipsychotic medications for behavioral and psychological symptoms of dementia (BPSD) in individuals with dementia without an assessment for an underlying cause of the behavior."⁹

The most recent UK audit of primary care data showed a decrease in antipsychotic prescribing to individuals with dementia from approximately 17% in 2006 to 7% in 2011.¹⁰ The audit showed widespread and significant variation in practice across the country, ranging from approximately 3% of individuals with dementia receiving antipsychotic medication at the time of the audit in London and the southeast to approximately 13% in the northwest. The audit provided no information on duration of prescription or on the residential setting of people with dementia and represents data from approximately 50% of general practices in the United Kingdom. Audit studies based in nursing homes have generally reported a higher prevalence of antipsychotic prescription among individuals with dementia.^{11–14}

Anecdotally, we are aware of a variety of interventions being used to assess, evaluate, and review the prescription of antipsychotic medications in care homes. These include education and raising staff awareness, development and use of decision-making pathways, medication checklists, mood, pain and behavioral charts, advice on nondrug-based alternatives, regular medication review by pharmacists, community or hospital-based psychiatrists and general practitioners, interdisciplinary education programs, and pharmacist-led strategies.

The purpose of this systematic review was to assess the effectiveness of interventions used to reduce inappropriate prescribing of antipsychotic medications to individuals with dementia resident in care homes to help to inform the provision of services. We also were interested in published accounts of the views and experiences of prescribers of included interventions to highlight barriers and facilitators to the successful implementation of such interventions.

Methods

The systematic review was conducted following the general principles published by the NHS Centre for Reviews and Dissemination (CRD).¹⁵ A predefined protocol was developed following consultation with topic and methods experts and is registered with PROSPERO (PROSPERO 2012:CRD42012003425).

Literature Search and Eligibility Criteria

A comprehensive search syntax using MeSH and free text terms was developed by an information specialist (M.R.) in consultation with the review team (Table 1). The strategy was developed for MEDLINE and adapted as appropriate for the other searched databases (EMBASE, Social Policy and Practice [including AgeInfo], and PsycINFO [via OVID], CDSR and CENTRAL [via The Cochrane Library], CINAHL [via

Table 1
Master Search Strategy

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present>	
1	assisted living facilities/or group homes/or homes for the aged/or nursing homes/or skilled nursing facilities/(35398)
2	(care adj (setting* or home* or residence* or facilit* or unit*)),ti,ab. (103097)
3	long-term care.ti,ab. (12891)
4	LTCF.ti,ab. (227)
5	elderly care.ti,ab. (636)
6	geriatric care.ti,ab. (1130)
7	geriatric clinic*.ti,ab. (339)
8	(geriatric adj2 unit).ti,ab. (722)
9	communal care.ti,ab. (11)
10	institutional* care.ti,ab. (1440)
11	(residential adj (care or unit* or home*)),ti,ab. (2424)
12	nursing home*.ti,ab. (20297)
13	(dementia adj (unit* or home* or care)),ti,ab. (941)
14	or/1–13 (150033)
15	exp Dementia/(109677)
16	exp Alzheimer Disease/(60964)
17	dementia.ti,ab. (58425)
18	alzheimer*.ti,ab. (80216)
19	(cognitive adj (impairment or decline)),ti,ab. (28848)
20	BPSD.ti,ab. (401)
21	(agitated or agitation).ti,ab. (11407)
22	(depressed or depression).ti,ab. (242245)
23	(anxiety or anxious).ti,ab. (100546)
24	(aggressive* adj2 behav*).ti,ab. (11959)
25	(unsettled adj2 behav*).ti,ab. (11)
26	(difficult adj2 behav*).ti,ab. (395)
27	residents.ti,ab. (58407)
28	or/15–27 (528228)
29	antipsychotic*.ti,ab. (23427)
30	neuroleptic*.ti,ab. (17905)
31	exp Antipsychotic Agents/(117101)
32	psychotropic*.ti,ab. (12422)
33	29 or 30 or 31 or 32 (137714)
34	14 and 28 and 33 (1025)
35	((reduce* or reducing or reduction) adj4 (medication or drug*)),ti,ab. (21110)
36	inappropriate prescribing.ti,ab. (446)
37	exp Inappropriate Prescribing/(329)
38	suboptimal prescribing.ti,ab. (59)
39	(inappropriate* adj3 (prescribed or prescriptions or medication or drug* or antipsychotics or neuroleptics)),ti,ab. (1307)
40	35 or 36 or 37 or 38 or 39 (22890)
41	40 and 14 (659)
42	34 or 41 (1621)

EBSCOhost], AMED and British Nursing Index [via NHS Evidence], Science Citation Index Expanded and Social Science Citation Index [via Web of Science]). All databases were searched from inception to November 2012. Update searches were run in November 2013. No date, study design, or language restrictions were imposed. The reference lists of all included articles and identified review articles were checked for additional relevant studies. Forward citation searching for each included article was conducted using ISI Web of Knowledge.

We were interested in the effectiveness of interventions (eg, staff training, regular medication review) designed to reduce inappropriate prescription of antipsychotic medications to individuals with dementia in community residential care settings. Interventions had to be aimed at professionals (eg, general practitioners, community psychiatrists, pharmacists) responsible for prescription of these medications in these settings. We also were interested in reports of the views and experiences of prescribers using the included interventions.

All quantitative studies reporting comparative data were included. Qualitative studies using recognized methods of qualitative data collection (eg, focus groups, interviews, and observation) and analysis (grounded theory, narrative analysis, thematic analysis, discourse analysis) were sought.

Study Selection

The search results were uploaded to reference management software (Endnote X5, V5; Thomson Reuters, Philadelphia, PA). Titles and abstracts were screened for relevance independently by 2 reviewers (J.T.C., M.R., or R.A.), with any disagreements being resolved by discussion and involvement of a third reviewer (J.T.C., M.R., or R.A.) where necessary. The full text of potentially relevant articles was retrieved and screened in the same way using the prespecified inclusion and exclusion criteria. All duplicate articles were double-checked and excluded.

Data Collection

For each study, details of the intervention, the characteristics of those receiving it, the characteristics of the patient population involved, the setting, the study methods, and outcomes relating to medication use were recorded. Data were extracted by one reviewer (J.T.C. or M.R.) into a data extraction form based on the Cochrane Effective Practice and Organisation of Care Review Group Data Collection Checklist,¹⁶ which was piloted on several studies and refined. The Cochrane Effective Practice and Organisation of Care Review Group Data Collection Checklist includes a taxonomy of intervention components, which was completed for each trial as part of this process. Data were collected from published articles only; manuals were not requested from trial authors. All data extraction was checked by a second reviewer (J.T.C. or M.R.) with discrepancies resolved by discussion and involvement of a third reviewer (R.A.) where necessary.

Risk of Bias

The quality of all included studies was appraised by one reviewer (J.T.C.) and checked by a second (M.R., R.A., or R.W.). In an amendment to the published protocol, all articles were appraised using the Effective Public Health Practice Project tool¹⁷ to enable assessment of all study designs with the same rubric. Appraisal considered the method of sample selection, potential for bias connected with study design, differences between groups at baseline and how these were dealt with in the analysis, assessment of outcome measures, description of the flow of patients through the study, and use of a valid and reliable primary outcome measure.

Data Synthesis

Changes in medication use were reported in all included studies. However, the multitude of different formats in which the data were provided and the range of included study designs precluded formal pooling of the data. For example, among the randomized studies, medication use was variously reported as psychoactive drug use score, proportion of residents who had antipsychotic medications discontinued, number of days of antipsychotic therapy per patient per month, proportion of residents taking antipsychotic medications, and dose of antipsychotic medication. Data were therefore tabulated, grouped according to study design and outcome, and discussed narratively.

Results

The electronic searches retrieved a total of 5071 unique citations. Screening of title and abstracts against the inclusion and exclusion criteria resulted in the retrieval of the full text of 80 articles. Fifty-nine articles were excluded because the following aspects of the article did not meet the inclusion criteria: population ($n = 3$), intervention ($n = 14$), reported outcomes ($n = 1$), and study design

($n = 32$). Six articles were published as conference abstracts only with insufficient information provided and we were unable to locate a full-text publication despite contact with authors, and 3 were duplicate publications. One additional article was located through hand searching of the bibliographies of identified systematic review articles. The update search identified an additional 985 articles, of which 7 were retrieved in full text and 1 article met the inclusion criteria. A total of 23 articles were included, describing 22 studies. Figure 1 shows the flow of studies through the review. Table 2 shows the study characteristics of all included articles. All the included studies provided quantitative data. We did not identify any articles reporting the views and experiences of prescribers with specific interventions. Our search identified a number of qualitative articles exploring factors that influence prescribing practice in care homes; these are considered further in the discussion.

Study Characteristics

Six of the studies are randomized,^{14,18–22} 5 have a controlled design,^{23–28} and 11 are uncontrolled before and after studies.^{29–39} The studies were published between 1987 and 2013 and were conducted in the United States ($n = 8$), the United Kingdom ($n = 5$), Canada ($n = 5$), Australia ($n = 2$), Norway, and Sweden. Very little demographic information was provided about the people (physicians, nurses, pharmacists, and so forth) who received the interventions and in most studies it is not clear how many prescribers were involved. The studies ranged in size from 21 to 7000; approximately 19,300 people with dementia were included in total (information not provided in all studies).

Intervention Characteristics

Descriptions of the interventions used in the studies are shown in Table 3. We grouped studies according to intervention type using 4

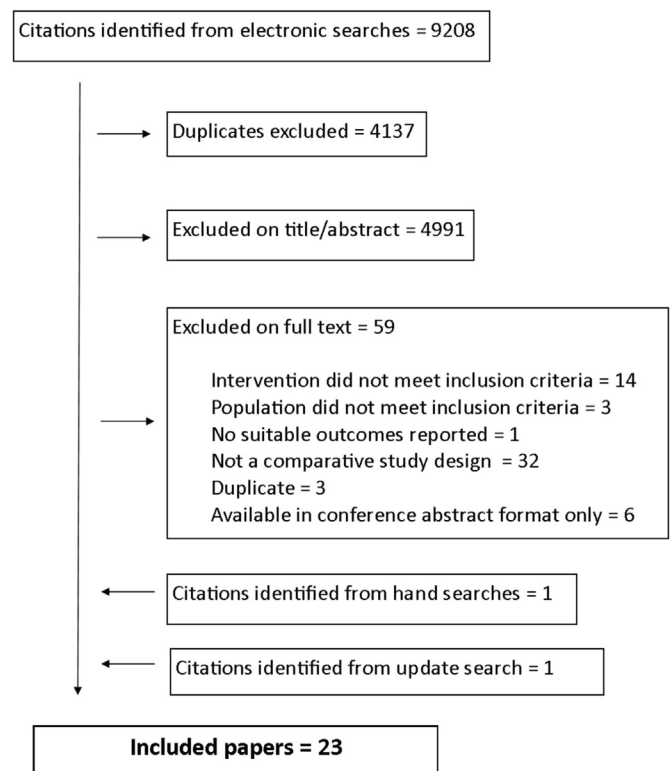


Fig. 1. Flow chart of study selection process.

Table 2
Characteristics of Included Studies

Source; Country; Study Design	Setting	Delivered by	Delivered to	Patients	Frequency and Duration of Intervention	Length of Follow-up, mo	Relevant Outcomes
Educational programs – randomized and controlled study designs (n = 7)							
Testad, 2010 ¹⁸ ; Norway; RCT	Nursing homes n = 2 [I] n = 2 [c]	Educators	All care staff, including leaders and domestic staff n = 197	All residents with dementia n = 75 [I] n = 70 [c]	2-day seminar and monthly guidance groups for 6 mo	6	Proportion of residents taking AP medication Changes in dose of AP medication
Fossey, 2006 ¹⁴ ; UK; cRCT	Dementia nursing homes n = 6 [I] n = 6 [c]	Psychologist, occupational therapist or nurse supported by research team	Care home staff n = not reported	All residents n = 168 [I] n = 181 [c]	2 days a week for 10 mo	10	Proportion of residents taking antipsychotics Dose of antipsychotics
Meador, 1997 ¹⁹ ; USA; RCT	Nursing homes n = 6 [I] n = 6 [c]	1. Old-age psychiatrist 2. Trained nurse educator 3. Home management specialist 4. Reference card and manual	All nursing home care providers including physicians, nurses, nursing assistants and other direct care staff, administrators and families n = not reported	All residents older than 65 years and resident for more than 6 months n = 680 [I] n = 631 [c]	1. 45–60-min visit to physicians with more than 5 residents 2. 5 or 6 x 1 hour sessions for nursing staff over a 1-wk period; follow-up session after 4 wk; evening meeting with families 3. 4-hour consultation with administrative staff 4. Provided to all staff	6	Medication use in days per 100
Avorn, 1992 ²⁰ ; USA; cRCT	Nursing homes n = 6 [I] n = 6 [c]	1. Mail drop 2. Clinical pharmacist	Physicians, nurses, nursing assistants and aides n = not reported	All residents n = 431 [I] n = 392 [c]	1. 3 mailings 2. 3 interactive visits with each physician; 4 training sessions with nurses and nursing assistants; 1 training session for nurses on night shift	5	Psychoactive drug use score Proportion of residents who discontinued AP medications Number of days of antipsychotic therapy per patient per month
Hagen, 2005 ²³ ; Canada; cITS	Long-term care facilities n = 12 [I] n = 12 [c]	1. Trained study pharmacist 2. Laminated reference card 3. Posters and word of mouth 4. Trained registered nurses	Physicians (n = 49/84), nurses (n = 195/250), facility pharmacists (n = 12/12) and family members	All resident n = 1190 [I] n = 1124 [c]	1. 1 session (30 min) for physicians; 2 sessions (30–45 min) for nursing staff; 1 session for pharmacists (30 min) 2. Provided to all staff 3. Provided in each unit 4. 1 session (45 min) for family members	12	Proportion of residents receiving antipsychotics
Ray, 1993 ²⁴ ; USA; CCT	Nursing homes n = 2 [I] n = 2 [c]	1. Old-age psychiatrist 2. Reference card/manual 3. Trained nurse educator 4. Nursing home management specialist	Physicians, nurses, nursing assistants, administrators and families n = not reported	All residents n = 228 [I] n = 218 [c]	1. 1 session for physicians (45–60 min) 2. Provided to all staff 3. 6 sessions (60 min) over 3-week period for nursing home staff (1 session each); follow-up session 4 weeks later; 1 evening session for family members 4. 1 session (240 min) for home's administrator	4	Medication use – days per 100 Proportion of residents withdrawn from antipsychotic medications

(continued on next page)

Table 2 (continued)

Source; Country; Study Design	Setting	Delivered by	Delivered to	Patients	Frequency and Duration of Intervention	Length of Follow-up, mo	Relevant Outcomes
Ray, 1987 ²⁵ ; USA; CCT	Nursing homes n = not reported	Trained physician counselor	Most frequent physician prescribers of antipsychotics within 3 geographical areas n = 45 [I] n = 136 [c]	All residents n = 2428 [I] n = 4579 [c]	1 visit (15 min)	12	Proportion of residents receiving antipsychotic medication Dose of antipsychotic medication Proportion of new antipsychotic drug users Proportion of chronic antipsychotic drug users
Educational programs – before and after study designs (n = 4)							
Monette 2013 ²⁹ ; Canada; BA	Long-term care center n = 2	1. Letters, posters and newsletters 2. Trained in-house nurse 3. Old-age psychiatrist 4. Pamphlet 5. Reminder memo	Prescribing physicians, pharmacists, nursing staff, and personal care attendants n = 370	All residents with dementia n = 293	1. 1 mailing 2. 1 session (90 min) for nursing staff and (60 min) for personal care attendants 3. 1 session for physicians and pharmacists (90 min) 4. Provided in each unit 5. Monthly memo	6	Proportion of antipsychotic users
Vida, 2012 ³⁰ ; Canada; BA	Long-term care center n = 1	1. Researchers 2. Written reference materials	Prescribing physicians and nursing staff n = not reported	All residents with dementia n = 308	1. 2 lectures (60–90 min) 2. Provided to all staff	5	Proportion of residents who had dose reduced Proportion of residents who had antipsychotic medication withdrawn
Monette, 2008 ³¹ ; Canada; BA	Nursing home n = 1	1. Letters, internal journal and posters 2. Researcher 3. Old-age psychiatrist 4. Pamphlet 5. Reminder memo	Physicians/pharmacists (n = 6/6), personal care assistants (n = 86/123), nursing staff (74/93)	All residents with a diagnosis of dementia receiving AP medication n = 90	1. 1 mailing 2. 1 session (90 min) for nursing staff and (45 min) for personal care attendants 3. 1 session for physicians and pharmacists (90 min) 4. Provided in each unit 5. Monthly memo	7	Proportion of residents who had dose reduced Proportion of residents who had antipsychotic medication withdrawn
Earthy, 2000 ³² ; Canada; BA	Long-term care facility n = 1	1. Researchers 2. Written information	Admitting physicians, nurses, rehabilitation staff, social workers, dietary and pharmacy staff n = not reported	All residents n = 198	1. Not reported 2. Not clear	6	Proportion of residents receiving antipsychotic medication
In-reach services – randomized and controlled study designs (n = 2)							
Schmidt, 1998 ²¹ ; Sweden; RCT	Nursing homes n = 18 [I] n = 18 [c]	Community pharmacists	Nursing home physicians and nursing personnel n = not reported	All long-term residents n = 626 [I] n = 1228 [c]	1 d/mo	12	Reduction in prescription of antipsychotic medications
Ballard, 2002 ²⁶ ; UK; CCT	Nursing and residential care facilities n = 6 [I] n = 3 [c]	1. Full-time psychiatric nurse supervised by a consultant old-age psychiatrist 2. Clinical psychologist	Psychiatric liaison team reviewed patients directly and also provided support to facility staff n = not reported	All residents with dementia n = 208 [I] n = 125 [c]	1. 2 sessions per wk 2. 1 session per wk	9	Reduction in antipsychotic use
Medication review – randomized study designs (n = 1)							
Patterson 2010 ²² ; UK; cRCT	Nursing homes n = 11 [I] n = 11 [c]	Study pharmacists	Nursing home prescribers (general practitioners) n = not reported	All residents over the age of 65 who gave informed consent n = 173 [I] n = 161 [c]	1 visit per mo	12	Proportion of residents taking inappropriate psychoactive medication

Medication review – before and after study designs (n = 3)							
Morrison, 2009 ³³ ; UK; BA	Nursing homes n = 3	General practice computer system	Multidisciplinary primary health care team and nursing home staff n = not reported	All nursing home residents registered with one GP n = 81	Initial meeting and then reminder to use at subsequent meetings every 6 mo	6	Proportion of residents receiving antipsychotic medication
Dahl, 2008 ³⁴ ; USA; BA	Dementia-specific long-term care facility n = 1	Quality Improvement (QI) Team using Psychotropic Assessment Tool (PAT)	Nursing home staff, families, social workers, consulting pharmacist, medical director, geriatric fellow, resident nurse manager, and administrators n = not reported	All residents n = 110	At 2 of 4 quarterly family conference meetings; discussed at subsequent QI meeting	12	Proportion of residents receiving antipsychotic medication
Schultz, 1991 ³⁵ ; USA; BA	Dementia care unit within a long-term care facility n = 1	Psychoactive medication review team (consultant old age psychiatrist, pharmacist and clinical psychologist) n = not reported	Facility staff n = not reported	All residents on the dementia care unit n = 38	Not clear	12	Proportion of residents receiving psychoactive medication
Multicomponent interventions – controlled study designs (n = 1)							
Westbury, 2010 ²⁷ and 2011 ²⁸ ; Australia; CCT	Nursing homes n = 13 [I] n = 12 [c]	1. Mail drop 2. Laminated guidelines 3. Well-known old-age psychiatrist 4. Researchers 5. Community pharmacists 6. Newsletters 7. Pamphlet	Physicians, community pharmacists, nursing staff, residents and their families n = not reported	All residents n = 863 [I] n = 715 [c]	1. Mailing 2. Provided to all homes 3. Lecture on one occasion 4. Two days' training for pharmacists; 1 session for nursing home physicians 5. Two sessions for nursing home staff 6. Provided to all homes 7. Available for all families/residents	6	Proportion of residents receiving antipsychotic medication
Multi-component interventions – before and after study designs (n = 4)							
Chakraborty, 2012 ³⁶ ; UK; BA	EMI care homes n = 6 at baseline n = 7 at re-audit	Psychiatrists and in-reach mental health nurses n = not reported	Psychiatric liaison team reviewed patients directly and also provided support to facility staff n = not reported	All residents with dementia n = 137 at baseline n = 174 at re-audit	Regular visits	Not clear	Proportion of residents receiving antipsychotic medication
Khan, 2011 ³⁷ ; UK; BA	Nursing homes with high level of referrals n = 4	Doctors (n = 3) Community psychiatric nurses (n = 4) Psychologist	Psychiatric liaison team reviewed patients directly and also provided support to facility staff n = not reported	All patients of a community mental health team resident in one of the care homes n = not clear	1 session per mo	6	Proportion of residents who had dose of antipsychotic medication reduced Proportion of residents who had antipsychotic medication discontinued
Heal, 1998 ³⁸ ; Australia; BA	Dementia-specific nursing home n = 1	Not clear	Nursing home staff including unit manager, physician, pharmacist, and divisional therapist n = not reported	All residents n = 21	Not clear	Not clear	Proportion of residents taking psychotropic medication
Rovner, 1992 ³⁹ ; USA; BA	Nursing homes n = 17	1. Mail drop 2. In-service education providers unclear	Nurses and physicians (n = not clearly reported)	All residents n = 2709	1. 1 mailing 2. Frequency and intensity of in-service education unclear	3	Proportion of residents receiving antipsychotic medication

AP, antipsychotic; BA, before and after study; c, control; CCT, controlled clinical trial; cITS, controlled interrupted time series; cRCT, cluster randomized clinical trial; GP, general practitioner; I, intervention; RCT, randomized clinical trial.

Table 3
Intervention Descriptions (Summary Using EPOC Data Collection Checklist)

	Professional						Organizational			Structural					Regulatory	
	Distribution of educational materials	Educational meetings	Educational outreach	Local opinion leaders	Audit and feedback	Reminders	Clinical multidisciplinary teams	Skill mix changes	Continuity of care	Changes to the setting site of service delivery	Changes in physical structure, facilities and equipment	Changes in scope and nature of benefits and services	Changes in organization of quality monitoring mechanisms	Presence and organization of medical records systems	Changes in medical records systems	Introduction of new regulations
<i>Educational programs</i>																
Testad 2010 ¹⁸	x	x	x		x	x							x			
Fossey 2006 ¹⁴			x													
Meador 1997 ¹⁹	x	x	x													
Avorn 1992 ²⁰	x	x	x													
Hagen 2005 ²³	x	x	x													
Ray 1993 ²⁴	x	x	x													
Ray 1987 ²⁵	x		x													
Monette 2013 ²⁹	x	x		x	x	x			x							
Vida 2012 ³⁰	x	x	x		x											
Monette 2008 ³¹	x	x			x	x			x							
Earthy 2000 ³²	x	x														
<i>In-reach services</i>																
Schmidt 1998 ²¹			x				x		x							x
Ballard 2002 ²⁶							x		x		x					
<i>Medication review</i>																
Patterson 2008 ²²			x				x									
Dahl 2008 ³⁴							x		x							
Morrison 2009 ³³							x	x								
Schultz 1991 ³⁵								x	x	x	x	x	x			
<i>Multi-component interventions</i>																
Westbury 2010 ²⁷ /11 ²⁸	x		x	x	x				x				x	x		
Chakraborty 2012 ³⁶					x				x	x						
Khan 2011 ³⁷	x		x				x		x	x		x				
Heal 1998 ³⁸			x					x				x				
Rovner 1992 ³⁹			x		x											x

categories: educational programs (n = 11 studies), in-reach services (n = 2 studies), medication review (n = 4 studies), and multicomponent interventions (n = 5 studies). The EPOC Data Collection Checklist includes a taxonomy of intervention components grouped under 4 headings: professional, organizational, structural, and regulatory.¹⁶ The interventions within studies of educational programs^{14,18–20,23–25,29–32} consisted mainly of professional components, such as educational meetings, distribution of educational materials, and educational outreach. In-reach services^{21,26} contained mainly organizational and structural components. Studies containing the most variety were those in the medication review^{22,33–35} and multicomponent intervention groups^{27,28,36–39} incorporating educational, organizational, structural, and regulatory interventions. In many cases, there was insufficient information provided in the article to replicate the intervention in another setting.

Using the EPOC Data Collection Checklist classification, the number of intervention components per study ranged from 1 to 7; most studies consisted of 3. The most frequently used intervention component was educational outreach (14 studies), and this was evident across all 4 types of intervention. Educational outreach was defined as the use of a trained person who met with providers in their practice settings to give information with the intent of changing the provider's practice.

Study Quality

Assessment of the quality of each included study is shown in Table 4. The global assessment of just over a third of the studies was moderate or strong. The main areas of weakness were in the collection of primary outcome data and in the reporting of withdrawals and

dropouts. In most of the studies, the outcome assessor was aware of the intervention status of participants and the study participants (prescribers) were aware of the research question. Although data on prescribing rates were taken from patient and pharmacy records in many cases, the data-collection process was performed by one individual with no procedure for checking accuracy. Furthermore, the data-collection tool was often not described, precluding judgment on the validity of the measure. In most studies, there was little information provided on the numbers of and reasons for withdrawals and dropouts of either prescribers or patients. In Table 4 we have assessed reporting of withdrawal and dropouts of patients; the reporting of the flow of prescribers was assessed as weak in all but 5 studies.^{14,21,24,31,33}

Medication Use

Educational programs (randomized and controlled study designs n = 7)

Despite considerable differences in the nature and implementation of the educational programs used, introduction of a program to enhance the management of BPSD behaviors and improve appropriate prescribing of antipsychotic medications had beneficial effects in all 4 randomized studies^{14,18–20} and in 1 of the controlled studies.²⁴ Four of the 5 showed a reduction in medication use in the intervention group compared with the control group of between 12% and 20%.^{14,19,20,24} Although Testad and colleagues¹⁸ reported no significant differences between groups in the change in proportion of residents taking antipsychotic medication, this was against a background of reductions in restraint use and agitation (Table 5).

Table 4
Indicators of Study Quality

		Selection bias	Study design	Confounders	Blinding	Data collection method	Withdrawals and drop-outs	Global assessment
Educational programmes								
RCT	Testad 2010 ¹⁸	Moderate	Strong	Weak	Moderate	Moderate	Weak	WEAK
	Fossey 2006 ¹⁴	Strong	Strong	Strong	Moderate	Weak	Strong	STRONG
	Meador 1997 ¹⁹	Moderate	Strong	Strong	Moderate	Moderate	Strong	STRONG
	Avorn 1992 ²⁰	Moderate	Strong	Strong	Weak	Weak	Weak	WEAK
CCT	Hagen 2005 ²³	Moderate	Moderate	Strong	Weak	Weak	Weak	WEAK
	Ray 1993 ²⁴	Moderate	Strong	Weak	Weak	Weak	Weak	WEAK
	Ray 1987 ²⁵	Moderate	Strong	Weak	Weak	Moderate	Weak	WEAK
B&A	Monette 2013 ²⁹	Moderate	Moderate	N/A	Weak	Weak	Weak	WEAK
	Vida 2012 ³⁰	Moderate	Moderate	N/A	Weak	Weak	Strong	MODERATE
	Monette 2008 ³¹	Moderate	Moderate	N/A	Weak	Moderate	Strong	MODERATE
	Earthy 2000 ³²	Weak	Moderate	N/A	Weak	Weak	Weak	WEAK
In-reach services								
RCT	Schmidt 1998 ²¹	Strong	Strong	Strong	Weak	Weak	Weak	MODERATE
CCT	Ballard 2002 ²⁶	Moderate	Strong	Strong	Moderate	Moderate	Moderate	STRONG
Medication review								
RCT	Patterson 2010 ²²	Weak	Strong	Strong	Strong	Moderate	Strong	MODERATE
B&A	Morrison 2009 ³³	Moderate	Moderate	N/A	Weak	Moderate	Strong	MODERATE
	Dahl 2008 ³⁴	Moderate	Moderate	N/A	Weak	Weak	Weak	WEAK
	Schultz 1991 ³⁵	Moderate	Moderate	N/A	Weak	Weak	Weak	WEAK
Multi-component interventions								
CCT	Westbury 2010 ²⁷ /2011 ²⁸	Moderate	Strong	Strong	Weak	Moderate	Weak	WEAK
B&A	Chakraborty 2012 ³⁶	Strong	Moderate	N/A	Strong	Weak	Weak	WEAK
	Khan 2011 ³⁷	Moderate	Moderate	N/A	Weak	Weak	Strong	WEAK
	Heal 1998 ³⁸	Moderate	Moderate	N/A	Weak	Weak	Strong	WEAK
	Rovner 1992 ³⁹	Weak	Moderate	N/A	Weak	Moderate	Weak	WEAK

B&A, before and after; CCT, controlled clinical trial; N/A, not applicable; RCT, randomized clinical trial.

The intervention did not influence prescription rates in the 2 remaining studies.^{23,25} These are the largest studies within the review in terms of the number of patients that the intervention was ultimately aimed at, although the number of physicians receiving training was relatively low, and in the study by Ray and colleagues,²⁵ training was not offered to nursing and other care home staff. Explanations for the lack of effect offered by the authors of these articles include the simultaneous introduction and promotion of the use of atypical antipsychotics during the study period,²³ a reflection of the wide variation in antipsychotic prescribing in care homes over time,²³ and barriers to reducing antipsychotic prescribing such as the increased time commitment necessary to implement alternative methods of behavior management.²⁵

Educational programs (before and after study designs n = 4)

The results from these studies are more difficult to interpret, as it is not clear what other factors influenced prescription rates over the study period. Results showed similar trends to those seen in studies of a more robust design. These are smaller single^{30–32} or 2-center studies²⁹ involving between 53 and 300 patients and their associated care staff. The interventions resulted in a decrease in antipsychotic use (variously reported) in 3 studies.^{29–31} The baseline level of antipsychotic use in the study reported by Earthy and colleagues³² was low and little changed by the intervention (increased from 17% to 19%). However, the authors report improvements in documentation, a reduction in administration of “as-needed” medication by nursing staff and a decrease in the frequency of problem behaviors.

In-reach services (randomized and controlled study designs n = 2)

Both of these studies involved improved multidisciplinary teamwork either with a psychiatric team²⁶ or a pharmacist²¹ spending time

working at care homes supporting the care home staff. In both studies, there were statistically significant reductions in prescription rates associated with the intervention (19%; $P = .007$ ²¹ and 16%; $P < .0001$ ²⁶); however, reductions also were seen in the control groups in both studies partly²¹ or wholly²⁶ negating the impact of the intervention.

Medication review (randomized [n = 1] and before and after study designs [n = 3])

The study reported by Patterson and colleagues²² provides the most robust evidence of the effectiveness of this approach to reducing inappropriate prescribing. The intervention used was also the most sophisticated and used an element of in-reach as well as medication review, with specially trained pharmacists visiting intervention homes monthly for 12 months to review prescribing information and guide prescribing decisions. The authors reported a significant difference between intervention and control homes in the proportion of residents taking inappropriate antipsychotic medications (20% vs 50% [odds ratio = 0.26; 95% confidence interval 0.14–0.49]). The design of the remaining 3 studies permits the consideration of trends in results only. Two used audit and feedback and reminders to review medication needs on a regular basis^{33,34} and these resulted in minimal changes in prescribing rates. The final study was conducted against a background of changes in accommodation conditions for the residents such that they were moved into a specialized, secure dementia unit. Perhaps unsurprisingly, prescription rates were reduced from the extremely high (95% of residents receiving antipsychotic medication) to a much lower proportion (58%), although it is not possible to determine whether this was due to the change in accommodation or the intervention.

Table 5
Summary of Medication Use Outcomes

Source	n (at Baseline)	Outcome Measure	Level at Baseline	Level Post Intervention	Effect on Outcome
Educational programs - randomized and controlled study designs					
Testad 2010 ¹⁸	44 [I] 46 [c]	Proportion of residents taking antipsychotic medication	28% [I] 9% [c]	29% [I] at 6/12 14.3% [c] at 6/12 32% [I] at 12/12 8.7% [c] at 12/12	<i>Medication use remained relatively unchanged at both 6/12 and 12/12.</i> <i>No statistically significant differences between groups.</i>
Fossey, 2006 ¹⁴	181 [I] 168 [c]	Proportion of residents taking antipsychotics	47% [I] 50% [c]	23 [I] at 12/12 42 [c] at 12/12	<i>Reduction in medication use in the intervention group.</i> Mean difference between groups 19.1%; 95% CI 0.5%–37.7%.
		Median dose of antipsychotics (in chlorpromazine equivalents)	100 [I] 100 [c]	102.1 [I] at 12/12 107.1 [c] at 12/12	<i>No significant difference in median dose of anti-psychotics</i>
Meador, 1997 ¹⁹	680 [I] 631 [c]	Medication use (days per 100)	25.3 ± 2.5 [I] 26.2 ± 1.7 [c]	19.7 ± 1.7 [I] at 6/12 26 ± 2.5 [c] at 6/12	Mean difference between groups 4.9 (–20.0–29.9; <i>P</i> = .67) <i>Reduction in medication use in the intervention group</i> Mean difference between groups 23% (0.014).
Avorn, 1992 ²⁰	431 [I] 392 [c]	Psychoactive drug use score	1.87 [I] 1.74 [c]	1.36 [I] 1.60 [c]	<i>Reduction in psychoactive drug use score</i> Mean difference in risk reduction –0.37; 95% CI –0.08 to –0.67; <i>P</i> = .02
		Proportion of residents who discontinued antipsychotic medication use	- -	32% [I] 14% [c]	<i>Greater proportion in the intervention group</i> Mean difference between groups –18%; 95% CI –3% to –33%
		Number of days of antipsychotic therapy per patient per month	Not reported	↓7.1 [I] ↓3.7 [c]	<i>Greater reduction in the intervention group</i> Mean difference between groups –3.5 d; 95% CI –10.6 to 3.6
Hagen, 2005 ²³	1666 [I] 648 [c]	Proportion of residents taking neuroleptic medication	17% [I] 19% [c]	24% [I] 27% [c]	<i>Small increase in medication use in both groups</i> No significant differences between groups
Ray, 1993 ²⁴	228 [I] 218 [c]	Medication use (days per 100)	29.2 ± 3.2 [I] 28.6 ± 3.2 [c]	Reduced by 21 days/100 [I] Reduced by 4 days/100 [c]	<i>Reduction in medication use in the intervention group</i> Mean difference between groups 59%; <i>P</i> < .01
		Proportion of residents who discontinued antipsychotic medication	- -	30/44 withdrawn [I] 7/59 withdrawn [c]	<i>Greater reduction in the intervention group</i> Mean difference between groups 12%; <i>P</i> < .01
Ray, 1987 ²⁵	Not clear	Residents taking antipsychotic medication (weighted average per 100 pts seen)	22.0 [I] 14.5 [c]	21.7 [c] 14.5 [c]	<i>No significant difference in any of the four indices of prescribing rate</i>
		Mean antipsychotic drug dose (gram- equivalents) (weighted average per 100 pts seen)	670 [I] 340 [c]	920 [I] 320 [c]	
		New antipsychotic drug users (weighted average per 100 pts seen)	5.1 [I] 4.5 [c]	4.8 [I] 3.2 [c]	
		Chronic antipsychotic drug users (weighted average per 100 pts seen)	12.8 [I] 6.2 [c]	11.1 [I] 5.5 [c]	
Educational program – before and after study designs					
Monette, 2013 ²⁹	293	Proportion of residents taking antipsychotic medication	44%	38% at 12/12 40% at 16/12	<i>Reduction in medication use during the program; reduction was not maintained postprogram in both centers.</i> During the intervention - odds ratio 0.943 per week in Center A (95% CI 0.921–0.965) and 0.969 per week in Centre B (95% CI 0.944–0.994)
Vida, 2012 ³⁰	53	Proportion of residents who had the dose of antipsychotic medication reduced	-	15.2%	<i>Reduction in medication use during the intervention.</i>
		Proportion of residents who discontinued antipsychotic medication	-	21.7%	
Monette, 2008 ³¹	90	Proportion of residents who discontinued antipsychotic medication	-	49.4%	<i>Reduction in medication use during the intervention.</i>
		Proportion of residents who had the dose of antipsychotic medication reduced	-	13.6%	
Earthy, 2000 ³²	198	Proportion of residents taking neuroleptic medication	17%	19%	<i>No significant difference in medication use.</i>
In-reach services – randomized and controlled study designs					
Schmidt, 1998 ²¹	626 [I] 1228 [c]	Proportion of residents taking antipsychotic medication	40.1% [I] 37.6% [c]	32.6% [I] 34.9% [c]	<i>Greater reduction in medication use in the intervention homes compared with baseline.</i> 19% reduction (<i>P</i> = .007) intervention. 7% reduction (<i>P</i> = .176) control.
Ballard, 2002 ²⁶	208 [I] 125 [c]	Proportion of residents taking neuroleptic medication	44% [I] 41% [c]	28% [I] 33% [c]	<i>Significant reductions in each group compared with baseline but no significant difference between groups</i>

Medication review – randomized study designs					
Patterson, 2008 ²²	173 [I] 161 [c]	Proportion of residents taking inappropriate psychoactive medication			<i>Greater reduction in medication use in the intervention group 20% vs 50% (odds ratio = 0.26; 95% CI 0.14–0.49).</i>
Medication review – before and after study designs					
Morrison, 2009 ³³	81	Proportion of residents taking antipsychotic medication	27%	19%	<i>Reduction in medication use during the intervention.</i>
Dahl, 2008 ³⁴	110	Proportion of residents taking antipsychotic medication	26.5%	25.2%	<i>No change in medication use during the intervention.</i>
Schultz, 1991 ³⁵	38	Proportion of residents taking psychoactive medication	95%	58%	<i>Reduction in medication use during the intervention.</i>
		Proportion of residents who had the dose of psychoactive medication reduced	-	42%	
Multicomponent interventions – controlled study designs					
Westbury, 2010 ²⁷ , 2011 ²⁸	863 [I] 715 [c]	Proportion of residents taking antipsychotic medication	20.3% [I] 21.9% [c]	18.6% [I] at 6/12 23.9% [c] at 6/12	<i>Greater reduction in medication use in the intervention homes during the intervention.</i>
				20% [I] at 18/12 18.9% [c] at 18/12	<i>Difference between intervention and control P < .05. 12 months after the end of the intervention; medication use returned to preintervention levels in the intervention group but decreased markedly in the control group.</i>
		Proportion of residents who had the dose of antipsychotic medication reduced or discontinued	-	36.9% [I] 20.9% [c]	<i>Greater proportion of residents had the dose of antipsychotic medication reduced or discontinued in the intervention group. Difference between intervention and control P < .01.</i>
Multicomponent interventions – before and after study designs					
Chakraborty, 2012 ³⁶	137	Proportion of residents taking antipsychotic medication	29.5% [RH] 57.1% [NH]	11.5% [RH] 43.7% [NH]	<i>Reduction in medication use in both nursing and residential homes during the intervention.</i>
Khan, 2011 ³⁷	63	Proportion of residents who had the dose of antipsychotic medication reduced	-	10%	<i>Reduction in medication use during the intervention.</i>
		Proportion of residents who discontinued antipsychotic medication	-	16%	
Heal, 1998 ³⁸	21	Proportion of residents taking psychotropic medication	72%	28%	<i>Reduction in medication use during the intervention.</i>
Rovner, 1992 ³⁹	2707	Proportion of residents taking neuroleptic medication (mean [SD])	25.4%	15.9% at 3/12 13.5% at 12/12	<i>Reduction in medication use during the intervention. Difference compared to baseline (P < .0001). The reduction in medication use was maintained at 9 months after the end of the intervention period.</i>

C, control; CI, confidence interval; I, intervention; NH, nursing home; pts, patients; RH, residential home.

Multicomponent interventions (controlled [n = 1] and before and after study designs [n = 4])

The 5 studies using multicomponent interventions ranged in complexity from a study involving 3 components, audit and feedback, continuity of care, and change to the site of service delivery³⁶ to 7 components incorporating education, audit and feedback, and structural changes.^{27,28} Studies also varied widely in size, and were implemented in between 1 and 25 homes. All studies showed reductions in prescription rates (ranging from 5% to 66%) associated with the intervention, although only the study reported by Westbury and colleagues was controlled.^{27,28}

Long-term effects of interventions

Only 4 studies assessed whether changes to prescription levels achieved during the intervention period were maintained. Two studies reported a return to baseline antipsychotic prescription levels.^{27–29} Testad and colleagues¹⁸ reported that medication levels remained constant 6 months after the end of the intervention. Finally, Rovner and colleagues³⁹ reassessed psychotropic drug use 9 months after the end of the study period and found the effects in the intervention on prescription rates had been maintained. Detail is sparse because these follow-up visits were outside of the formal trial period, but it is likely that the extent to which procedures used during the study continued to be used varied between sites both within the same trial and between trials. For example, Monette and colleagues²⁹ commented that although staff at the long-term care centers had expressed an intention to adopt some of the program components, none were systematically adopted after the study. In contrast, Rovner and colleagues³⁹ attribute the maintenance of the effect of the intervention in their study to an ongoing requirement for physicians to complete an “indications and side effects” document for each resident receiving psychoactive medication.³⁹

Discussion

Principal Findings

This is the first systematic review to specifically synthesize evidence of the effectiveness of interventions to reduce inappropriate prescribing of antipsychotics to people with dementia resident in care homes. Irrespective of the nature of the intervention, in the studies with the most robust design, antipsychotic prescription rates were seen to fall as a result of the intervention. Although, more difficult to interpret, similar effects were also seen in the less well-designed studies. There is little information in the included studies to aid understanding of the sustainability of the effects of interventions. Furthermore, one of the striking features of this body of literature is that it spans 27 years, with the earliest trial reported in 1987. Over this period, there have been a variety of initiatives, including changes in regulations and widely disseminated guidance aimed at limiting the use of these agents, but evidently prescribers still find compelling reasons to use them.

Results in Context

This work highlights 2 key issues that have been illustrated in previous systematic reviews of related areas: (1) the challenges of changing practice within care homes and (2) the scarcity of good-quality research conducted in this setting. This body of literature spans an extended time period during which research and reporting methods have improved considerably; however, 6 of the included before and after studies were conducted within the last 4 years. We specifically searched for qualitative information on the views and experiences of prescribers using the included interventions, but

disappointingly were unable to locate any articles meeting our inclusion criteria. Studies exploring factors that influence prescribing behavior more generally suggest a variety of factors may be involved. These include shortfalls in time, staffing levels, and staff training that impact on nonpharmacological alternatives to antipsychotic medication being considered viable, a pressure from family members and carers to prescribe and a misconception of the likelihood that an individual might benefit from antipsychotic medication.^{40–44} Other studies that have looked at implementation of interventions for other purposes in care home settings have identified the importance of involving family members in decision-making in the successful management of behavioral problems⁴⁵ and the management of incontinence.⁴⁶ A systematic review of the implementation of psychosocial interventions for people with dementia in care homes found that active engagement of care-home staff and family members played a crucial role in successful implementation.⁴⁷ Similarly, systematic reviews on the more general topic of improving prescribing practice in care homes^{48–53} also have been unable to make clear recommendations for future practice due to the varied nature of the design, interventions, outcomes, and results^{49,50,53} and the poor quality of included studies.^{48,51,52}

Strengths and Limitations of Our Study

This systematic review followed best practice guidelines for systematic reviews,¹⁵ is reported according to the PRISMA statement,⁵⁴ and is the first in this topic area. Extensive electronic searches that were not limited by date, study design, or language were augmented with forward and backward citation searching of all included articles, and authors of conference abstracts were contacted for their data, where possible. We are, therefore, confident that this review encompasses most if not all the available data on this topic.

We focused the review on one outcome measure, change in medication use, but were unable to perform a meta-analysis of the randomized clinical trials because of the variety of formats in which these data was presented. This is undoubtedly a limitation of the review but given the uniformity of the direction of the effect in most of the studies, the small number of randomized clinical trials identified, and the accompanying variation and complexity in the interventions used, it is unlikely that a pooled result would provide any more useful insight than the synthesis we present. Although the results of the before and after studies are difficult to interpret, as there may have been other influences on prescribing during the study period, they provide a full picture of the spectrum of interventions that have been evaluated and add weight to the evidence, as interventions implemented in less tightly controlled conditions also may have produced positive results. We had hoped to explore in more depth whether specific attributes or implementation approaches impacted on the effectiveness of interventions. Because of the relatively small number of robust studies within each category and the lack of reported detail, this was not possible, although we have used a recognized method of characterizing the components of interventions¹⁶ to provide the reader with as much detail as possible.

Implications for Practice and Research

The overall picture is one in which it would seem that the current guidelines to limit antipsychotic prescribing are difficult to implement in the day-to-day reality of practice, whilst juggling ethical concerns, staffing levels, staff competence with nonpharmacological alternatives, and the wishes of distressed relatives and carers. Large, good quality, well-reported, randomized research within the care home setting with accompanying process evaluations would enable a better understanding of the environment and its impact on successful

implementation of interventions. Further qualitative work to explore the barriers and facilitators to the appropriate prescription of antipsychotic medications will support efforts to achieve sustained change in the varying specific contexts of individual care and nursing homes.

Conclusions

Interventions to reduce inappropriate prescribing of antipsychotic medications to people with dementia resident in care homes may be effective in the short term, but longer-term, more robust studies are needed. For prescribing levels to be reduced in the long term, the culture and nature of care settings and the availability and feasibility of nondrug alternatives needs to be addressed.

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References

- Schneider L, Dagerman K, Insel P. Risk of death with atypical antipsychotic drug treatment for dementia: Meta-analysis of randomised placebo-controlled trials. *JAMA* 2005;294:1934–1943.
- Ballard C, Creese B, Aarsland D. Atypical antipsychotics for the treatment of behavioural and psychological symptoms of dementia with a particular focus on longer term outcomes and mortality. *Expert Opin Drug Saf* 2011;10:35–43.
- Huybrechts K, Gerhard T, Crystal S, et al. Differential risk of death in older residents in nursing homes prescribed specific antipsychotic drugs: Population-based cohort study. *BMJ* 2012;344:1–12.
- National Institute for Health and Excellence. Dementia: Supporting people with dementia and their carers in health and social care; 2006.
- Alzheimer's Society. Optimising treatment and care for people with behavioural and psychological symptoms of dementia; 2011.
- Azermat M, Petrovic M, Elseviers M, et al. Systematic appraisal of dementia guidelines for the management of behavioural and psychological symptoms. *Ageing Res Rev* 2012;11:78–86.
- Barnes T, Banerjee S, Collins N, et al. Antipsychotics in dementia: Prevalence and quality of antipsychotic drug prescribing in UK mental health services. *Br J Psychiatry* 2012;201:221–226.
- de Vugt ME, Stevens F, Aalten P, et al. A prospective study of the effects of behavioral symptoms on the institutionalization of patients with dementia. *Int Psychogeriatr* 2005;17:577–589.
- Vance J. AMDA choosing wisely. *J Am Med Dir Assoc* 2013;14:639–41.
- Health and Social Care Information Centre. National Dementia and Antipsychotic Prescribing Audit. Secondary National Dementia and Antipsychotic Prescribing Audit 2012. Available at: www.ic.nhs.uk/dementiaaudit. Accessed November 2012.
- Nijk RM, Zuidema SU, Koopmans RTCM. Prevalence and correlates of psychotropic drug use in Dutch nursing-home patients with dementia. *Int Psychogeriatr* 2009;21:485–493.
- Mann E, Kopke S, Haastert B, et al. Psychotropic medication use among nursing home residents in Austria: A cross-sectional study. *BMC Geriatr* 2009;9:18.
- Richter T, Mann E, Meyer G, et al. Prevalence of psychotropic medication use among German and Austrian nursing home residents: A comparison of 3 cohorts. *J Am Med Dir Assoc* 2012;13:187.e7–187.e13.
- Fossey J, Ballard C, Juszcak E, et al. Effect of enhanced psychosocial care on antipsychotic use in nursing home residents with severe dementia: Cluster randomised trial. *Br Med J* 2006;332:756–758.
- NHS Centre for Reviews and Dissemination. CRD's guidance for undertaking reviews in health care. York, UK: University of York; 2009.
- Cochrane Effective Practice and Organisation of Care Group. Data Collection Checklist. Secondary Data Collection Checklist. Available at: <http://epoc.cochrane.org/epoc-resources>. Accessed July 29, 2014.
- Effective Public Health Practice Project. Quality Assessment Tool for Quantitative Studies. Secondary Quality Assessment Tool for Quantitative Studies. Available at: <http://www.ehpp.ca/tools.html>. Accessed November 2013.
- Testad I, Ballard C, Bronnick K, et al. The effect of staff training on agitation and use of restraint in nursing home residents with dementia: A single-blind, randomized controlled trial. *J Clin Psychiatry* 2010;71:80–86.
- Meador KG, Taylor JA, Thapa PB, et al. Predictors of antipsychotic withdrawal or dose reduction in a randomised controlled trial of provider education. *J Am Geriatr Soc* 1997;45:207–210.
- Avorn J, Soumerai SB, Everitt DE, et al. A randomized trial of a program to reduce the use of psychoactive drugs in nursing homes. *N Engl J Med* 1992;327:168–173.
- Schmidt I, Claesson CB, Westerholm B, et al. The impact of regular multidisciplinary team interventions on psychotropic prescribing in Swedish nursing homes. *J Am Geriatr Soc* 1998;46:77–82.
- Patterson SM, Hughes CM, Crealey G, et al. An evaluation of an adapted U.S. model of pharmaceutical care to improve psychoactive prescribing for nursing home residents in Northern Ireland (Fleetwood Northern Ireland Study). *J Am Geriatr Soc* 2010;58:44–53.
- Hagen BF, Armstrong-Esther C, Quail P, et al. Neuroleptic and benzodiazepine use in long-term care in urban and rural Alberta: Characteristics and results of an education intervention to ensure appropriate use. *Int Psychogeriatr* 2005;17:631–652.
- Ray WA, Taylor JA, Meador KG, et al. Reducing antipsychotic drug use in nursing homes. A controlled trial of provider education. *Arch Intern Med* 1993;153:713–721.
- Ray WA, Blazer DG 2nd, Schaffner W, et al. Reducing antipsychotic drug prescribing for nursing home patients: A controlled trial of the effect of an educational visit. *Am J Public Health* 1987;77:1448–1450.
- Ballard C, Powell I, James I, et al. Can psychiatric liaison reduce neuroleptic use and reduce health service utilization for dementia patients residing in care facilities. *Int J Geriatr Psychiatry* 2002;17:140–145.
- Westbury J, Jackson S, Gee P, et al. An effective approach to decrease antipsychotic and benzodiazepine use in nursing homes: The RedUSE project. *Int Psychogeriatr* 2010;22:26–36.
- Westbury J, Tichelaar L, Peterson G, et al. A 12-month follow-up study of "RedUSE": A trial aimed at reducing antipsychotic and benzodiazepine use in nursing homes. *Int Psychogeriatr* 2011;23:1260–1269.
- Monette J, Monette M, Sourial N, et al. Effect of an interdisciplinary educational program on antipsychotic prescribing among residents with dementia in two long-term care centers. *J Appl Gerontol* 2013;32:833–854.
- Vida S, Monette J, Wilchesky M, et al. A long-term care center interdisciplinary education program for antipsychotic use in dementia: Program update five years later. *Int Psychogeriatr* 2012;24:599–605.
- Monette J, Champoux N, Monette M, et al. Effect of an interdisciplinary educational program on antipsychotic prescribing among nursing home residents with dementia. *Int J Geriatr Psychiatry* 2008;23:574–579.
- Earthy A, Collins J, Wong S, et al. Ensuring the appropriate use of neuroleptics. *Canadian Nursing Home* 2000;11:5–10.
- Morrison A. Antipsychotic prescribing in nursing homes: An audit report. *Qual Prim Care* 2009;17:359–362.
- Dahl LJ, Wright R, Xiao A, et al. Quality improvement in long term care: The psychotropic assessment tool (PAT). *J Am Med Dir Assoc* 2008;9:676–683.
- Schultz BM, Gambert SR. Minimizing the use of psychoactive medications in the institutionalized elderly. *Clinical Gerontologist: The Journal of Aging and Mental Health* 1991;11:80–83.
- Chakraborty A, Linton CR. Antipsychotic prescribing in dementia patients in care homes: Proactive in-reach service improved quality of care. *Int J Geriatr Psychiatry* 2012;27:1097–1098.
- Khan F, Curtice M. Non-pharmacological management of behavioural symptoms of dementia. *Br J Community Nurs* 2011;16:441–449.
- Heal C, McCracken A. Review of psychotropic medications and application of problem solving approaches to behavioural management in a dementia specific facility. *Geriacton* 1998;16:7–9.
- Rovner BW, Edelman BA, Cox MP, et al. The impact of antipsychotic drug regulations on psychotropic prescribing practices in nursing homes. *Am J Psychiatry* 1992;149:1390–1392.
- Cornege-Blokland E, Kleijer BC, Hertogh CPM, et al. Reasons to prescribe antipsychotics for the behavioral symptoms of dementia: A survey in Dutch nursing homes among physicians, nurses, and family caregivers. *J Am Med Dir Assoc* 2012;13:80.e1–80.e6.
- McCleery J, Fox R. Antipsychotic prescribing in nursing homes. *BMJ* 2012;344:e1093.
- Whitby P. Improve environment to reduce pressure to prescribe antipsychotic drugs in nursing homes. *BMJ* 2012;344:e2450.
- Azermat M, Vander Stichele R, Van Bortel L, et al. Barriers to antipsychotic discontinuation in nursing homes: An exploratory study. *Ageing Ment Health* 2013;18:346–353.
- Wood-Mitchell A, James IA, Waterworth A, et al. Factors influencing the prescribing of medications by old age psychiatrists for behavioural and psychological symptoms of dementia: A qualitative study. *Age Ageing* 2008;37:547–552.
- Long-Foley K, Sudha S, Sloane PD, et al. Staff perceptions of successful management of severe behavioural problems in dementia special care units. *Dementia* 2003;2:105–124.
- Roe B, Flanagan L, Jack B, et al. Systematic review of descriptive studies that investigated associated factors with the management of incontinence in older people in care homes. *Int J Older People Nurs* 2013;8:29–49.
- Lawrence V, Fossey J, Ballard C, et al. Improving quality of life for people with dementia in care homes: Making psychosocial interventions work. *Br J Psychiatry* 2012;201:344–351.
- Forsetlund L, Eike MC, Gjerberg E, et al. Effect of interventions to reduce potentially inappropriate use of drugs in nursing homes: A systematic review of randomised controlled trials. *BMC Geriatr* 2011;11:16.

49. Marcum ZA, Handler SM, Wright R, et al. Interventions to improve suboptimal prescribing in nursing homes: A narrative review. *Am J Geriatr Pharmacother* 2010;8:183–200.
50. Alldred DP, Raynor DK, Hughes C, et al. Interventions to optimise prescribing for older people in care homes. *Cochrane Database Syst Rev* 2013;(2):CD009095.
51. Fleming A, Browne J, Byrne S. The effect of interventions to reduce potentially inappropriate antibiotic prescribing in long-term care facilities: A systematic review of randomised controlled trials. *Drugs Aging* 2013;30:401–408.
52. Verrue CLR, Petrovic M, Mehuys E, et al. Pharmacists' interventions for optimization of medication use in nursing homes: A systematic review. *Drugs Aging* 2009;26:37–49.
53. Loganathan M, Singh S, Franklin BD, et al. Interventions to optimise prescribing in care homes: Systematic review. *Age Ageing* 2011;40:150–162.
54. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. *BMJ* 2009;339:b2700.