Psychosocial interventions for reducing antipsychotic medication in care home residents (Review)

Richter T, Meyer G, Möhler R, Köpke S

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2012, Issue 12

http://www.thecochranelibrary.com

TABLE OF CONTENTS

[Intervention Review]

Psychosocial interventions for reducing antipsychotic medication in care home residents

Tanja Richter[1], Gabriele Meyer[2], Ralph Möhler[2], Sascha Köpke[1,3]

[1]Unit of Health Sciences and Education, University of Hamburg, Hamburg, Germany. [2]School of Nursing Science, Faculty of Health, Witten/Herdecke University, Witten, Germany. [3]Nursing Research Group, Institute for Social Medicine, University of Lübeck, Lübeck, Germany

Contact address: Sascha Köpke, sascha.koepke@uksh.de.

Editorial group: Cochrane Dementia and Cognitive Improvement Group.
Publication status and date: New, published in Issue 12, 2012.
Review content assessed as up-to-date: 1 October 2012.

Citation: Richter T, Meyer G, Möhler R, Köpke S. Psychosocial interventions for reducing antipsychotic medication in care home residents. *Cochrane Database of Systematic Reviews* 2012, Issue 12. Art. No.: CD008634. DOI: 10.1002/14651858.CD008634.pub2.

ABSTRACT

Background

Antipsychotic medication is regularly prescribed in care homes to control 'behavioural and psychological symptoms of dementia' despite moderate efficacy, significant adverse effects, and available non-pharmacological alternatives.

Objectives

To evaluate the effectiveness of psychosocial interventions to reduce antipsychotic medication in care home residents.

Search methods

The Cochrane Dementia and Cognitive Improvement Group's Specialized Register, MEDLINE, EMBASE, CINAHL, PsycINFO, LILACS, a number of trial registers and grey literature sources were searched on 19th December 2011.

Selection criteria

Individual or cluster-randomised controlled trials comparing a psychosocial intervention aimed at reducing antipsychotic medication with usual care in care home residents or comparing two different approaches.

Data collection and analysis

Two review authors independently assessed the retrieved articles for relevance and methodological quality and extracted data. Critical appraisal of studies addressed risk of bias through selection bias, performance bias, attrition bias, and detection bias, as well as criteria related to cluster design. Authors of relevant studies were contacted for additional information.

Owing to clinical heterogeneity of interventions, statistical heterogeneity was not assessed and no meta-analysis performed. Study results are presented in a narrative form.

Main results

Four cluster-randomised controlled studies met the inclusion criteria. All of them investigated complex interventions comprising educational approaches. Three studies offered education and training for nursing staff, one study offered multidisciplinary team meetings as main component of the intervention. There was one high-quality study, but overall the methodological quality of studies was moderate.

The studies revealed consistent results for the primary end point. All studies documented a decrease of the proportion of residents with antipsychotic drug use or a reduction in days with antipsychotic use per 100 days per resident, respectively. In summary, the reviewed evidence on psychosocial interventions targeting professionals is consistent with a reduction of antipsychotic medication prescription in care home residents. However, owing to heterogeneous approaches, summary effect sizes cannot be determined.

Authors' conclusions

There is evidence to support the effectiveness of psychosocial interventions for reducing antipsychotic medication in care home residents. However, the review was based on a small number of heterogeneous studies with important methodological shortcomings. The most recent and methodologically most rigorous study showed the most pronounced effect.

PLAIN LANGUAGE SUMMARY

Psychosocial interventions for reducing antipsychotic medication in care home residents

In care homes, antipsychotic medication is commonly prescribed to control so called 'behavioural and psychological symptoms of dementia' such as agitation, aggression, or restlessness. However, it is questionable whether antipsychotic medication is effective and safe. Adverse effects, such as sedation, falls, and cardiovascular symptoms, are frequent. Therefore, antipsychotic medication should be avoided if possible. This review investigates whether psychosocial interventions aimed at reducing antipsychotic medication in care homes are effective. By psychosocial interventions, we mean programmes that consist of different non-pharmacological components including talking to the staff, residents, or both. We identified four randomised controlled trials for inclusion in the review. All studies examined, among other components, education targeted at nursing staff in care homes. The methodological quality of three studies was limited, one study showed high quality. In all studies the interventions led to a reduction of antipsychotic medication use, but the overall magnitude of the effect remains unclear.

BACKGROUND

Description of the condition

Dementia is common in care home residents. Prevalence rates of over 60% have been reported from different countries (Matthews 2002; Seitz 2010). In addition to cognitive impairment, people with dementia often show neuropsychiatric symptoms or so called 'behavioural and psychological symptoms of dementia' (BPSD), for example, agitation, aggression, restlessness, wandering, repetitive vocalisations, and shouting (Howard 2001; Zuidema 2007). This frequently results in distress to patients and carers (Black 2004). A number of pharmacological interventions are available for the treatment of BPSD, including different classes of psychotropic drugs as for example antipsychotic medication (Sink 2005). Despite the weak and ambiguous evidence concerning the effectiveness of psychotropic drugs, these are regularly prescribed for the treatment of BPSD. Practice guidelines on agitation in dementia recommend psychosocial options as first-line approaches for the treatment of BPSD and that psychotropic drugs should be stopped after symptoms disappear (DEGAM 2008; Howard 2001). The reality is different: psychotropic drugs are regularly prescribed in care homes as first-line treatment (Ruths 2008). In particular, antipsychotic medication is often used to control BPSD (Richter 2011; Schneider 2006), with studies reporting prescription rates between 21% and 46% (Mann 2009; Molter-Bock 2006; Richter 2011; Rochon 2007). One meta-analysis indicated that atypical antipsychotic drugs are the only effective psychotropic drugs for treatment of BPSD (Ballard 2006; Sink 2005), but with only moderate efficacy and important adverse effects such as sedation, falls, and extrapyramidal, cardiovascular, and anticholinergic symptoms (Hartikainen 2007; Kolanowski 2006; Rochon 2005; Sink 2005). In addition, some studies have indicated an increased mortality risk for both atypical and typical antipsychotic medication (Ballard 2008; Douglas 2008; Gill 2007). Prescription rates of antipsychotic medication have been reported to be influenced by a number of factors such as organisational factors, staff training, and patient characteristics (Richter 2011; Hughes 2000). Considering the current evidence, it is questionable whether prescription of antipsychotic medications can be justified for controlling BPSD. The limited effectiveness and the potential harm of antipsychotic medication in people with dementia highlights the need to seek less harmful alternatives (Ballard 2009; Banerjee 2009; Schneider

2006). Prescription rates do not frequently seem to be based on rational clinical reasoning or work conditions. For example, an analysis of three large prevalence studies in Germany and Austria (Richter 2011) did not find an impact of nurse staffing levels or proportion of trained nurses on prescription rates. Also, associations between organisational characteristics and antipsychotic medication rates were not consistently shown. Thus, rather than the clinical situation, the organisational "culture" seems to determine prescription rates. Therefore, interventions aiming to decrease antipsychotic medication should establish pre-requisites to build a different culture.

Description of the intervention

One possible alternative to the use of antipsychotic medication is the implementation of psychosocial interventions. These interventions are not easy to classify (see Types of interventions). One possibility is to categorise interventions according to the target groups, that is:

1. interventions directly targeting residents: these could include psycho-educative interventions or behavioural therapy aimed at modification of affect and behaviour of residents. Common goals of these interventions are to enable residents to achieve insight into their disease, to replace inadequate coping with adequate coping, and to reduce emotional distress (Kasl-Godley 2000; Solomon 1992). Further aims are to challenge residents' negative cognitions in order to reduce distortions and to enable them to generate more adaptive ways of viewing specific situations and events or to enhance residents' sense of control (Teri 1991);
2. interventions targeting nursing and other healthcare staff: these interventions may aim to strengthen staff members' expertise in dealing with people with BPSD. Also, interventions could aim to reduce staff distress or resolve management difficulties, or both, by identifying the underlying unsatisfied need or cause, the antecedents or consequences of residents' challenging behaviour (Moniz-Cook 2012). In this context, interventions to reduce antipsychotic medication in care home residents intend to improve management of BPSD and in parallel to minimise or abolish the use of antipsychotic medication. As a starting point interventions often try to increase staff awareness of the limited effectiveness and possible adverse effects of antipsychotic medication;
3. interventions targeting both groups: these interventions may contain elements from both the above groups with different emphases. Here, interventions may also support the shift from a more biomedical model of acute care, focusing on physical conditions and activities of daily living to more person-centred care targeting residents' psychosocial and emotional needs.

Why it is important to do this review

The best evidence for the efficacy of psychosocial interventions to reduce antipsychotic medication in long-term care homes should stem from large, well-conducted randomised controlled trials (RCTs). If applicable, systematic reviews and, if possible, meta-analyses of these trials are even more informative. These publications are necessary to provide carers and policy makers with the current best evidence for alternative, less harmful interventions to reduce antipsychotic medication in care home residents. Other reviews (Forsetlund 2011; Nishtala 2008) have summarised a wide range of interventions aimed at reducing psychotropic medication. These frequently include psychosocial interventions, a classification that remains ambiguous and hard to delineate from 'non-pharmacological' interventions (Vasse 2012). Therefore, using a rather strict definition of 'psychosocial interventions', this review aims to synthesise the best evidence on interventions that usually consist of different components, but always comprises an 'interpersonal dialogue'.

OBJECTIVES

1. To determine whether psychosocial interventions can reduce antipsychotic medication compared with no intervention or other interventions.

2. To describe the components and the developmental process of the interventions investigated as suggested in recent methodological reports concerning the development and reporting of complex interventions (Craig 2008; Möhler 2012).

3. To describe the quality and quantity of research evidence available in order to make recommendations about effective interventions that could be used in practice and to set an agenda for future research in this field.

METHODS

Criteria for considering studies for this review

Types of studies

We included all individual RCTs or cluster-RCTs with (groups of) care home residents allocated either (a) to a programme aiming to reduce the prescription rate of antipsychotic medication by one or more psychosocial interventions (the intervention group, IG) or (b) to regular care, to optimised regular care, or to a different psychosocial intervention (the control group, CG). Studies were included if the primary aim was the reduction of antipsychotic medication, that is, the primary end point was related to prescription

of antipsychotic medication. Non-blinded studies were included in the review as blinding of participating carers seems unrealistic. Also, studies without blinding of outcome assessors were included, as the risk of detection bias seems small considering the primary outcome measures (i.e. prescription of antipsychotic medication). No language restrictions were applied.

Types of participants

Participants were care home residents of either gender requiring long-term nursing care, irrespective of their cognitive status. Although the target group for antipsychotic medication predominantly consists of people with dementia and BPSD, in practice, such people are not easy to determine. The percentage of individuals with dementia and BPSD is often high in care homes; however, not all of these individuals have an established diagnosis. Also, not all residents with a diagnosis are clearly suffering from dementia and BPSD. Furthermore, residents' status may have changed during follow-up. Therefore, all residents were included, assuming that most of those who receive antipsychotic medication do so because of BPSD and only a minority as a treatment for psychosis. Care homes were defined as institutions where long-term care is provided by professional care workers for residents requiring nursing care, that is, mostly frail elderly people.

Types of interventions

Psychosocial interventions were defined as: 'any intervention that emphasises psychological or social factors rather than biological factors' (Ruddy 2005). In this sense, psychosocial intervention programmes may consist of different non-pharmacological elements. This definition allowed for the inclusion of interventions with components of psychological therapies and health education, as well as interventions with a focus on social aspects, such as social support and networking. Importantly, a psychosocial intervention needed to comprise an interpersonal dialogue (i.e. 'talking'), in the form of a verbal communication at least as a part of a complex intervention. This communication could take place between different partners:

1. an individual resident or a group of residents and a trained member of nursing staff;
2. an individual resident or a group of residents and a person from outside the institution (e.g. a cognitive or behavioural therapist);
3. an individual staff member or a group of staff members and somebody who is coming from outside to implement the intervention (e.g. a trainer for social skills or coping skills).

This definition may differ from others (e.g. used in guidelines), but gives consideration to communication as a central component of 'interaction' identified as important aspect of psychosocial interventions (Moniz-Cook 2011). Therefore, interventions commonly referred to in European guidelines as psychosocial interventions (e.g. physical activity, multisensory stimulation, or even light therapy) (Vasse 2012) are not considered psychosocial interventions here.

Interventions combining psychosocial elements with biological components were also considered for inclusion. Interventions were included irrespective of the format of provision (i.e. groups vs. individuals) or scope (i.e. single training session vs. multiple training sessions).

We excluded interventions without psychosocial components (e.g. placebo-controlled or uncontrolled withdrawal of antipsychotic medication or pharmacological interventions replacing antipsychotic medication by other pharmaceuticals), interventions based solely on physical or sensory factors (e.g. physical activity, massage, aroma therapy, music therapy), interventions providing information without a personal contact and communication (e.g. leaflets, educational videotapes) and structural interventions (e.g. changing organisational policies, increasing staffing levels).

Types of outcome measures

Primary outcomes

- Use of regularly prescribed antipsychotic medication measured at the unit of randomisation level (the resident or the care home).

Secondary outcomes

- Type, dosage, number, and duration of regularly prescribed antipsychotic medication.
- Antipsychotic medication administered 'as needed'.
- Prescription of any regular psychotropic medication.
- Adverse effects of the interventions employed (e.g. falls, injuries, hospitalisation, and death).
- Residents' cognitive status.
- BPSD measured with a validated scale (e.g. Neuropsychiatric Inventory (NPI), Cohen-Mansfield-Agitation-Inventory (CMAI), Behavioural Pathology in Alzheimer's Disease (BEHAVE-AD)).
- Physical restraints.
- Costs.

Antipsychotic agents were defined according to the Anatomical Therapeutic Chemical Classification (ATC-Index 2009) as drugs listed under the ATC-category N05A. Regular prescription was defined as continuous (daily, weekly, or monthly) administration of the drug over a period of time in opposite to drugs administered 'as needed'.

Search methods for identification of studies

Electronic searches

We searched ALOIS (www.medicine.ox.ac.uk/alois), the Cochrane Dementia and Cognitive Improvement Group's (CDCIG) Specialized Register, on 19 December, 2011. To be as sensitive as possible all non-pharmacological RCTs listed on the site were screened for inclusion.

ALOIS is maintained by the Trials Search Co-ordinator for CDCIG and contains dementia and cognitive improvement studies identified from:

1. monthly searches of a number of major healthcare databases: MEDLINE, EMBASE, CINAHL, PsycINFO, and LILACS;
2. monthly searches of a number of national and international trial registers: ClinicalTrials.gov, Current Controlled Trials, the World Health Organization (WHO) Portal (which covers Chinese Clinical Trials Register, German Clinical Trials Register, Iranian Registry of Clinical Trials, and the Netherlands National Trials Register, plus others), and Umin - Trials Register of Japan;
3. monthly searches of a number of pharmaceutical industry trial registers: AstraZeneca Clinical Trials, Bristol-Myers Squibb Clinical Trial Registry, Eli Lilly and Company Clinical Trials Registry, Forest Clinical Trial Registry, GlaxoSmithKline Clinical Trial Register, NovartisClinicalTrials.com, Pfizer Clinical Trials, Wyeth Clinical Trial Listings, and more;
4. six-monthly searches of a number of grey literature sources: ISI Web of knowledge Conference Proceedings, Index to Theses, and Australasian Digital Theses.

To view a complete list of all sources searched for ALOIS see About ALOIS at the ALOIS website.

Details of the search strategies used for the retrieval of reports of trials from the healthcare databases, CENTRAL, and conference proceedings can be viewed in the 'methods used in reviews' section within the editorial information about the Dementia and Cognitive Improvement Group.

Additional searches were performed in the most important databases of ALOIS to cover the period of time from the last searches performed for ALOIS to ensure that the search for the review was as up-to-date and as comprehensive as possible. The search strategies used can be seen in Appendix 1.

Searching other resources

Reference lists of published reviews and retrieved articles were checked for additional trials. Experts in the field were contacted to identify unpublished or ongoing studies.

Data collection and analysis

Titles and abstracts of citations obtained from the search were examined independently by two review authors and obviously irrelevant articles were discarded.

Selection of studies

Two review authors (TR, RM) independently assessed the retrieved articles for inclusion in the review according to the inclusion criteria mentioned above. Disagreements were resolved by discussion or, if necessary, referred to a third review author (SK).

Data extraction and management

Data were extracted by two independent review authors (TR, RM) using a standardised data collection sheet and checked for accuracy. Results were discussed and in case of disagreement a third review author (SK) was called in to reach consensus. If necessary, study authors were contacted for additional information. For each study, the following data were extracted: characteristics of participants, baseline data, interventions, duration of the intervention, length of follow-up, outcome measures, and adverse events. Estimates of the intra-cluster correlation coefficient (ICCC) were extracted if possible.

Assessment of risk of bias in included studies

Quality criteria were developed by the authors of the review, following the *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.0.2 (Higgins 2011). Critical appraisal of studies addressed risk of bias through selection bias, performance bias, attrition bias, and detection bias, as well as cluster design-related criteria. Two review authors (TR, RM) independently assessed and scored studies' methodological quality using the data evaluation sheet in order to identify any potential sources of systematic bias. Since cluster-RCTs were considered for inclusion, various design-related criteria for these types of studies were applied (Campbell 2004; Hahn 2005; Puffer 2003) (see Appendix 2). If information was unclear or missing, studies' corresponding authors were contacted to ask for the required data. Study validity was categorised into low, moderate, or high risk of bias.

Measures of treatment effect

As we found pronounced clinical heterogeneity and therefore decided to present study results in a narrative form, data were extracted as reported in the Characteristics of included studies table.

Unit of analysis issues

For each study, we considered whether groups of individuals were randomised in clusters or individually, whether individuals underwent more than one intervention or whether there were multiple observation times for the same outcome.

Dealing with missing data

Numbers and types of missing data related to participants' dropout are described in the Characteristics of included studies table.

Assessment of heterogeneity

Studies were analysed and presented separately. We analysed all studies in terms of participants, interventions, and outcomes to consider clinical heterogeneity. As marked clinical heterogeneity was present, we did not further check for statistical heterogeneity.

Assessment of reporting biases

In order to minimise the risk of publication bias, a comprehensive search in multiple databases was performed, including searching for unpublished studies in trials registers. Also authors of primary studies were contacted to inquire about unpublished or ongoing studies. As we identified only four publications that were heterogeneous concerning interventions and outcomes, we did not enter the data into a funnel plot to investigate the likelihood of overt publication bias.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies.
See: Characteristics of included studies; Characteristics of excluded studies.

Results of the search

A total of 161 abstracts were screened for inclusion (see Appendix 3), 19 publications were assessed in full text. Four publications fulfilled the eligibility criteria (Avorn 1992; Fossey 2006; Meador 1997; Schmidt 1998). One publication (Schmidt 2000) reporting follow-up results for an included study (Schmidt 1998) had to be excluded as study populations were not comparable owing to organisational changes and re-organising processes in participating care homes. We identified one ongoing (see Ongoing studies) and no unpublished studies. Finally four studies were included in this review.

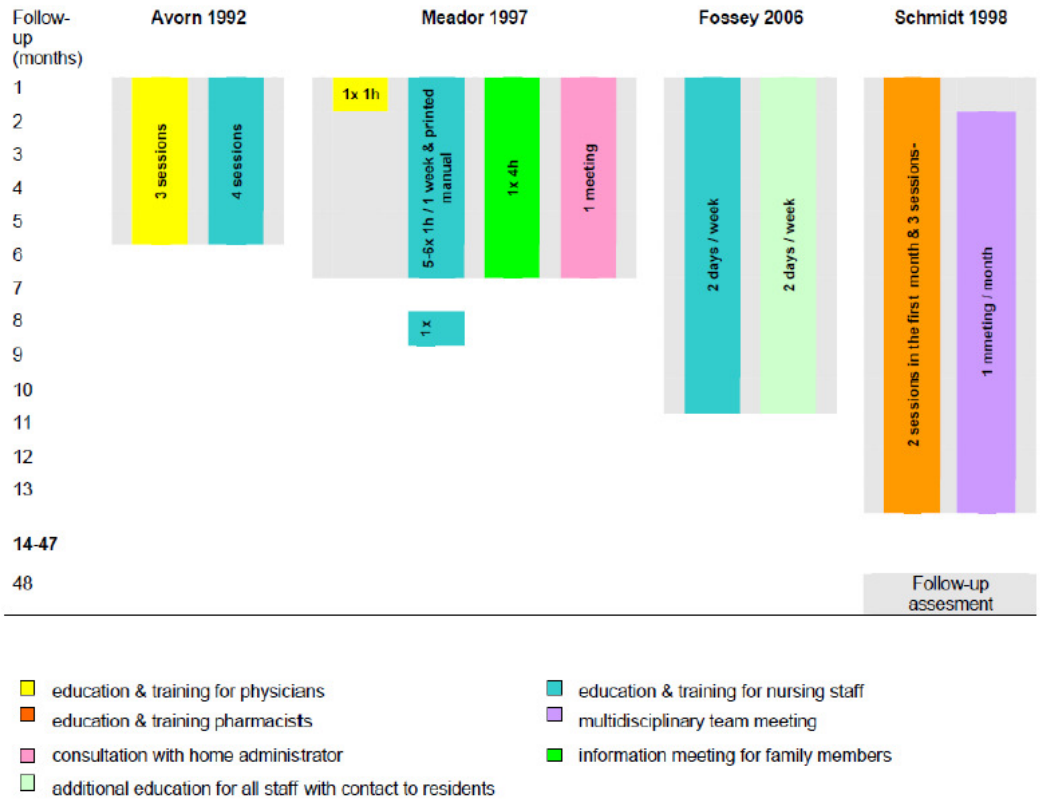
Included studies

Two studies were carried out in the US, one in England, and one in Sweden. In all studies, groups of individuals were randomised in clusters. In all studies one IG was compared to one CG. In three studies stratified block randomisation was used, according to cluster location (region) and baseline use of antipsychotic medication (Fossey 2006); cluster size and baseline use of antipsychotic medication (Meador 1997); or cluster size, care home ownership, and baseline use of psychotropic medication (Avorn 1992). In three studies the unit of analysis was the cluster (i.e. the care home; Avorn 1992; Fossey 2006; Meador 1997). In one study individual residents were defined as unit of analysis (Schmidt 1998).
We found a pronounced clinical heterogeneity in terms of definitions of psychosocial interventions and outcomes. Therefore, we did not analyse statistical heterogeneity and did not perform a meta-analysis. Thus, study results are presented in a narrative format.

Duration of follow-up

All studies included one follow-up observation at a single time point. For one study (Schmidt 1998) a second observation after three years has been reported (Schmidt 2000), which was excluded owing to important changes in study populations. Therefore, separate analyses to compare short-term and long-term follow-up were not possible. The median duration of follow-up was nine months, ranging from five (Avorn 1992) to 13 months (Schmidt 1998) (see Figure 1).

Figure 1. Overview of the components of the interventions.



Definition of antipsychotic medication

Definitions of antipsychotic medication were heterogeneous between studies. Avorn 1992 did not give a definition for antipsychotic medication, but classified psychotropic drugs into three categories: not recommended, acceptable, and others, with antipsychotic medication classified as not recommended. In Fossey 2006 daily doses of drugs were translated into chlorpromazine daily equivalents according to the British National Formulary. Meador 1997 converted antipsychotic medication to standard equivalents of thioridazine according to the American Medical Association 1986. In Schmidt 1998, trained coders, supervised by pharmacists, classified and coded all antipsychotic prescriptions using the ATC Classification System (ATC-Index 2009).

In Avorn 1992 antipsychotic medication was assessed during two 30-day periods before and after the intervention without reporting who collected the data. Specially developed software was used to daily record all medications during these periods. In Fossey 2006, antipsychotic medication was assessed before and after the intervention by trial clinicians and psychology research assistants not involved in the study. In Meador 1997, an independent research nurse assessed daily use of drugs during 30 days preceding baseline assessment and monthly during the 6 months' follow-up. Information about types and doses of drugs was collected daily. In Schmidt 1998, information on antipsychotic medication, including type of drug, administration route, and dosage changes were assessed one month before and one month after the intervention, without reporting who collected the data.

Methods of data collection

Methods of data collection concerning psychotropic drug prescriptions were homogeneous among studies. In all studies, data were assessed from patient records or resident files.

Setting and participants

A total of 69 clusters (33 IG, 36 CG) with 4337 residents (1918 IG, 2419 CG) were assessed. In three studies, study groups consisted of all care home residents (Avorn 1992; Fossey 2006; Meador 1997).

In one study in principle all wards of the care homes were eligible, but in two larger homes, only an undefined sample of residents was included (Schmidt 1998).

Avorn 1992 included 12 care homes in Eastern Massachusetts, US. Exclusion criteria were: more than 20% residents admitted from inpatient psychiatric hospitals, active nurse practitioner prescribing, and pre-existing relationship between authors and pharmacists or physicians of the care homes. The care homes were grouped into six pairs matched on the basis of size, type of ownership, and level of medication. Out of these pairs, one care home was randomly assigned to receive the intervention. Data were obtained from all residents living in the home at baseline data collection. The proportion of residents remaining in the groups after the intervention was 81% in the IG and 84% in the CG.

Fossey 2006 included 12 care homes, four each in the area of London, Newcastle, and Oxford, UK, which were registered to admit elderly mentally impaired people and had a minimum of 25% of residents with dementia taking antipsychotic medication. After baseline assessment, the blinded study statistician classified the four homes into two homes with low and two homes with high level of antipsychotic medication per region. After this classification, homes were randomly assigned to the IG or CG, stratified by region and antipsychotic medication use. Data were obtained from all residents living in the home at baseline and at follow-up.

Meador 1997 included 12 care homes in Tennessee, US. Inclusion criteria were: at least 40 Medicaid beds with 20% of Medicaid residents receiving antipsychotic medication, no specialisation in psychiatric or skilled nursing, and no implementation of an antipsychotic medication withdrawal programme. Data were obtained on residents aged 65 years or older living in the home for at least six months at the start of the study. The proportion of residents remaining in the study after the intervention was 85% in the IG and 91% in the CG.

Schmidt 1998 included 36 care homes in Sweden in a three-step process. Eighteen out of 36 regions in Sweden were randomly selected. Out of each region the regional pharmacy director selected two care homes, considering different care home characteristics. Out of these, one care home each was randomly assigned to the IG or the CG. Three of the care homes in the IG became ineligible because of employing a geriatric specialist, being unable to provide data, or loss of their pharmacist. Data were obtained from all permanent residents even though they may have not resided in the care home at baseline assessment. There are no data about the proportion of residents remaining in the study after the intervention.

Baseline data

In Avorn 1992, no baseline data were reported, except for use of psychotropic medication, showing a prevalence of antipsychotic medication of 29.3% of residents with psychotropic medication in the IG and 26.2% in the CG. In Meador 1997, the authors described baseline data as comparable between study groups with mean thioridazine equivalents antipsychotic doses of 185 mg in the IG and 158 mg in the CG. In Fossey 2006, demographic and clinical characteristics of residents were comparable between groups. In Schmidt 1998, no significant differences in baseline characteristics were documented. Three of the original experimental homes became ineligible. The number of residents in the CG was nearly twice as high as in the IG (1228 people in IG vs. 626 people in CG).

In three studies there was no information about staffing levels. Schmidt 1998 reported that there were no significant differences in staff:resident ratios between groups.

Description of interventions

Components of the tested interventions differed between studies in terms of content, duration, frequency, and target group of educational sessions (for details see Figure 1). All studies offered an educational programme as main component of a complex intervention. In three studies (Avorn 1992; Fossey 2006; Meador 1997) the intervention comprised an educational programme for nursing staff. In addition, an education programme for physicians was offered in Avorn 1992 and Meador 1997. In Meador 1997, if requested, consultations with the home administrator and an information evening for family members were offered. In Fossey 2006 additional education for all staff with contact to residents (including housekeeping and kitchen staff) and a medication review by a consultant old age psychiatrist and a senior member of nursing staff were offered to both groups. In Schmidt 1998 an educational programme for pharmacists was offered in addition to multidisciplinary team meetings (Table 1 Figure 1).

Educational programmes

Underlying concepts of educational programmes

The educational programme by Avorn 1992 was developed on the basis of previous research in drug therapy decision-making (Avorn 1983; Soumerai 1990). Meador 1997 developed the educational programme on the basis of previous research in managing behavioural problems in care home residents (Ray 1991; Ray 1993; Taylor 1990). The educational programme by Fossey 2006 was described as comprising "whole home" issues without referring to any specific concept. Underlying theories were named for several elements of the programme: philosophy and application of person-centred care (Kitwood 1997), positive care planning (Edberg 1999), antecedent behaviour consequence models (Stevens 1998), reminiscence techniques (Lai 2004), behavioural management techniques including training in the Cohen-Mansfield approach (Cohen-Mansfield 1997), individual case supervision (James 2003), and organisational issues supervision (Cole

2000). The educational programme for pharmacists by Schmidt 1998 was based on the Swedish Medical Product Agency *Guidelines for Treatment of Demented Older Adults* (SMPA 1995).

Delivery and content of educational programmes

The educational programmes were administered over periods of one to five months for physicians, five to 10 months for nursing staff, and 13 months for pharmacists. The duration of individual educational sessions ranged from 30- to 45-minute session to full-day seminars (Figure 1).

Avorn 1992 offered three interactive visits for physicians, four training sessions for nurses and nursing assistants (in separate groups), and one training session for night staff within five months without reporting the exact duration. Schmidt 1998 offered two training sessions for pharmacists before starting the outreach programme (multidisciplinary team meetings) and three sessions during the programme for pharmacists, without reporting the exact number of training hours. The aim of the programme was to improve communication about drug use and to minimise the use of non-recommended drugs as defined in the national Swedish guideline (SMPA 1995). Fossey 2006 offered a programme of two hours per week over a 10-month period. Education sessions varied in duration, content, and target group. At the beginning of the study, intervention homes performed a self audit to identify areas of need. In Meador 1997, at the beginning of the study, 45- to 60-minute visits by the study geronto-psychiatrist for all physicians treating five or more residents in the IG homes was offered. Subsequently, five or six one-hour in-house programmes were offered over a one-week period for care home staff by a trained nurse educator. Each programme was offered several times to facilitate attendance by direct-care staff in all shifts.

Content of educational programmes

Programmes differed in terms of contents. Main topics are briefly listed below referring to target groups.

Nursing staff

Person-centred care (Avorn 1992; Fossey 2006), alternatives to psychoactive drug use, adverse drug reaction, use of hypnotic agents (Avorn 1992), behavioural management techniques (Meador 1997; Fossey 2006), positive care planning (Fossey 2006), environmental design issues (Fossey 2006), antecedent behaviour consequence model (Fossey 2006), development of individualised interventions (Fossey 2006), active listening and communication skills (Fossey 2006), reminiscence techniques (Fossey 2006), and involvement of family carers (Fossey 2006).

Physicians

Geriatric pharmacology, alternatives for sedation (Avorn 1992), risks and benefits of antipsychotic and other psychotropic drugs (Meador 1997), and short summary of the educational activities for the care home staff (Meador 1997).

Pharmacists

Drug use in older people, gerontology, communication skills, and methods of networking (Schmidt 1998).

Trainers

"Yesterday, today, tomorrow-training pack", a video-based training programme for anyone working with people with dementia, developed by the Alzheimer's Society as standard training, skills development in training and supervision, and organisational issues (Fossey 2006).

Consultation

If requested, Meador 1997 comprised a single four-hour consultation session with care home administrators, delivered by a care home management specialist. The consultations comprised supervision of staff, quality control for care, and relations with the families of the residents.

Information

Meador 1997 offered a single information meeting for family members. The information included information about the intervention and the opportunity to ask questions concerning cognitive disorders.

Multidisciplinary team meetings

Schmidt 1998 offered monthly multidisciplinary team meetings over a period of 12 months. Participants were pharmacists, physicians, selected nurses, and nursing assistants. No special training, education, or incentives were provided for participants except pharmacists. During the meetings, drug use of individual residents was discussed.

Medication review

Fossey 2006 offered medication reviews for both IG and CG every three months. The reviews included the recommendation to stop psychotropic drugs that had been prescribed for more than three months and to discontinue these when behavioural problems had been resolved. Recommendations were made by a letter from the

study psychiatrist to prescribing doctors, followed by a telephone call if no action had been taken after two weeks.

Control group

In three studies (Avorn 1992; Meador 1997; Schmidt 1998) no intervention was offered to the CG (usual care). Characteristics of usual care were not reported in any of the studies. In Fossey 2006, a medication review by a consultant old age psychiatrist and a senior member of nursing staff was offered every three months for IG and CG homes.

Feasibility/pilot test

None of the studies provided any information on pilot or feasibility tests of the intervention.

Implementation of the interventions

Information about implementation strategies were presented only in two studies: in Meador 1997 physicians received a reference card summarising programme recommendations, including a flow chart for the antipsychotic withdrawal protocol. All nursing staff members received a manual, describing the behaviour management programme. In Fossey 2006, the intervention was delivered by staff who had received training on the delivery of person-centred care and skills development in training and supervision, who were supervised weekly during the study period. Details of the intervention and the models and tools used have been published in a manual in 2008 (Fossey 2008). No information on implementation strategies are available for Avorn 1992 and Schmidt 1998. None of the studies formally evaluated the implementation process.

Nurse attendance at educational sessions

None of the four included studies provided information on the proportion of nurses attending educational sessions or proportion of nursing staff turnover during the study periods.

Excluded studies

Studies were excluded because they were not RCTs or did not meet the inclusion criteria related to main outcomes, participants, or intervention.

Risk of bias in included studies

The first authors of all studies were contacted and asked to deliver further information on methodological details not reported in the publications. All authors responded to our requests. One author (K. Meador) regretted not to have enough time to answer the questions, the others provided information, although two (J. Avorn, I. Schmidt) were not able to answer all questions since the studies had been performed many years ago (Avorn 1992; Schmidt 1998). One study was assessed to be of high methodological quality (Fossey 2006), with the other three being of moderate methodological quality (see Figure 2; Figure 3 and Appendix 2).

Figure 2. Methodological quality graph: review authors' judgements about each methodological quality item presented as percentages across all included studies.

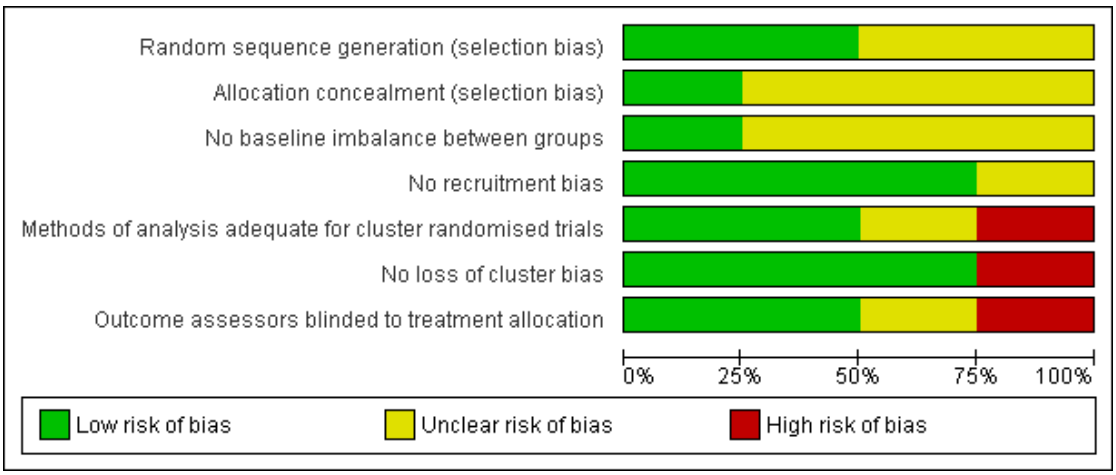
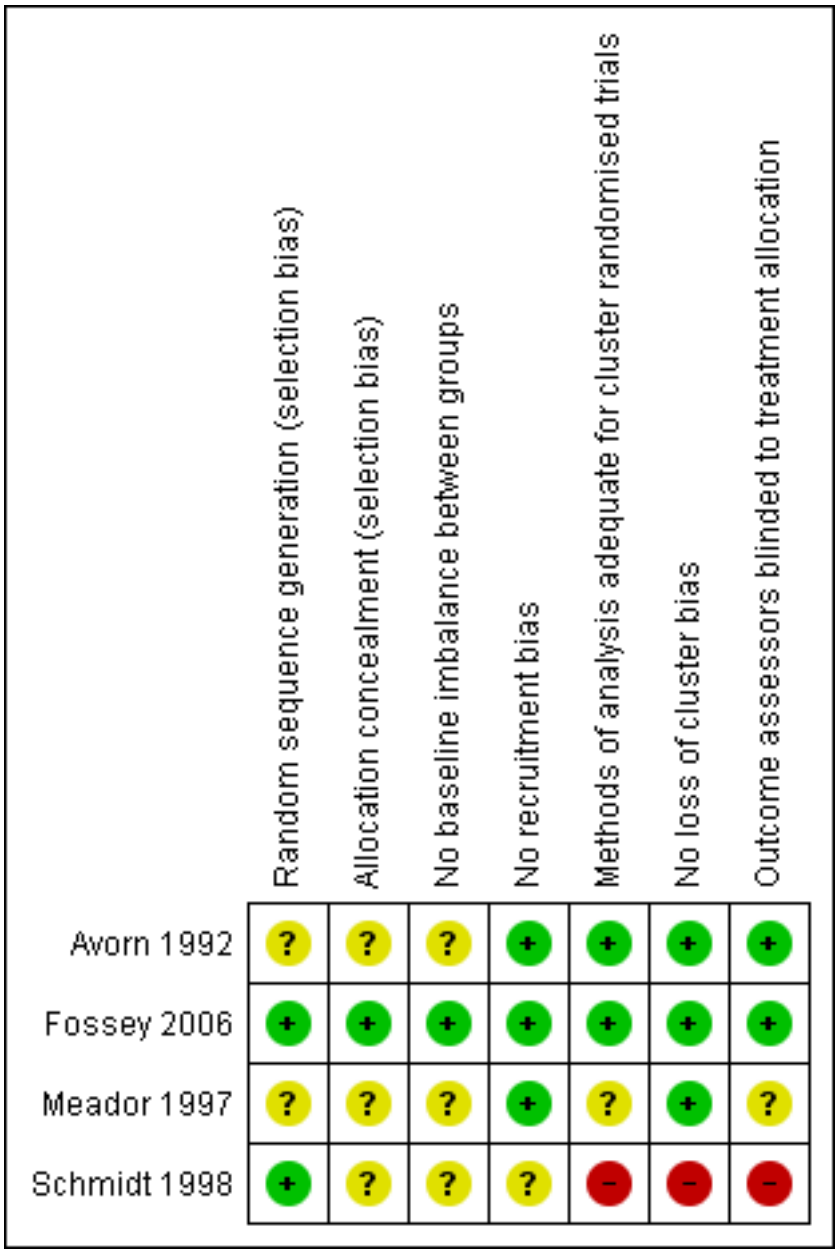


Figure 3. Methodological quality summary: review authors' judgements about each methodological quality item for each included study.



Allocation

Sequence generation was adequate in two studies (Fossey 2006; Schmidt 1998), allocation concealment was adequate in only one study (Fossey 2006), and unclear in the others studies (Avorn 1992; Meador 1997; Schmidt 1998).

Blinding

Outcome assessors were blinded to treatment allocation in two studies (Avorn 1992; Fossey 2006), in the other two studies blinding remained unclear (Meador 1997; Schmidt 1998).

Incomplete outcome data

In three studies none of the clusters were lost to follow-up (Avorn 1992; Fossey 2006; Meador 1997). In Schmidt 1998, three out of 18 clusters in the IG dropped out of the study. In two larger clusters in the IG only a sample of wards was included.

Selective reporting

In Meador 1997, results were not reported for all outcomes listed in the methods section of the publication. Results for the secondary end points type, dosage, number and duration of regularly prescribed antipsychotic medication were reported only for a subgroup, results for the secondary end point BPSD were reported without presenting data.

None of the studies reported the number of physical restraints as a secondary end point.

Other potential sources of bias

Recruitment bias

In three studies, participants were included before random allocation of clusters (Avorn 1992; Fossey 2006; Meador 1997). In the study by Schmidt 1998, it remains unclear whether patients were included in clusters before randomisation.

Baseline imbalance between groups

In Avorn 1992, no baseline data were reported except for the prevalence of antipsychotic medication use (IG 29.3%, CG 26.2%). In Meador 1997, there was no imbalance for baseline data between groups, except for mean antipsychotic doses (IG 185 mg thioridazine or equivalent, CG 158 mg). In Fossey 2006, groups were reported as similar at baseline, with differences reported for residents with at least one episode of aggression in the past 12 months (IG 6.5%, CG 15.5%) and with no, questionable, or mild dementia (IG 15%, CG 23%). In Schmidt 1998, there was a difference in mean numbers of residents per home (IG 51, CG 80). It remains unclear whether these differences constitute clinically relevant imbalances between groups. These imbalances were not controlled for statistically in any study.

Methods of analysis adequate for cluster RCTs

Two studies used adequate methods for the analysis of cluster RCTs. Fossey 2006 adjusted the likelihood of taking antipsychotic medication to the cluster effects and reported ICCC for treatment effect sizes. Avorn 1992 used matched home pairs of nursing homes as unit of analysis. In Meador 1997, there was not enough information to assess adequacy of methods. Although the care home was reported as unit of analysis, no further information was given. Schmidt 1998 did not adequately account for the cluster design as individual residents were used as unit of analysis weighted in proportion to the size of the nursing home.

Effects of interventions

Since a meta-analysis was not feasible, this review is reported in narrative form. Three studies presented proportions of residents receiving antipsychotic treatment as primary outcome (Avorn 1992; Fossey 2006; Schmidt 1998). One study presented data about the use of antipsychotic medication in days per 100 resident-days (Meador 1997). A list of outcomes for each included study is presented in Table 2.

Primary outcome - use of regularly prescribed antipsychotic medication

In Avorn 1992, reductions in the proportion of residents on antipsychotic medication after six months compared to baseline were reported for both groups: 5.3 percentage points in the IG (from 29.3% to 24.0%) and 0.9 percentage points in the CG (from 26.2% to 25.3%). As these percentages are means across all nursing homes, they differ slightly from the results expressed as raw numbers. In the IG at baseline 100 of 349 residents (28.7%) received antipsychotic medication compared to 84 of 349 residents (24.1%) after the intervention. In the CG at baseline 84 of 329 residents (25.5%) received antipsychotic medication compared to 81 of 329 residents (24.6%) after the intervention. No data about statistical significance were given. For the subgroup of residents who had received antipsychotic medication in the 30-day period before the intervention, a reduction of 32 percentage points in the IG and 14 percentage points in the CG (difference -18%; 95% confidence interval (CI) -33% to -3%) was shown; raw data were not available. In Fossey 2006, after 12 months the proportion of residents with antipsychotic medication in the IG decreased from

85 of 181 (47.0%) to 40 of 174 (23.0%), in the CG from 83 of 167 (50%) to 69 of 164 (42.1%). This represents a between-group difference of residents with antipsychotic medication at the end of follow-up of 19.1 percentage points (95% CI 37.7% to 0.5%; P = 0.045). In Meador 1997, antipsychotic medication use was measured in days per 100 resident days. After six months, this had decreased significantly by 5.6 days from a mean 25.3 days (standard deviation (SD) ± 2.5) to 19.7 days (SD ± 1.7) in the IG compared to 0.2 days from 26.2 days (SD ± 1.7) to 26.0 days (SD± 2.5) in the CG (P = 0.014 for between-group difference). No raw data were reported. Schmidt 1998 documented a significant decrease in the proportion of residents receiving antipsychotic medication after 13 months by 7.5 percentage points (from 40.1% to 32.6%; P = 0.007) in the IG compared to a non-significant decrease by 2.7 percentage points (from 37.6% to 34.9%; P = 0.176) in the CG, with no data given for the number of residents receiving antipsychotic medication or for the statistical significance of the difference between groups.

Secondary outcomes

Type, dosage, number, and duration of regularly prescribed antipsychotic medication

Avorn 1992 documented a non-significant reduction in the number of days of antipsychotic medication per resident per month (-7.1 in the IG vs. -3.7 in the CG; mean difference -3.5; 95% CI -10.6 to 3.6). In Fossey 2006, one secondary end point was the dose of antipsychotic medication measured in chlorpromazine equivalents. Unit of measurement was the mean of medians of clusters per group. After 12 months the mean dose in the IG was 102.1 units compared to 107.1 units in the CG, a non-significant difference was 4.9 (95% CI -20.0 to 29.9; P = 0.67). Adjusting for different variables did not change the non-significant result. In Meador 1997, the subgroup of residents taking antipsychotic medication at baseline were analysed in a cohort analysis with 44 out of 133 residents (33%) being withdrawn from the analysis. Of the 89 residents who continued, 22 (25%) had a dose reduction of 50% or more with no data about the distribution between groups. Schmidt 1998 did not give any information about changes in type, dosage, number, and duration of regularly prescribed antipsychotic medication.

Antipsychotic medication administered 'as needed'

Schmidt 1998 reported an increase for both groups in anxiolytic prescribing associated with a significant increase in antipsychotic medication taken 'as needed'. The authors reported a small increase in the overall rate of psychotropic medication administered 'as needed' (+1.8 percentage points in the IG vs. +0.5 percentage points in the CG), with no data given for statistical significance of the between-group difference. Avorn 1992, Fossey 2006, and Meador 1997 did not report any information about drugs administered 'as needed'.

Prescribing of regularly psychotropic medication other than antipsychotic medication

All psychotropic medication

Avorn 1992 documented a significant reduction of the mean psychoactive-drug-use score for all residents with potentially inappropriate drug use in the IG (from 1.87 to 1.36) compared to the CG (from 1.74 to 1.60) (mean difference in risk reduction -0.37; 95% CI -0.67 to -0.08; P = 0.02). In Fossey 2006, the proportion of residents taking other psychotropic drugs than antipsychotic medication increased from 54% to 62.6% in the IG and from 53% to 56.8% in the CG, a non-significant difference (5.9 percentage points; 95% CI -27.2 to 15.5; P = 0.56). In Schmidt 1998, there was no change in residents with psychotropic drug prescription between study groups before and after the intervention (from 75.8% to 77.1% in the IG vs. from 77.8% to 79.1% in the CG). Meador 1997 did not report use of general psychotropic medication.

Benzodiazepines

Avorn 1992 reported a shift to no drugs or benzodiazepines categorised as acceptable in residents receiving long-acting or other benzodiazepines (20% in the IG vs. 9% in the CG; mean difference -11 percentage points; 95% CI -38 to 15) In Meador 1997, no change in the use of benzodiazepines was reported (data were not provided). Fossey 2006 and Schmidt 1998 did not report use of benzodiazepines.

Antidepressants

Little or no change was reported for antidepressants in Avorn 1992 and Meador 1997 (data were not provided). In contrast, Schmidt 1998 found a significant increase of antidepressants in both IG (6.3%) and CG (6.4%) with a significant shift from non-recommended to acceptable antidepressants in both groups. Fossey 2006 did not report the use of antidepressants.

Hypnotics

Avorn 1992 found withdrawal or replacement of the non-recommended hypnotic diphenhydramine in 45% in the IG and 21% in the CG (mean difference -24%; 95% CI -54% to 5%). In Schmidt 1998, the overall prescribing rate for hypnotics decreased significantly by 6% (from 38.3% to 32.3%; P = 0.032) in the IG and increased non-significantly in the CG (from 42.4% to 43.4%). In the IG, the use of non-recommended hypnotic agents decreased by 6.9%, whereas the use of acceptable hypnotics increased by

6.1%. There were no significant changes in the CG. In both studies no information was given about statistical significance between groups. Fossey 2006 and Meador 1997 did not report the use of hypnotics.

Anxiolytics

Schmidt 1998 reported a significant increase of the proportion of residents with acceptable anxiolytics in the IG by 6.9 percentage points (from 13.9% to 20.8%; P = 0.002) and residents with any anxiolytics in the IG by 9.7 percentage points (from 34.1% to 43.8%; P < 0.001). In the CG, no significant changes were found. No information was given about the statistical significance between the groups. Avorn 1992, Fossey 2006, and Meador 1997 did not report use of anxiolytics.

Adverse effects

Avorn 1992 reported a significantly higher rate of worsening of depressive symptoms in the IG compared to the CG (56% in the IG vs. 27% in the CG; rate ratio 2.0; 95% CI 1.1 to 3.9). Changes in anxiety were not significantly different between groups (46% in the IG vs. 35% in the CG; rate ratio 1.3; 95% CI 0.7 to 2.4). There were no differences in rates of hospitalisation, mortality, and changes in level of care (data were not provided). Fossey 2006 reported non-significant reductions of fall rates in both groups compared to the 12 months before the study (from 60% to 52% in the IG vs. from 58% to 55% in the CG). Meador 1997 and Schmidt 1998 did not report any adverse effects.

Cognitive status

In Avorn 1992, data about residents' cognitive status were assessed for residents who had received antipsychotic medication in the 30-day period before the intervention. Changes in memory function (Delayed-Recognition Span Test) (Albert 1984), and cognitive status (Mini-Mental State Examination (MMSE)) (Folstein 1975) were found. Memory function deteriorated significantly more often in CG residents compared to the IG (31% in the IG vs. 54% in the CG; rate ratio 0.6; 95% CI 0.3 to 1.0). No significant difference was found for cognitive status. For both tests, results were available for less than 50% of participants. Fossey 2006, Meador 1997, and Schmidt 1998 did not report any results for cognitive status.

Any BPSD

In Avorn 1992, no significant differences between groups were found for worsening of behavioural symptoms, measured by FRED (Functionally Ranked Explanatory Designations) (Morris 1987) and residents' self-reported sleep disorders. Fossey 2006 reported no significant differences in the level of agitation, measured by the Cohen-Mansfield Agitation Inventory (Cohen-Mansfield 1986) and aggression, assessed as "events during the last 12 months" by a blinded psychology research assistant. Meador 1997 reported no increase in behavioural symptoms in the subgroup of residents with withdrawn antipsychotic medication (data were not provided). Schmidt 1998 did not report any results for BPSD.

Physical restraints

No study assessed the use of physical restraints.

Costs

No study reported data on costs.

DISCUSSION

Summary of main results

Four cluster-RCTs were included in this review, showing consistent results for the primary end point. Two studies documented a significant reduction of the proportion of residents with antipsychotic medication as a result of the intervention (Fossey 2006; Schmidt 1998). For Avorn 1992 it remained unclear if the reported differences between groups were statistically significant. Meador 1997 showed a significant reduction in days with antipsychotic use per 100 resident days.

The study by Fossey 2006 is of high methodological quality, whereas the other studies (Avorn 1992; Meador 1997; Schmidt 1998) show methodological shortcomings.

In summary, the reviewed evidence consistently showed reductions in antipsychotic medication prescription rates as a result of the different interventions, although magnitudes of effects differed between studies. The study with the most complex intervention according to the underlying concept, educational content, number of target groups, and absolute time spent on the intervention as well as the greatest methodological rigor (Fossey 2006) showed an absolute difference between groups of residents with antipsychotic medication of 19.1 percentage points at the end of follow-up after 12 months. As both the IG and CG received a structured medication review every three months, the reported effect may be mainly ascribed to the psychosocial components of the intervention. Results on secondary outcomes were inconsistent or fragmentary for prescribing of other psychotropic medication, subgroups, and cognitive status. Schmidt 1998 reported a significant increase of the proportion of residents with acceptable anxiolytics and with any anxiolytics respectively in the IG, but not in the CG with no information given about the statistical significance between groups. The increased prescribing of anxiolytics was attributable primarily to the increased use of oxazepam, which was classified

by SMPA as acceptable for both sedation and hypnotic use. Overall, there was no indication that reduction of antipsychotic medication was related to replacement of antipsychotic medication with other psychotropic medication. No study found significant changes in BPSD. Reporting of adverse effects was insufficient, with one study reporting significant adverse effects (Avorn 1992) (i.e. a higher rate of depressive symptoms in the IG). When the data were analysed as continuous rather than dichotomous variables, the difference did not reach statistical significance. None of the studies reported physical restraint use. Also costs of interventions were not reported in any of the studies. Therefore we are unable make assumptions about cost comparison or cost effectiveness. One published economic evaluation on "alternatives to antipsychotic drugs for individuals living with dementia" (Matrix Evidence 2011) suggested that non-pharmacological interventions are cost effective by avoiding adverse outcomes of antipsychotic medication.

Overall completeness and applicability of evidence

The number of studies included in this review is small. Three of the four included studies were published in the 1990s (Avorn 1992; Meador 1997; Schmidt 1998) and therefore it was not possible to access all missing information or data for these studies. We did identify only one unpublished or ongoing study. Thus, high-quality research activities in the field of reduction of antipsychotic medication should be accelerated. The included studies demonstrated heterogeneity in terms of definition of the primary end point and components of the intervention. Usual care, which was the comparator in all studies, was not sufficiently described in any study. Therefore, replicability of studies and applicability of results are limited. Owing to clinical heterogeneity, we were not able to perform a meta-analysis based on published aggregated data. We did not limit inclusion to residents with an established dementia diagnosis or receiving antipsychotic medication explicitly prescribed for management of BPSD. We consider this reasonable because most antipsychotic medication in care homes are administered for managing BPSD in people with dementia and because of the questionable reliability of dementia diagnoses and validity of documented reasons for prescription of antipsychotic medication in care home residents. Follow-up periods were different between studies. As all interventions targeted nursing staff, longer follow-up periods may have resulted in smaller effects owing to the high turn-over of staff in care homes.

Evaluation of complex interventions

All studies investigated interventions of complex nature. There is no evidence supporting the effectiveness of single parts of the complex interventions. Therefore, we were unable to make assumptions about possible 'effective' components of the interventions. Considering our current knowledge base, we have to assume that the interaction of the different components of the complex intervention results in the reported effects, although it cannot be ruled out that more simple interventions would yield comparable effects. To evaluate complex interventions adequately, it is necessary to assess information on underlying theories, modelling of components, piloting of feasibility and acceptability, and standardised introduction of the intervention in different centres (Möhler 2012). This information was insufficient or even entirely missing in three of four studies, with no additionally published data available. Fully reported process and outcome evaluations and a clear description of the intervention would enable replication and synthesis of evidence (Craig 2008). Thus, for the projected update of this review, we will put more emphasis on these issues by trying to assess additional data about the following stages: developing, piloting, evaluating, reporting, and implementing the interventions.

Quality of the evidence

One study showed sufficient internal validity (Fossey 2006). Three of four studies showed weaknesses in at least half or more of the assessed methodological quality indicators (Figure 2; Figure 3). In two studies the method of analysis was adequate for cluster RCT. In Schmidt 1998, it is highly likely that a unit of analysis bias led to 'over-precise results' (i.e. to P values that are artificially small); in Meador 1997, this remains unclear. All four included studies showed some differences between groups regarding baseline data with unclear clinical relevance. We did not limit inclusion by a certain level of loss to follow-up. As only one of the included studies reported three of 18 clusters that were lost to follow-up, this seems unproblematic considering the small number of studies and the descriptive analyses.

Potential biases in the review process

Efforts to minimise risk of bias have been made throughout the review process. Publication bias is unlikely to have affected results since an intensive literature search was performed covering electronic databases and trial registers, guided by the CDCIG. We tried to obtain unpublished studies via handsearching of abstract books from scientific congresses and through contact with authors of included studies and other experts in the field. Selection of studies, quality appraisal, risk of bias, and data extraction were conducted by two independent review authors.

Agreements and disagreements with other studies or reviews

There are two other systematic reviews investigating the effect of non-pharmacological interventions on psychotropic drug use, but they do not clearly delineate psychosocial interventions.

Nishtala 2008 focused on interventions to reduce psychotropic drug use in care home residents. In contrast to our review, the authors included not only psychosocial interventions but also medication reviews and also non-RCTs. Eleven studies were included; among them all four of the studies included in this review. The authors conducted a meta-analysis for the impact of medication reviews or educational interventions, or both, on antipsychotic medication use including the studies by Avorn 1992, Fossey 2006, and Schmidt 1998. Meta-analysis was conducted despite marked heterogeneity of interventions. Including both educational interventions and medication reviews, the authors reported a non-significant result for the impact of interventions on antipsychotic medication with an odds ratio of 0.813 (95% CI 0.635 to 1.039).

Forsetlund 2011 reviewed interventions for reducing potentially inappropriate medication in care homes. Included studies were high-quality systematic reviews of RCTs, primary studies with a randomised controlled design, or both. The review by Nishtala 2008 was not included because of lack of quality. Twenty RCTs were included. To be able to compare the effects of the interventions, the authors classified them into seven categories on the basis of their main component (educational outreach initiatives, educational meetings, educational meetings with at least one additional intervention, medication review, geriatric assessment and care teams, early psychiatric intervention, activity programme interventions for residents). In contrast to our review, Forsetlund 2011 classified the studies by Schmidt 1998 and Schmidt 2000 as "medication review". According to our inclusion criteria we considered the multidisciplinary team meeting as the main component, independent from being coached by a pharmacist. In Forsetlund 2011, the evidence for the interventions was shortly summarised per category. Comparability to our results is limited because the studies included in our review were categorised differently. The authors concluded that their results indicate that educational programmes for health personnel may have a small effect on drug managing practice when circumstances are favourable although in summary the evidence was reported as low or very low. As a main limiting factor the authors described that although all interventions were "context dependent", reporting of important contextual information was lacking as for example, about intensity and duration of the intervention or target group. The review authors therefore encourage authors of original studies to improve the reporting of important characteristics of interventions and settings as well as details of the extent of implementation. This is in line with the guidance for developing and evaluating complex interventions referred to above (Craig 2008; Craig 2008a). Still, the authors do not go into detail about the included complex interventions. In contrast to the reviews by Nishtala 2008 and Forsetlund 2011, our review attempted to draw a clearer picture by assessing components of the included complex interventions.

AUTHORS' CONCLUSIONS

Implications for practice

As all study results point in the same direction and the most recent and most rigorous study shows the strongest effect without adverse events, it seems likely that complex interventions aimed to reduce antipsychotic medication are beneficial. Before implementation, local adaption and evaluation seems necessary. The local organisation of care home care (e.g. in different healthcare systems) should be considered when assessing the applicability of study results.

Implications for research

In future trials, researchers are urgently requested to adhere to the recommendations of careful development of complex interventions including theory-based modelling of components and pilot testing of feasibility and acceptability (Craig 2008; Möhler 2012). Evaluation studies should adhere to the best available methodological standards, especially in terms of putting more emphasis on well-designed cluster-RCTs with rigorous statistical methods adjusting for cluster design and process evaluation. Reporting of complex interventions should correspond to existing reporting statements, for example, the CONSORT statements for non-pharmacological interventions (Boutron 2008) and for cluster-RCTs (Campbell 2004). Also suggestions for criteria specific to complex interventions (Glasziou 2010; Möhler 2012) should be taken into account. Considering the effects shown by Fossey 2006, a replication of this specific intervention seems urgently warranted. Here, researchers should adhere to guidelines for the evaluation of complex interventions (Craig 2008) and include a rigorous process evaluation, which might not only allow for tailoring of the intervention to individual settings and healthcare systems, but also to identify central components and establish a minimum necessary 'dose' of the intervention.

Owing to lack of data we were not able to describe the components of the intervention fully, a problem frequently encountered with publications reporting on complex intervention trials (Glasziou 2010; Lenz 2007). Using contemporary approaches (e.g. online supplements or special databases), journals should aim to allow for adequate reporting of the intervention's components and other important aspects (e.g. the description of usual care in the CG). This would also allow researchers and clinicians to replicate a successful psychosocial intervention adequately and adapt it to the local context.

ACKNOWLEDGEMENTS

We acknowledge the contributions of the consumer reviewers Helga Schneider-Schelte (German Alzheimer Society, Berlin, Germany) and Anja Hansen (Lawyer and Legal Guardian, Hamburg,

Germany) in the development of the protocol and critical review of the final review.

We would also like to acknowledge the CDCIG for their support.

REFERENCES

References to studies included in this review

Avorn 1992 *{published data only}*
Avorn J, Soumerai S, Everitt D, Ross-Degnan D, Beers M, Sherman D, et al.A randomized trial of a program to reduce the use of psychoactive drugs in nursing homes. *New England Journal of Medicine* 1992;**327**(3):168–73. [PUBMED: 1608408]

Fossey 2006 *{published data only}*
Fossey J, Ballard C, Juszczak E, James I, Alder N, Jacoby R, et al.Effect of enhanced psychosocial care on antipsychotic use in nursing home residents with severe dementia: cluster randomised trial. *British Medical Journal* 2006;**332**(7544): 756–61. [PUBMED: 16543297]

Meador 1997 *{published data only}*
Meador K, Taylor J, Thapa P, Fought R, Ray W. Predictors of antipsychotic withdrawal or dose reduction in a randomized controlled trial of provider education. *Journal of the American Geriatrics Society* 1997;**45**(2):207–10. [PUBMED: 9033521]

Schmidt 1998 *{published data only}*
Schmidt I, Claesson C, Westerholm B, Nilsson L, Svarstad B. The impact of regular multidisciplinary team interventions on psychotropic prescribing in Swedish nursing homes. *Journal of the American Geriatrics Society* 1998;**46**(1):77–82. [PUBMED: 9434669]

References to studies excluded from this review

Crotty 2004 *{published data only}*
Crotty M, Whitehead C, Rowett D, Halbert J, Weller D, Finucane P, et al.An outreach intervention to implement evidence based practice in residential care: a randomized controlled trial [ISRCTN67855475]. *BMC Health Services Research* 2004;**4**(1):6. [PUBMED: 15066200]

Furniss 2000 *{published data only}*
Furniss L, Burns A, Craig S, Scobie S, Cooke J, Faragher B. Effects of a pharmacist's medication review in nursing homes. Randomised controlled trial. *British Journal of Psychiatry* 2000;**176**:563–7. [PUBMED: 10974963]

Hagen 2005 *{published data only}*
Hagen B, Armstrong-Esther C, Quail P, Williams RJ, Norton P, Le Navenec C, 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. *International Psychogeriatrics* 2005;**17**(4):631–52. [PUBMED: 16246262]

Matteson 1997 *{published data only}*
Matteson M, Linton A, Cleary B, Barnes S, Lichtenstein M. Management of problematic behavioral symptoms associated with dementia: a cognitive developmental approach. *Aging (Milano)* 1997;**9**(5):342–55. [PUBMED: 9458995]

Nobili 2008 *{published data only}*
Nobili A, Piana I, Balossi L, Pasina L, Matucci M, Tarantola M, et al.Alzheimer special care units compared with traditional nursing home for dementia care: are there differences at admission and in clinical outcomes? . *Alzheimer Disease and Associated Disorders* 2008;**22**(4): 352–61. [PUBMED: 18978601]

Ray 1987 *{published data only}*
Ray W, Blazer D 2nd, Schaffner W, Federspiel C. Reducing antipsychotic drug prescribing for nursing home patients: a controlled trial of the effect of an educational visit. *American Journal of Public Health* 1987;**77**(11):1448–50. [PUBMED: 2889382]

Ray 1993 *{published data only}*
Ray W, Taylor J, Meador K, Lichtenstein M, Griffin M, Fought R, et al.Reducing antipsychotic drug use in nursing homes. A controlled trial of provider education. *Archives of Internal Medicine* 1993;**153**(6):713–21. [PUBMED: 8447709]

Roberts 2001 *{published data only}*
Roberts M, Stokes J, King M, Lynne T, Purdie D, Glasziou P, et al.Outcomes of a randomized controlled trial of a clinical pharmacy intervention in 52 nursing homes. *British Journal of Clinical Pharmacology* 2001;**51**(3):257–65. [PUBMED: 11298072]

Rovner 1996 *{published data only}*
Rovner B, Steele C, Shmuely Y, Folstein M. A randomized trial of dementia care in nursing homes. *Journal of the American Geriatrics Society* 1996;**44**(1):7–13. [PUBMED: 8537594]

Schmidt 2000 *{published data only}*
Schmidt I, Fastbom J. Quality of drug use in Swedish nursing homes. A follow-up study. *Clinical Drug Investigation* 2000;**20**(6):433–46.

Siegler 1997 *{published data only}*
Siegler E, Capezuti E, Maislin G, Baumgarten M, Evans L, Strumpf N. Effects of a restraint reduction intervention and OBRA '87 regulations on psychoactive drug use in nursing homes. *Journal of the American Geriatrics Society* 1997;**45** (7):791–6. [PUBMED: 9215327]

Svarstad 2001 *{published data only}*
Svarstad B, Mount J, Bigelow W. Variations in the treatment culture of nursing homes and responses to regulations to reduce drug use. *Psychiatric Services (Washington, D.C.)* 2001;**52**(5):666–72. [PUBMED: 11331803]

Toseland 1997 *{published data only}*
Toseland R, Diehl M, Freeman K, Manzanares T, Naleppa M, McCallion P. The impact of validation group therapy on nursing home residents with dementia. *Journal of Applied Gerontology* 1997;**16**:31–50.

Weiner 2002 *{published data only}*
Weiner M, Tractenberg R, Sano M, Logsdon R, Teri L, Galasko D, et al.No long-term effect of behavioral treatment on psychotropic drug use for agitation in Alzheimer's disease patients. *Journal of Geriatric Psychiatry and Neurology* 2002; **15**:95–8.

Westbury 2010 *{published data only}*
Westbury J, Jackson S, Gee P, Peterson G. An effective approach to decrease antipsychotic and benzodiazepine use in nursing homes: the RedUSe project. *International Psychogeriatrics* 2010;**22**(1):26–36. [PUBMED: 19814843]

References to ongoing studies

Ballard 2012 *{published and unpublished data}*
Ballard C. WHELD - improving person centred care for people with dementia in care homes. www.controlled-trials.com/ISRCTN40313497/wheld (accessed 26 October 2012).

Additional references

Albert 1984
Albert M, Moss M. The assessment of memory disorders in patients with Alzheimer disease. In: Squire LR, Butters N editor(s). *Neuropsychology of Memory*. New York: Guilford Press, 1984:236–46.

American Medical Association 1986
American Medical Association. *Drug Evaluations.* 6th Edition. Philadelphia: WB Saunders Co., 1986.

ATC-Index 2009
Deutsches Institut für medizinische Dokumentation und Information (DIMDI). Anatomical Therapeutic Chemical (ATC) Classification System for the classification of drugs, 2009 [Anatomisch–therapeutisch–chemische Klassifikation mit Tage3–sdosen – Amtliche Fassung des ATC–Index mit DDD–Angaben für Deutschland im Jahre 2009]. www.dimdi.de/static/en/amg/atcddd/index.htm (accessed 26 October 2012).

Avorn 1983
Avorn J, Soumerai S. Improving drug-therapy decisions through educational outreach: a randomized controlled trial of academically based "detailing". *New England Journal of Medicine* 1983;**308**:1457–63.

Ballard 2006
Ballard C, Waite J. Atypical antipsychotics for the treatment of aggression and psychosis in Alzheimer's disease. *Cochrane Database of Systematic Reviews* 2006, Issue 1. [DOI: 10.1002/14651858.CD003476.pub2]

Ballard 2008
Ballard C, Lana M, Theodoulou M, Douglas S, McShane R, Jacoby R, et al.A randomized, blinded, placebo-controlled trial in dementia patients continuing or stopping neuroleptics (the DART-AD trial). *PLoS Medicine* 2008;**5** (4):e76.

Ballard 2009
Ballard C, Hanney ML, Theodoulou M, Douglas S, McShane R, Kossakowski K, et al.The dementia antipsychotic withdrawal trial (DART-AD): long-term follow-up of a randomised placebo-controlled trial. *The Lancet Neurology* 2009;**8**(2):1–7.

Banerjee 2009
Banerjee S. *Use of Antipsychotic Medication for People with Dementia: Time for Action*. London: Department of Health, 2009.

Black 2004
Black W, Almeida O. A systematic review of the association between the behavioral and psychological symptoms of dementia and burden of care. *International Psychogeriatrics* 2004;**16**(3):295–315.

Boutron 2008
Boutron I, Moher D, Altman D, Schulz K, Ravaud P, CONSORT Group. Extending the CONSORT statement to randomized trials of nonpharmacologic treatment: explanation and elaboration. *Annals of Internal Medicine* 2008;**148**(4):295–309.

British National Formulary
Joint Formulary Committee. *British National Formulary*. London: British Medical Association and Royal Pharmaceutical Society, 2012.

Campbell 2004
Campbell M, Elbourne D, Altman D, CONSORT group. CONSORT statement: extension to cluster randomised trials. *British Medical Journal* 2004;**328**(7441):702–8.

Cohen-Mansfield 1986
Cohen-Mansfield J. Agitated behaviors in the elderly. II. Preliminary results in the cognitively deteriorated. *Journal of the American Geriatrics Society* 1986;**34**(10):722–7.

Cohen-Mansfield 1997
Cohen-Mansfield J, Werner P. Management of verbally disruptive behaviours in nursing home residents. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 1997;**52**(6):M369–77.

Cole 2000
Cole R, Scott S, Skelton-Robinson M. The effect of challenging behaviour and staff support on the psychological wellbeing of staff working with older adults. *Aging and Mental Health* 2000;**4**(4):359–65.

Craig 2008
Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex

interventions: the new Medical Research Council guidance. *British Medical Journal* 2008;**337**:a1655.

Craig 2008a
Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: new guidance, 2008. UK Medical Research Council. www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC004871. (accessed 26 October 2012).

DEGAM 2008
Deutsche Gesellschaft für Allgemeinmedizin und Familienmedizin (DEGAM). Guideline No. 12 Dementia, 2008 [Leitlinie Nr. 12 Demenz, 2008]. leitlinien.degam.de/uploads/media/LL-12˙Langfassung˙TJ˙03˙korr˙01.pdf (accessed 26 October 2012).

Douglas 2008
Douglas I, Smeeth L. Exposure to antipsychotics and risk of stroke: self controlled case series study. *British Medical Journal* 2008;**337**:a1227.

Edberg 1999
Edberg A, Norberg A, Hallberg I. Mood and general behavior of patients with severe dementia during one year of supervised, individualized planned care and systematic clinical supervision. Comparison with a similar control group. *Aging (Milano)* 1999;**11**(6):395–403.

Folstein 1975
Folstein M, Folstein S, McHugh P. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research* 1975;**12**(3):189–98.

Forsetlund 2011
Forsetlund L, Eike M, Gjerberg E, Vist G. Effect of interventions to reduce potentially inappropriate use of drugs in nursing homes: a systematic review of randomised controlled trials. *BMC Geriatrics* 2011;**11**:16.

Fossey 2008
Fossey J, James I. *Evidence based approaches to improving dementia care in care homes*. London: Alzheimer Society, 2008.

Gill 2007
Gill S, Bronskill S, Normand S, Anderson G, Sykora K, Lam K, et al.Antipsychotic drug use and mortality in older adults with dementia. *Annals of Internal Medicine* 2007;**146**(11):775–86.

Glasziou 2010
Glasziou P, Chalmers I, Altman D, Bastian H, Boutron I, Brice A, et al.Taking healthcare interventions from trial to practice. *British Medical Journal* 2010;**13**(341):c3852.

Hahn 2005
Hahn S, Puffer S, Torgerson D, Watson J. Methodological bias in cluster randomised trials. *BMC Medical Research Methodology* 2005;**5(1)**:10.

Hartikainen 2007
Hartikainen S, Lönnroos E, Louhivuori K. Medication as a risk factor for falls: critical systematic review. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 2007;**62**(10):1172–81.

Higgins 2011
Higgins J, Greene S (editors). Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org,.

Howard 2001
Howard R, Ballard C, O'Brien J, Burns A. Guidelines for the management of agitation in dementia. *International Journal of Psychiatry* 2001;**16**(7):714–7.

Hughes 2000
Hughes C, Lapane K, Mor V. Influence of facility characteristics on use of antipsychotic medications in nursing homes. *Medical Care* 2000;**38**(12):1164–73.

James 2003
James I, Powell I, Kendell K. The castle and the know-it-all - access to the inner circle. *Journal of Dementia Care* 2003;**11**(4):24–6.

Kasl-Godley 2000
Kasl-Godley J, Gatz M. Psychosocial interventions for individuals with dementia: an integration of theory, therapy, and a clinical understanding of dementia. *Clinical Psychology Review* 2000;**20**(6):755–82.

Kitwood 1997
Kitwood T, Bredin K. In: Bradford Dementia Research Group, editor(s). *Evaluating Dementia Care The DCM Method*. 7th Edition. Bradford, UK: Bradford University, 1997.

Kolanowski 2006
Kolanowski A, Fick D, Waller J, Ahern F. Outcomes of antipsychotic drug use in community-dwelling elders with dementia. *Archives of Psychiatric Nursing* 2006;**20**(5):217–25.

Lai 2004
Lai C, Chi I, Kayser-Jones J. A randomised controlled trial of a specific reminiscence approach to promote the well-being of nursing home residents with dementia. *International Psychogeriatrics* 2004;**16**(1):33–49.

Lenz 2007
Lenz M, Steckelberg A, Richter B, Mühlhauser I. Meta-analysis does not allow appraisal of complex interventions in diabetes and hypertension self-management: a methodological review. *Diabetologia* 2007;**50**(7):1375–83.

Mann 2009
Mann E, Köpke S, Haastert B, Pitkala K, Meyer G. Psychotropic medication use among nursing home residents in Austria: a cross-sectional study. *BioMed Central Geriatrics* 2009;**9**:18.

Matrix Evidence 2011
Matrix Evidence. *An economic evaluation of alternatives to antipsychotic drugs for individuals living with dementia*. Coventry: NHS-Institute for Innovation and Improvement, 2011.

Matthews 2002
Matthews F, Dening T. UK Medical Research Council Cognitive Function and Ageing Study. Prevalence of dementia in institutional care. *Lancet* 2002;**360**(9328): 225–6.

Molter-Bock 2006
Molter-Bock E, Hasford J, Pfundstein T. Psychopharmacological drug treatment in Munich nursing homes [Psychopharmakologische Behandlungspraxis in Münchener Altenpflegeheimen]. *Zeitschrift für Gerontologie und Geriatrie* 2006;**39**(5):336–43.

Moniz-Cook 2011
Moniz-Cook E, Vernooij-Dassen M, Woods B, Orrell M. Psychosocial interventions in dementia care research: the INTERDEM manifesto. *Aging and Mental Health* 2011;**15** (3):283–90.

Moniz-Cook 2012
Moniz-Cook E, Swift K, James I, Malouf R, De Vugt M, Verhey F. Functional analysis-based interventions for challenging behaviour in dementia. *Cochrane Database of Systematic Reviews* 2012, Issue 2. [DOI: 10.1002/ 14651858.CD006929]

Morris 1987
Morris J, Sherwood S, May M, Bernstein E. FRED: an innovative approach to nursing home level-of-care assignments. *Health Services Research* 1987;**22**(1):117–38.

Möhler 2012
Möhler R, Bartoszek G, Köpke S, Meyer G. Proposed criteria for reporting the development and evaluation of complex interventions in healthcare (CReDECI). *International Journal of Nursing Studies* 2012;**49**(1):40–6.

Nishtala 2008
Nishtala P, Mc Lachlan A, Bell J, Chen T. Psychotropic prescribing in long-term-care facilities: impact of medication reviews and educational interventions. *The American Journal of Geriatric Psychiatry* 2008;**16**(8):621–32.

Puffer 2003
Puffer S, Torgerson D, Watson J. Evidence for risk of bias in cluster randomised trials: review of recent trials published in three general medical journals. *British Medical Journal* 2003;**327(7418)**:785–9.

Ray 1991
Ray W, Taylor J, Lichtenstein M, Meador K, Stoudemire A, Liptzin B, et al.Managing behavior problems in nursing home residents. *Contemporary Management in Internal Medicine* 1991;**1**(4):71–122.

Richter 2011
Richter T, Mann E, Meyer G, Haastert B, Köpke S. Prevalence of psychotropic medication use among German and Austrian nursing home residents: a comparison of 3 cohorts. *Journal of the American Medical Directors Association* 2011;**13**(2):187.

Rochon 2005
Rochon P, Stukel T, Sykora K, Gill S, Garfinkel S, Anderson G, et al.Atypical antipsychotics and parkinsonism. *Archives of Internal Medicine* 2005;**165**(16):1882–88.

Rochon 2007
Rochon PA, Stukel TA, Bronskill SE, Gomes T, Sykora K, Wodchis WP, et al.Variation in nursing home antipsychotic prescribing rates. *Archives of Internal Medicine* 2007;**167**: 676–83.

Ruddy 2005
Ruddy R, House A. Psychosocial interventions for conversion disorder. *Cochrane Database of Systematic Reviews* 2005, Issue 4. [DOI: 10.1002/14651858.CD005331.pub2]

Ruths 2008
Ruths S, Straand J, Nygaard HA, Aarsland D. Stopping antipsychotic drug therapy in demented nursing home patients: a randomized, placebo-controlled study - the Bergen District Nursing Home Study (BEDNURS). *International Journal of Geriatric Psychiatry* 2008;**23**(9): 889–95.

Schneider 2006
Schneider L, Tariot P, Dagerman K, Davis S, Hsiao J, Ismail S, et al.CATIE-AD Study Group. Effectiveness of atypical antipsychotic drugs in patients with Alzheimer's disease. *New England Journal of Medicine* 2006;**355**(15):1525–38.

Seitz 2010
Seitz D, Purandare N, Conn D. Prevalence of psychiatric disorders among older adults in long-term care homes: a systematic review. *International Psychogeriatrics* 2010;**22**(7): 1025–39.

Sink 2005
Sink K, Holden K, Yaffe K. Pharmacological treatment of neuropsychiatric symptoms of dementia: a review of the evidence. *JAMA* 2005;**293**(5):596–608.

SMPA 1995
Medical Products Agency and the Norwegian Medicines Control Authority. Treatment of Mental Conditions in Patients with Dementia (workshop) 1995, Uppsala.

Solomon 1992
Solomon K, Szwabo P. Psychotherapy for patients with dementia. In: Morley J, Coe R, Strong R, Grossberg G editor(s). *Memory Function and Aging-Related Disorders*. New York: Springer, 1992:295–319.

Soumerai 1990
Soumerai S, Avorn J. Principles of educational outreach ("academic detailing") to improve clinical decision making. *JAMA* 1990;**263**(4):549–56.

Stevens 1998
Stevens A, Burgio L, Bailey E, Burgio K, Paul P, Capilouto E, et al.Teaching and maintaining behavior management skills with nursing assistants in a nursing home. *Gerontologist* 1998;**38**(3):379–84.

Taylor 1990

Taylor J, Ray W, Meador K. *Managing Behavior Problems in Nursing Home Residents: A Manual for Nursing Home Staff*. Nashville: Department of Preventive Medicine, 1990.

Teri 1991

Teri L, Gallagher-Thompson D. Cognitive-behavioral interventions for treatment of depression in Alzheimer's patients. *Gerontologist* 1991;**31**(3):413–6.

Vasse 2012

Vasse E, Vernooij-Dassen M, Cantegreil I, Franco M, Dorenlot P, Woods B, et al.Guidelines for psychosocial interventions in dementia care: a European survey and comparison. *International Journal of Geriatric Psychiatry* 2012;**27**(1):40–8.

Zuidema 2007

Zuidema S, Koopmans R, Verhey F. Prevalence and predictors of neuropsychiatric symptoms in cognitively impaired nursing home patients. *Journal of Psychiatry and Neurology* 2007;**20**(1):41–9.

* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Avorn 1992

Methods	Cluster-randomised controlled trial
Participants	Country: US 12 care homes in the area of Massachusetts All residents in each participating care home
Interventions	IG: comprehensive educational outreach programme 1. For nurses and nursing assistants (in separate groups): 4 training sessions; content: direct patient care, alternatives to psychotropic drugs, recognition of adverse drug reaction. For staff on night shift: use of hypnotic agents 2. For physicians: printed material used as decision aids, 3 face-to-face educational sessions. CG: usual care
Outcomes	Antipsychotic medication/30-day period, change in the number of days of use of antipsychotic medication, changes in measures of clinical outcomes (mental status, memory, anxiety, depression, behaviour, sleep)
Notes	Facilities with atypically high or low levels of psychoactive medication were excluded Care homes were grouped into 6 matched pairs, with one home each randomly assigned to the IG Lost to follow-up: IG: 82 out of 431 residents (19%), CG: 63 out of 392 residents (16%) , reasons not mentioned

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not mentioned
Allocation concealment (selection bias)	Unclear risk	Not mentioned
No baseline imbalance between groups All outcomes	Unclear risk	Not all baseline characteristics are mentioned
No recruitment bias	Low risk	Participants were included before random allocation of clusters
Methods of analysis adequate for cluster randomised trials	Low risk	Use of methods that accounted both for potential bias owing to clustering and for the paired design
No loss of cluster bias	Low risk	

Avorn 1992 (*Continued*)

Outcome assessors blinded to treatment allocation	Low risk	

Fossey 2006

Methods	Cluster-randomised controlled trial
Participants	Country: UK 12 care homes in the area of London, Newcastle, and Oxford. All residents in each participating care home
Interventions	IG: systemic consultation approach 1. Medication review by a consultant old age psychiatrist and a senior member of nursing staff/home, every 3 months. Contact between psychiatrist and prescribing physician 2. For care staff: didactic training, skills modelling, and supervision of groups and individual staff. Key elements: initial skills training, behavioural management techniques, ongoing training and support in philosophy and application of person centred care, positive care planning, awareness of environmental design issues, use of antecedent behaviour consequence models, development of individualised interventions, active listening and communication skills, reminiscence techniques, environment of family carers CG: 1. Medication review by a consultant old age psychiatrist and a senior member of nursing staff/home, every 3 months. Contact between psychiatrist and prescribing physician 2. Usual care
Outcomes	Proportion of residents receiving antipsychotic medication, mean dosage of antipsychotic medication/promazine equivalents Proportion of residents receiving any regularly psychotropic medication, agitated and disruptive behaviour (Cohen-Mansfield agitation inventory), person-centred care practice (dementia care mapping), resident level quality of life
Notes	Homes were eligible for randomisation with a minimum of 25% of residents with dementia and taking antipsychotic medication Classification of 2 homes, each with high and low antipsychotic use respectively per region. Stratified block randomisation with fixed block size of 2 Baseline data: female residents: IG 35%, CG 39%, a rate untypically low for care homes

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	
Allocation concealment (selection bias)	Low risk	

Fossey 2006 (*Continued*)

No baseline imbalance between groups All outcomes	Low risk	
No recruitment bias	Low risk	Participants were included before random allocation of clusters
Methods of analysis adequate for cluster randomised trials	Low risk	Analysis on intention-to-treat basis, primary analyses carried out at cluster level
No loss of cluster bias	Low risk	
Outcome assessors blinded to treatment allocation	Low risk	

Meador 1997

Methods	Cluster-randomised controlled trial
Participants	Country: US 12 care homes in the area of Tennessee Participants where at least 65 years old and living in the home for at least the 6 preceding months
Interventions	IG: education programme, key elements: training to use structured guidelines for management of behavioural symptoms: 1. For physicians who had 5 or more patients at the care home: 45- to 60-minute visit by the study gerontopsychiatrist: key elements: risks and benefits of antipsychotic medication, description of the educational activities for the care home staff 2. For care home staff: 5 to 6 one-hour in service programmes over a 1-week period. Major points of the guideline were emphasised through use of role-play, case examples, and problem-solving sessions. Delivery of a manual. 1 follow-up session after 4 weeks after the programme was completed 3. If requested: an evening meeting for families to explain the programme 4. Four-hour consultation with the care home administrator, key elements: supervision, quality control, relations with residents' families CG: usual care
Outcomes	Proportion of days with antipsychotic drug (converted to standard equivalents of thioridazine) prescription/care home residence (mean days of use/100 days of residence) Presence and severity of behavioural symptoms (Care Home Behavioral Problem Scale)
Notes	Inclusion criteria: stable antipsychotic use: prevalence $\geq$ 20% Care homes were grouped into 6 matched pairs by size and antipsychotic use, 1 home per pair was randomly assigned to the IG Lost to follow-up: IG: 105 out of 680 (15%), IG: 54 out of 631 (9%), reasons not mentioned Primary end point was ascertained by an independent research nurse, secondary end points were not ascertained in a blinded manner

Meador 1997 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not mentioned
Allocation concealment (selection bias)	Unclear risk	Not mentioned
No baseline imbalance between groups All outcomes	Unclear risk	Only few data were presented
No recruitment bias	Low risk	Participants were included before random allocation of clusters
Methods of analysis adequate for cluster randomised trials	Unclear risk	Care homes reported as unit of analysis with no further information
No loss of cluster bias	Low risk	
Outcome assessors blinded to treatment allocation	Unclear risk	An independent research nurse ascertained daily drug use

Schmidt 1998

Methods	Cluster-randomised controlled trial
Participants	Country: Sweden 36 care homes selected in 3 steps: 1) National Cooperation of Swedish Pharmacies is divided in 36 areas, 18 of these randomly selected. 2) Each regional pharmacy director selected 2 similar facilities. 3) 1 of each pair was randomly assigned to receive the intervention All permanent residents in each participating care home except 2 larger homes in the IG, with only a sample of wards included
Interventions	IG: multidisciplinary team meetings, key element: to improve communication about drug use 1. For physicians: no special training, education, or incentives; participation in multidisciplinary team meetings led by pharmacist once a month 2. For care home staff, selected by head nurse: no special training, education, or incentives; participation in multidisciplinary team meetings led by pharmacist once a month 3. Responsible pharmacists in the intervention homes received 2 training sessions before initiating team meetings and 3 sessions during the programme. Content: medication in elderly, gerontology, communication skills, methods of networking. Function of pharmacist: contact with care home physician and nursing personnel, organising and participation in multidisciplinary team meetings once a month Content of meetings: discussion about medication of individual residents

Schmidt 1998 (*Continued*)

	CG: usual care. In 1994, new treatment guidelines were distributed to all physicians in Sweden by the SMPA (SMPA 1995). The guidelines basically recommended minimal use of antipsychotic medication, certain benzodiazepines, and tricyclic antidepressants
Outcomes	Number of residents with antipsychotic prescription, prescription of subgroups of psychotropic drugs, psychotropic prescription, polymedicine or therapeutic duplication. Proportions of residents with non-recommended and acceptable drug prescription (following the SMPA guidelines (SMPA 1995)) of antipsychotic medication, hypnotics, anxiolytics, antidepressants
Notes	Experimental homes were smaller than control homes (IG: 626 residents in 15 homes, CG: 1228 residents in 18 homes; mean: 51 beds in IG vs. 80 beds in CG; $P < 0.05$) Lost to follow-up: 3 out of 18 homes in IG became ineligible because of employing a geriatric specialist, being unable to provide required data, or not employing a pharmacist. IG: 64 out of 626 residents (10%), CG: 15 more than baseline (1%), reasons not mentioned

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	
Allocation concealment (selection bias)	Unclear risk	Not mentioned
No baseline imbalance between groups All outcomes	Unclear risk	Despite randomisation ratio of participants 1:2 between groups
No recruitment bias	Unclear risk	All residents were included, but in 2 larger care homes only a sample of wards were included, with no further information on the selection process
Methods of analysis adequate for cluster randomised trials	High risk	Unit of analysis individual residents weighted "in proportion to the size of the nursing home"
No loss of cluster bias	High risk	3 IG clusters lost after randomisation
Outcome assessors blinded to treatment allocation	High risk	

CG: control group; IG: intervention group; SMPA: Swedish Medical Product Agency.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Crotty 2004	Primary outcome was not reduction of antipsychotic medication; intervention did not address the primary end point
Furniss 2000	Primary outcome was not reduction of antipsychotic medication; intervention was not a psychosocial intervention according to defined inclusion criteria
Hagen 2005	Not an RCT
Matteson 1997	Not an RCT; primary outcome was not reduction of antipsychotic medication
Nobili 2008	Not an RCT; primary outcome was not reduction of antipsychotic medication
Ray 1987	Not an RCT
Ray 1993	No an RCT, participants did not correspond with defined inclusion criteria
Roberts 2001	Primary outcome was not reduction of antipsychotic medication
Rovner 1996	Primary outcome was not reduction of antipsychotic medication
Schmidt 2000	Follow-up results of Schmidt 1998 after 3 years. Owing to important re-organisation in nursing homes, populations and nursing homes were not comparable. For example traditional nursing home facilities were converted into other types of facilities, such as special group living units for mentally ill people. This applied to 25 out of 38 care homes that also resulted in a reduction of about 500 beds compared to the originally study
Siegler 1997	Primary outcome was not reduction of antipsychotic medication; study was not a primary study analysis
Svarstad 2001	Not an RCT; intervention was not a psychosocial intervention according to defined inclusion criteria
Toseland 1997	Primary outcome was not reduction of antipsychotic medication; intervention did not address the primary end point
Weiner 2002	Not an RCT; primary outcome was not reduction of antipsychotic medication; intervention did not address the primary end point
Westbury 2010	Not an RCT

RCT: randomised controlled trial.

Characteristics of ongoing studies *[ordered by study ID]*

Ballard 2012

Trial name or title	NIHR WHELD
Methods	Cluster randomised controlled trial
Participants	Care home residents
Interventions	(1) Person-centred care, (2) antipsychotic review, (3) "social interaction intervention" and "pleasant activities"
Outcomes	(1) Antipsychotic medication, (2) agitation
Starting date	3 May 2011
Contact information	Prof. Clive Ballard, Professor of Age Related Diseases, The Strand, London WC2 2LS, UK
Notes	-

DATA AND ANALYSES

This review has no analyses.

ADDITIONAL TABLES

Table 1. Components of the complex interventions

	Education programme/ nursing staff	**Education programme/** physicians	**Education programme/** pharmacists	**Education programme/** trainers, other target groups	**Consultation**	**Information**	**Multidisciplinary team meetings**	**Medication review**
Avorn 1992	√	√	-	-	-	-	-	-
Fossey 2006	√	-	-	√	-	-	-	(√)*
Meador 1997	√	√	-	-	√	√	-	-
Schmidt 1998	-	-	√	-	-	-	√	-

* In both intervention and control groups.

Table 2. Outcomes for each included study

	Antipsychotic medication	Type, dose, number of antipsychotic medication	Antipsychotic medication administered as needed	Psychotropic medication	Benzodiazepines	Antidepressants	Hypnotics	Anxiolytics	Cognitive status	BPSD	Physical restraints	Costs	Adverse effects
Avorn 1992	√	√	-	√	√	√	√	-	√	√	-	-	√
Fossey 2006	√	√	-	√	-	-	-	-	-	√	-	-	√
Meador 1997	√	√	-	-	√	√	-	-	-	√	-	-	-

Table 2. Outcomes for each included study (*Continued*)

Schmidt 1998	√	-	√	√	-	√	√	√	-	-	-	-	-

APPENDICES

Appendix 1. Search: August 2010

Source	Search strategy	Hits
MEDLINE In-process and other non-indexed citations and MEDLINE 1950 to present (Ovid SP)	1. antipsychotic*.mp. 2. neuroleptic*.mp. 3. risperidone.mp. 4. olanzapine.mp. 5. haloperidol.mp. 6. prothipendyl.mp. 7. methotrimeprazine.mp. 8. clopenthixol.mp. 9. flupenthixol.mp. 10. clothiapine.mp. 11. methylperon.mp. 12. droperidol.mp. 13. pipamperone.mp. 14. benperidol.mp. 15. bromperidol.mp. 16. fluspirilene.mp. 17. pimozide.mp. 18. penfluridol.mp. 19. sulpiride.mp. 20. veralipride.mp. 21. levosulpiride.mp. 22. sultopride.mp. 23. aripiprazole.mp. 24. clozapine.mp. 25. quetiapine.mp. 26. thioridazine.mp. 27. phenothiazine.mp. 28. butyrophenone.mp. 29. Risperidone/ 30. Haloperidol/ 31. Methotrimeprazine/	148

(*Continued*)

	32. Clopenthixol/ 33. Flupenthixol/ 34. Benperidol/ 35. Fluspirilene/ 36. Pimozide/ 37. Penfluridol/ 38. Sulpiride/ 39. Clozapine/ 40. Thioridazine/ 41. Phenothiazines/ 42. Butyrophenones/ 43. Antipsychotic Agents/ 44. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 45. Geriatric Nursing/ 46. Residential Facilities/ 47. Nursing Homes/ 48. "geriatric nursing".mp. 49. "residential facilit*".mp. 50. "nursing home*".mp. 51. "care home*".mp. 52. "geriatric care".mp. 53. 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 54. discontinu*.mp. 55. cessation.mp. 56. reduc*.mp. 57. taper*.mp. 58. stop*.mp. 59. ceas*.mp. 60. 54 or 55 or 56 or 57 or 58 or 59 61. (discontinu* or cessation or reduc* or taper* or stop* or ceas*).mp. adj4 ((antipsychotic* or neuroleptic* or risperidone or olanzapine or haloperidol or prothipendyl or methotrimeprazine or clopenthixol or flupenthixol or clothiapine or methylperon or droperidol or pipamperone or benperidol or bromperidol or fluspirilene or pimozide or penfluridol or sulpiride or veralipride or levosulpiride or sultopride or aripiprazole or clozapine or quetiapine or thioridazine or phenothiazine or butyrophenone).mp. or Risperidone/ or	

(*Continued*)

	Haloperidol/ or Methotrimeprazine/ or Clopenthixol/ or Flupenthixol/ or Benperidol/ or Fluspirilene/ or Pimozide/ or Penfluridol/ or Sulpiride/ or Clozapine/ or Thioridazine/ or Phenothiazines/ or Butyrophenones/ or Antipsychotic Agents/) 62. 53 and 61 63. randomized controlled trial.pt. 64. controlled clinical trial.pt. 65. randomized.ab. 66. placebo.ab. 67. drug therapy.fs. 68. randomly.ab. 69. trial.ab. 70. groups.ab. 71. 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 72. 62 and 71 73. 44 and 60 and 71 74. 73 and 53 75. 62 or 74	
EMBASE (Ovid SP) 1980 to 2010 week 30	1. (antipsychotic* or "anti-psychotic*").ti, ab. 2. neuroleptic*.mp. 3. risperidone.mp. 4. olanzapine.mp. 5. haloperidol.mp. 6. prothipendyl.mp. 7. methotrimeprazine.mp. 8. clopenthixol.mp. 9. flupenthixol.mp. 10. clothiapine.mp. 11. methylperon.mp. 12. droperidol.mp. 13. pipamperone.mp. 14. benperidol.mp. 15. bromperidol.mp. 16. fluspirilene.mp. 17. pimozide.mp. 18. penfluridol.mp. 19. sulpiride.mp. 20. veralipride.mp. 21. levosulpiride.mp. 22. sultopride.mp. 23. aripiprazole.mp. 24. clozapine.mp. 25. quetiapine.mp. 26. thioridazine.mp.	117

(*Continued*)

	27. phenothiazine.mp. 28. butyrophenone.mp. 29. neuroleptic agent/ or ATYPICAL ANTIPSYCHOTIC AGENT/ 30. olanzapine/ or chlorpromazine/ or clozapine/ or risperidone/ or quetiapine/ or fluphenazine/ or haloperidol/ 31. or/1-30 32. nursing home/ 33. geriatric nursing/ 34. psychogeriatric nursing/ 35. residential home/ 36. "geriatric nursing".mp. 37. "residential facilit*".mp. 38. "nursing home*".mp. 39. "care home*".mp. 40. "geriatric care".mp. 41. "convalescence home*".mp. 42. or/32-41 43. discontinu*.mp. 44. cessation.mp. 45. reduc*.mp. 46. taper*.mp. 47. stop*.mp. 48. ceas*.mp. 49. withdraw*.mp. 50. or/43-49 51. randomized controlled trial/ 52. controlled clinical trial/ 53. random*.ti,ab. 54. placebo.ab. 55. trial.ab. 56. groups.ab. 57. "control group*".ab. 58. or/51-57 59. 31 and 42 and 50 and 58	
PSYCINFO (Ovid SP) 1806 to July week 4 2010	1. antipsychotic*.mp. 2. neuroleptic*.mp. 3. risperidone.mp. 4. olanzapine.mp. 5. haloperidol.mp. 6. prothipendyl.mp. 7. methotrimeprazine.mp. 8. clopenthixol.mp. 9. flupenthixol.mp. 10. clothiapine.mp. 11. methylperon.mp. 12. droperidol.mp.	56

(*Continued*)

	13. pipamperone.mp. 14. benperidol.mp. 15. bromperidol.mp. 16. fluspirilene.mp. 17. pimozide.mp. 18. penfluridol.mp. 19. sulpiride.mp. 20. veralipride.mp. 21. levosulpiride.mp. 22. sultopride.mp. 23. aripiprazole.mp. 24. clozapine.mp. 25. quetiapine.mp. 26. thioridazine.mp. 27. phenothiazine.mp. 28. butyrophenone.mp. 29. exp Neuroleptic Drugs/ or exp Clozapine/ 30. Risperidone/ 31. Olanzapine/ 32. Haloperidol/ 33. or/1-32 34. Neuroleptic Drugs/ 35. 33 or 34 36. exp nursing homes/ 37. exp Residential Care Institutions/ 38. "geriatric nursing".mp. 39. "residential facilit*".mp. 40. "nursing home*".mp. 41. "care home*".mp. 42. "geriatric care".mp. 43. "convalescence home*".mp. 44. institutionali?ed.ti,ab. 45. or/36-44 46. discontinu*.mp. 47. cessation.mp. 48. reduc*.mp. 49. taper*.mp. 50. stop*.mp. 51. ceas*.mp. 52. withdraw*.mp. 53. or/46-52 54. exp Clinical Trials/ 55. random*.ti,ab. 56. trial.ab. 57. groups.ab. 58. "control group".ab. 59. or/54-58 60. 35 and 45 and 53 and 59	

(*Continued*)

CINAHL (EBSCOhost)	S1 (MH "Antipsychotic Agents") S2 TX neuroleptic* S3 TX risperidone S4 TX olanzapine S5 TX haloperidol S6 TX prothipendyl S7 TX methotrimeprazine S8 TX clopenthixol S9 TX flupenthixol S10 TX flupenthixol S11 TX methylperon S12 TX droperidol S13 TX pipamperone S14 TX benperidol S15 TX bromperidol S16 TX fluspirilene S17 TX pimozide S18 TX penfluridol S19 TX sulpiride S20 TX veralipride S21 TX levosulpiride S22 TX sultopride S23 TX aripiprazole S24 TX clozapine S25 TX quetiapine S26 TX thioridazine S27 TX phenothiazine S28 TX butyrophenone S29 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27 or S28 S30 (MH "Gerontologic Nursing") S31 (MH "Residential Facilities") S32 (MH "Nursing Homes+") or (MH "Nursing Home Patients") S33 TX "care home*" S34 TX "nursing home*" S35 TX "geriatric care" S36 TX "geriatric nursing" S37 TX "residential facilit*" S38 TX "convalescence home*" S39 TX institutionalized OR institutionalised S40 S30 or S31 or S32 or S33 or S34 or S35 or S36 or S37 or S38 or S39	98

(*Continued*)

	S41 TX discontinu* S42 TX cessation S43 TX reduc* S44 TX taper* S45 TX stop* S46 TX ceas* S47 TX withdraw* S48 S41 or S42 or S43 or S44 or S45 or S46 or S47 S49 S29 and S40 and S48	
Web of Science with Conference Proceedings 1945 to present) (ISI Web of Knowledge)	Topic=(discontinu* OR cessation OR reduc* OR taper* OR stop* OR ceas* OR withdraw*) AND Topic=(antipsychotic* OR neuroleptic* OR risperidone OR olanzapine OR haloperidol OR prothipendyl OR methotrimeprazine OR clopenthixol OR flupenthixol OR clothiapine OR methylperon OR droperidol OR pipamperone OR benperidol OR bromperidol OR fluspirilene OR pimozide OR penfluridol OR sulpiride OR veralipride OR levosulpiride OR sultopride OR aripiprazole OR clozapine OR quetiapine OR thioridazine OR phenothiazine OR butyrophenone) AND Topic=(random* OR trial* OR "control* study" OR "control group*" OR placebo OR "single-blind*" OR "double-blind*") AND Topic=(dementia OR alzheimer* OR BPSD) Timespan=All Years	322
LILACS (BIREME)	redução OR reduza OR interrompa OR retire OR batente OR discontinu$ OR cessation OR reduc$ OR taper$ OR stop$ OR ceas$ OR withdraw$ [Words] and antipsychotic$ OR neuroleptic$ OR risperidone OR olanzapine OR haloperidol OR prothipendyl OR methotrimeprazine OR clopenthixol OR flupenthixol OR clothiapine OR methylperon OR droperidol OR pipamperone OR benperidol OR bromperidol OR fluspirilene OR pimozide OR penfluridol OR sulpiride OR veralipride OR levosulpiride OR sultopride OR aripiprazole OR clozapine OR quetiapine OR thioridazine OR phenothiazine OR butyrophenone [Words]	107

(*Continued*)

ALOIS (www.medicine.ox.ac.uk/alois)	Advanced search: [Study aim: Treatment Dementia] AND [Study Design: RCT] AND [Intervention Type: Non-pharmacological]	423
CENTRAL (*The Cochrane Library*)	#1 MeSH descriptor Antipsychotic Agents explode all trees #2 antipsychotic* #3 neuroleptic* #4 risperidone #5 olanzapine #6 haloperidol #7 prothipendyl #8 methotrimeprazine #9 clopenthixol #10 flupenthixol #11 clothiapine #12 methylperon #13 droperidol #14 pipamperone #15 benperidol #16 bromperidol #17 fluspirilene #18 pimozide #19 penfluridol #20 sulpiride #21 veralipride #22 levosulpiride #23 sultopride #24 aripiprazole #25 clozapine #26 quetiapine #27 thioridazine #28 phenothiazine #29 butyrophenone #30 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29) #31 discontinu* #32 cessation #33 reduc* #34 taper* #35 stop* #36 ceas* #37 withdraw*	172

(*Continued*)

	#38 (#31 OR #32 OR #33 OR #34 OR # 35 OR #36 OR #37) #39 (#30 AND #38) #40 MeSH descriptor Geriatric Nursing explode all trees #41 MeSH descriptor Residential Facilities explode all trees #42 MeSH descriptor Nursing Homes explode all trees #43 "geriatric nursing" #44 "residential facilit*" #45 "nursing home*" #46 "care home*" #47 "geriatric care" #48 dement* OR alzheimer* #49 bpsd #50 (#40 OR #41 OR #42 OR #43 OR # 44 OR #45 OR #46 OR #47 OR #48 OR #49) #51 (#39 AND #50)	
Clinicaltrials.gov	(reduce OR reduction OR stop OR withdraw OR cease OR cessation OR taper) AND (antipsychotic OR neuroleptic) AND (elderly OR dementia OR alzheimer OR alzheimers OR lewy)	36
Total		1496
Total after de-dupe and first-assess		148

Appendix 2. Items for quality assessment of included studies

Item	Avorn 1992	Fossey 1997	Meador 2006	Schmidt 1998
METHOD				
Allocation sequence adequately generated	Unclear	Yes	Unclear	Yes*
Allocation adequately concealed	Unclear	Yes	Unclear	Unclear
No evidence for cluster imbalance	Unclear	Yes	Yes	No

(*Continued*)

Clusters lost to follow-up	No	No	No	Yes
Participants identified before randomisation	Yes	Yes	Yes	Unclear
If no: no evidence for biased selection of participants	-	-	-	Unclear
PARTICIPANTS				
Inclusion/ exclusion criteria for participants clearly defined	No	Yes	Yes	No
Inclusion/exclusion criteria for clusters clearly defined	Yes	Yes	Yes	Yes
Sample size calculation	Unclear	Yes	Unclear	No*
Adequate sample size calculation using methods for cluster randomisation	Unclear	Yes	Unclear	No*
No relevant differences between groups after randomisation	Unclear	Yes	Unclear	Unclear
Loss to follow-up less 5% of participants	No	Unclear	Unclear	Unclear
Were incomplete data adequately explained	No	Yes	No	No
INTERVENTIONS				
All groups treated equally, except of intervention or control	Yes	Yes	Yes	Yes
OUTCOMES				
Primary outcome clearly stated?	Unclear	Yes	Yes	Unclear

(*Continued*)

Method of primary outcome assessment adequate	Yes	Yes	Yes	Yes
Outcome assessors blinded to group allocation	Yes	Yes	Unclear	No*
Data collection started immediately after randomisation	Unclear	No*	Unclear	No*
RESULTS				
Intention-to-treat analysis	No	Yes	Unclear	No*
Complete reporting of outcome (as scheduled)	No	Yes	No	Yes
Methods of analysis adequate for cluster-randomised trials	Unclear	Yes	Unclear	
Coefficient of intra-cluster correlation reported	No	Yes	No	No
MISCELLANEOUS				
No evidence for interpretation bias	Unclear	Yes	Yes	Unclear
Conflicts of interest mentioned	No	Yes	No	No
Requests to authors required	Yes	Yes	Yes	Yes

* Items marked with an asterisk have been answered by the study authors following personal request.

Appendix 3. Search results

Source	Date range searched	Records retrieved
MEDLINE (Ovid SP)	Searched 19 December 2011	169
EMBASE (Ovid SP)	Searched 19 December 2011	147
PSYCINFO (Ovid SP)	Searched 19 December 2011	63
CINAHL (EBSCOhost)	Searched 19 December 2011	121
Web of Science with Conference Proceedings (ISI Web of Knowledge)	Searched 19 December 2011	377
LILACS (BIREME)	Searched 19 December 2011	120
ALOIS www.medicine.ox.ac.uk/alois	Searched 19 December 2011	504
CENTRAL *The Cochrane Library*	Searched 19 December 2011	184
Clinicaltrials.gov www.clinicaltrials.gov	Searched 19 December 2011	91
PsycBITE	Searched 19 December 2011	22
TOTAL including duplicates		1798
TOTAL after rejecting duplications and title screening		161

HISTORY

Protocol first published: Issue 8, 2010

Review first published: Issue 12, 2012

CONTRIBUTIONS OF AUTHORS

SK and GM initially planned the study; TR, GM, and SK wrote the study protocol.

TR and RM selected studies for inclusion/exclusion, evaluated the methodological quality of included trials, and extracted data.

TR and SK interpreted the study data.

TR corresponded with the study authors and wrote the drafts of the review with substantial contributions by SK.

RM, GM, and SK contributed to all versions of the review draft.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Unit of Health Sciences and Education, University of Hamburg, Germany.
- Faculty of Health, School of Nursing Science, Witten/Herdecke University, Germany.

External sources

- Ministry of Education and Research, Germany.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

None.

NOTES

None.

INDEX TERMS

Medical Subject Headings (MeSH)

*Nursing Homes; Aggression [*drug effects; psychology]; Antipsychotic Agents [*administration & dosage]; Dementia [*psychology]; Health Personnel [education]; Nursing Staff [education]; Psychomotor Agitation [*drug therapy]; Randomized Controlled Trials as Topic

MeSH check words

Humans