
Health Care Team Interventions for Older Adults With Distress Behaviors

November 2023

VA



U.S. Department of Veterans Affairs

Veterans Health Administration
Health Services Research & Development Service

Recommended citation: Shepherd-Banigan M, Ramos K, McDermott C, et al. Health Care Team Interventions for Older Adults With Distress Behaviors: A Systematic Review. Washington, DC: Evidence Synthesis Program, Health Services Research and Development Service, Office of Research and Development, Department of Veterans Affairs. VA ESP Project #09-010; 2023.

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PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to conduct timely, rigorous, and independent systematic reviews to support VA clinicians, program leadership, and policymakers to improve the health of Veterans. ESP reviews have been used to develop evidence-informed clinical policies, practice guidelines, and performance measures; to guide implementation of programs and services that improve Veterans' health and wellbeing; and to set the direction of research to close important evidence gaps. Four ESP Centers are located across the US. Centers are led by recognized experts in evidence synthesis, often with roles as practicing VA clinicians. The Coordinating Center, located in Portland, Oregon, manages program operations, ensures methodological consistency and quality of products, engages with stakeholders, and addresses urgent evidence synthesis needs.

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ACKNOWLEDGMENTS

The authors are grateful to Liz Wing for editorial support and Jessica Fulton for reference screening efforts, external peer reviewers, and the following individuals for their contributions to this project:

Operational Partners

Operational partners are system-level stakeholders who help ensure relevance of the review topic to the VA, contribute to the development of and approve final project scope and timeframe for completion, provide feedback on the draft report, and provide consultation on strategies for dissemination of the report to the field and relevant groups.

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Disclosures

This report was prepared by the Evidence Synthesis Program Center located at the **Durham VA Medical Center**, directed by Jennifer M. Gierisch, PhD, MPH, and Karen M. Goldstein, MD, MSPH and funded by the Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development.

The findings and conclusions in this document are those of the author(s) who are responsible for its contents and do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. The final research questions, methodology, and/or conclusions may not necessarily represent the views of contributing operational and content experts. No investigators have affiliations or financial involvement (eg, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

Executive Summary

KEY FINDINGS

- ▶ The vast majority of literature (43 studies) examined interventions in the long-term residential care setting (*eg*, nursing homes) among patients with dementia, and the largest number of studies evaluated interventions focused on developing health care worker (HCW) skill sets and knowledge alongside structured patient care activities.
 - ▶ The 6 studies evaluating interventions focused only on HCW skills, knowledge, or roles suggest distress behaviors may be reduced when measured by the Neuropsychiatric Inventory (NPI) in the short term (*ie*, days to weeks), but there is no evidence of an effect in the longer term (*ie*, 7-8 months) or when measured by the Cohen-Mansfield Agitation Inventory (CMAI). There is no evidence of improvement in quality of life or reduction in antipsychotic use in the few studies reporting these outcomes.
 - ▶ The 3 interventions focused on HCW activities around structured patient care had mixed results on agitation. Only 1 study measured the impact on quality of life and found no significant effect.
 - ▶ Seventeen interventions included both HCWs and patient-focused activities. Effects of these interventions were associated with a significant reduction in odds of antipsychotic use (odds ratio [OR] = 0.79, 95% CI [0.69, 0.91]) and improvement in quality of life (standardized mean difference [SMD] = 0.71, 95% CI [0.39, 1.04]), but inconclusive for agitation as measured by CMAI (SMD = -0.31, 95% CI [-0.78, 0.16]) and NPI (SMD = -0.47, 95% CI [-1.18, 0.24]).
 - ▶ Of the 3 interventions that included health care team-, patient-, and environment-focused activities, only 1 intervention showed an improvement in agitation in the short term (*ie*, 4 months) but not in the long term. Antipsychotic use did not change.
 - ▶ Six studies across multiple intervention types examined staff-level outcomes and none demonstrated a beneficial effect.
 - ▶ None of the included studies reported health care utilization outcomes.
 - ▶ Two studies evaluated patient distress behaviors during or around a transition. Both relevant studies examined changes after a move from 1 long-term residential setting to another. One small, single site before-after study found a reduction in distress behaviors among 14 patients from a special care unit for advanced Alzheimer's disease.
 - ▶ Two primarily staff-focused interventions were evaluated across 3 articles. A theoretically driven multifaceted intervention with 10 specified activities (*eg*, Safewards) led to significant reductions in conflicts (*eg*, physical or verbal aggression) and containment events (*eg*, forced medication or restraint use).
-

Older adults with complex medical disorders (dementia, serious mental illness, multiple chronic medical conditions) may have a high prevalence of distress behaviors (*eg*, physical or verbal aggression, repeated vocalizations, disengagement). For example, among patients with dementia, 75% exhibit at least 1 neuropsychiatric symptom. Across health care settings, these symptoms are often manifestations of patient distress and may be uncomfortable for both patients and their paid caregivers. Exacerbation of these symptoms is likely due to vulnerability to environmental factors such as under-

or over-stimulation, or unmet medical, physical, emotional, and social needs. Moreover, these symptoms may be unintentionally reinforced by staff or care routines. Patient distress behaviors can impact patient quality of life, care provision, cost of care, or transition to community-based care settings.

Distress behaviors can cause significant challenges to the ability of health care systems generally, and for clinical providers in particular, to deliver care using traditional, clinician-focused strategies, as these strategies tend to prioritize diagnostic procedures, close monitoring, and delivery of treatments. These challenges can lead to staff burnout and provider distress. In order to better address underlying and unmet patient needs and reduce distress behaviors in a productive and safe work environment, it is imperative that health systems develop evidence-based, effective approaches to support and prepare health care teams around this aspect of high-quality patient care.

One promising approach to promoting safe, person-centered, and positive systemic change for patients at increased risk of distress behaviors are interventions that focus on health care worker (HCW) actions through activities such as skill building, knowledge acquisition, and changes in staff roles and workflow patterns. Despite the integration of individual patient-level nonpharmacologic approaches into recent guidelines for the care of older adults with dementia, approaches that are centered on staff characteristics (*eg*, optimal staffing, staffing education/training, staff approaches to improved patient care management) have received limited attention. In addition, while patients with serious mental illness and other psychiatric disorders are overrepresented in residential long-term care settings, little is known about the use of these strategies among this high-risk population. Similarly, how to address distress behaviors during periods of stress due to transitions in residential settings is unknown. The goal of this systematic review is to evaluate the effect of health care team-focused interventions intended to reduce patient distress behaviors across key relevant settings.

The key questions (KQs) for this review are:

- KQ1. What is the effect of health care team-focused interventions designed to manage persistent or recurrent distress behaviors among older adults in long-term residential or inpatient health care settings on patient, staff, and utilization outcomes?
- KQ2. What is the effect of health care team-focused interventions designed to manage persistent or recurrent distress behaviors among older adults during transitions between health care settings on patient, staff, and utilization outcomes?
- KQ3. What is the effect of health care team-focused interventions designed to manage persistent or recurrent distress behaviors among older adults in the context of inpatient mental health settings on patient, staff, and utilization outcomes?

CURRENT REVIEW

This review was nominated by the VA Office of Mental Health and Suicide Prevention to inform work being done by the VHA Interoffice of Care for Patients with Complex Problems Steering Committee around supporting health care delivery for Veterans with distress behaviors. The topic was refined through iterative discussions with the nominating partner to tailor the review focus to the needs of this group and to be most relevant to care provided within or purchased by the VA.

We employed standard systematic review methodology to address the KQs. Key methodologic points include that we searched Ovid MEDLINE, Elsevier Embase, and Ovid PsycInfo from December 2002

through December 2022 for relevant literature. Our eligibility criteria included a population of adults 50 years of age or older in long-term residential or inpatient care settings (KQ1), transitioning between health care settings and home (KQ2), or inpatient mental health settings (KQ3). Interventions had to primarily target HCWs or a health care team as the primary point of deployment of intervention activities with the intent to change the way care is delivered in order to reduce or prevent distress behaviors. Due to the size of the literature, for KQ1 we prioritized randomized trials at low to moderate risk of bias for abstraction and synthesis. We included any VA-focused study regardless of study design given the relevance to the target audience for this review. We completed certainty of evidence assessments for KQ1 studies that evaluated patient-level outcomes of interest using the most commonly used measures of Cohen-Mansfield Agitation Index (CMAI), the Neuropsychiatric Inventory (NPI), and quality of life (measures varied).

We screened 6,582 articles by title and abstract and included 212 for full-text review. Ultimately, 39 randomized trials were prioritized for KQ1 and found to have a low or moderate risk of bias. We identified 2 studies for KQ2 and 3 studies for KQ3. Most studies were conducted in Europe ($N = 18$) or USA ($N = 10$). All trials prioritized for KQ1 were cluster-randomized trials and the majority focused on patients with dementia.

For KQ1, we grouped studies by inclusion of intervention activities meeting 8 of 10 prioritized Alzheimer's Association Dementia Care Practice Recommendations. Activities fell under 1 of 3 categories: (1) patient-focused: activities carried out by the health care staff that were intended to assess and provide ongoing support for individual patient distress behaviors (*eg*, assessment to detect distress behaviors, care planning, medical management); (2) HCW-focused: approaches that were intended to build capacity, knowledge, behaviors, or skills of HCWs individually or at a team level to reduce distress behaviors (*eg*, general education about distress behaviors, building skills to cope with distress behaviors); or (3) environment-focused: activities that altered the lived environment in which an individual with distress behaviors resides with the intent of addressing underlying needs and reducing distress. Any individual study intervention could include activities in any or all of these categories.

We found 3 studies that evaluated interventions designed to change patient-facing HCW interactions (patient-focused-only), 6 included HCW-focused intervention activities only, 17 included both patient- and HCW-focused activities, and 3 included HCW-, patient-, and environment-focused activities. Most interventions were complex with many featuring more than 1 intervention activity, intervention actions directed at changing more than 1 HCW behavior, and many interventions included a high level of interaction between intervention activities. Examples of intervention activities are as follows: patient-focused activities include structured, individualized care planning and establishing a mechanism for the detection of distress behaviors; HCW-focused activities centered on general dementia education and skills building for coping with distress behaviors; environment-focused activities addressed the structural setting within which patient care was delivered, such as lighting and access to outdoor walking spaces.

The 3 interventions were designed to change patient-facing HCW interactions only (*ie*, patient-focused-only) and had mixed results on agitation. Two studies evaluated a decision tree protocol to detect and diagnose distress behaviors and generate individualized treatment plans (Treatment Routes for Exploring Agitation or TREA); both found short-term improvements in agitation as measured by the agitation behavior mapping instrument at 10 and 14 days ($p = 0.002$ and $p < 0.001$, respectively) (longer-term outcomes were not measured). The third study evaluated a low-intensity intervention that

provided life histories to nursing home staff and found no agitation effect using the CMAI. Only 1 of the 3 studies measured the impact on quality of life and found no significant effect after adjusting for baseline characteristics.

Four of 6 studies focused on improving HCW skills, knowledge, or team roles (*ie*, HCW-focused-only) and assessed effects on patient distress behaviors using the NPI total score. Two studies with longer-term outcomes (*ie*, 7-8 months) found no intervention effect, while 2 studies with shorter-term outcomes (*ie*, 30 days to 8 weeks) found that the intervention reduced patient distress behaviors (very low certainty of evidence). The Staff Training in Assisted Living Residences (STAR) study found a significant reduction in total NPI at 8 weeks ($p = 0.031$). The longer-term MEDCED study found a non-significant difference from baseline to 7 months between arms (5.7 vs 1.8; $p = 0.207$). The 6-session manual-based intervention MARQUE study reported a non-significant adjusted mean difference (aMD) of -0.84 (95% CI [-5.51, 3.84]) at 8 months. Of the studies that measured quality of life ($N = 2$) and antipsychotic use ($N = 2$), there was no effect on either (low certainty of evidence). Two of the 3 HCW-focused-only interventions measured staff burnout and found no difference. The third measured “sense of competence and satisfaction with patient care” and found no difference at 8 weeks. Among the studies that evaluated HCW-focused-only intervention activities, 3 measured changes in agitation with the CMAI.

Eleven of 17 studies that combined patient-focused and HCW-focused intervention activities measured agitation using the CMAI. Data from 9 interventions across 7 studies were included in a meta-analysis. Follow-up times ranged from 6 to 12 months. In a meta-analysis of 7 studies (including 9 intervention conditions), health care worker- and patient-focused interventions did not lead to a significant reduction in patient agitation (SMD = -0.31, 95% CI [-0.78, 0.16]). This result may be attributable to substantial variation in effects across studies (95% PI [-1.38, 0.76]), including across studies of the same specific intervention. Nine HCW-/patient-focused studies used the NPI to measure distress behaviors. When distress was measured by NPI, similar inconclusive results were found. Eight intervention arms from 5 studies that assessed changes in the NPI between 6 and 11 months were appropriate for inclusion in a meta-analysis and yielded an SMD of -0.47 (95% CI [-1.18, 0.24]) (moderate certainty of evidence).

Nine HCW-/patient-focused studies also evaluated the intervention effect on quality of life. Seven interventions from 5 studies were included in a meta-analysis with follow-up at 7-11 months and showed a moderate- to large-sized improvement on patient quality of life (SMD = 0.71, 95% CI [0.39, 1.04]) (moderate certainty of evidence). The final patient-level outcome for HCW-/patient-focused interventions was the use of antipsychotics as reported by 8 studies. Seven interventions from 6 studies were included in a meta-analysis, which suggested a reduced odds of antipsychotic use at 6 to 12 months with HCW-/patient-focused interventions (OR = 0.79, 95% CI [0.69, 0.91]) (high COE). Two studies also measured a variety of staff-level outcomes (*eg*, perceived self-efficacy in caring for people with dementia, burnout), but neither found any significant intervention benefit. In summary, interventions that incorporated both patient-focused and HCW-focused activities showed a significant improvement in quality of life and reduction in antipsychotic use. However, the benefits of this type of intervention to reduce distress behaviors were not conclusive.

Three studies evaluated HCW-, patient-, and environmental-focused intervention activities; all trained staff to develop tailored care plans using a focus on function. All 3 measured agitation using the CMAI. Two studies did not find any evidence of reduction in agitation at 3 to 12 months of follow-up, and the third found a statistically, though likely not clinically, significant decrease in agitation

(treatment group baseline of 14.79 decreased to 14.64 and the control group increased from 14.55 to 14.88, $p = 0.045$). One study measured change in antipsychotic use and found no significant decrease at 12 months (MD = -0.44, 95% CI [-2.27, 0.64]) (moderate certainty of evidence). One study measured staff self-efficacy and job satisfaction and found no benefit.

None of the identified studies reported system-level outcomes such as utilization.

We identified 5 VA-specific studies, all of which were program evaluations of the STAR-VA program, which had been implemented in VA Community Living Centers (CLCs). The included studies reported clinically significant reductions in frequency and severity of distress behaviors and an initial reduction in staff injury in the first year after training due to assault, though injuries rose in the subsequent year. We note a similar intervention complexity with STAR-VA to other identified multilevel interventions (eg, those that target both HCW and patient management). Specifically, it features multiple intervention activities requiring multiple actions of the involved health care team with significant tailoring to individual patients. Moreover, the interaction between the described activities is significant (eg, using effective communication approaches could contribute to increasing frequency of personally relevant and pleasant events).

Two studies addressed patient distress behaviors during or around a transition from 1 residential setting to another residential setting that was engineered to provide a more supportive environment. Each also required changes to HCW workflow patterns. One study of 116 patients relocated from a 12th-century building with inadequate structural conditions to a newly built facility with improved features (eg, improving lighting, access to indoor ambulation) found a significant reduction in distress behaviors as measured by NPI among the 14 residing in special care units for patients with advanced dementia (MD at 12 weeks = -14.08, $p < 0.001$) and no change in the other 112 patients (MD at 12 weeks = -0.8, $p = 0.45$). The second study found no change in “negative affect or inappropriately engaged.”

Two primarily HCW-focused interventions were evaluated across 3 papers that took place in inpatient mental health care units. One trial and 1 program evaluation examined a theoretically driven multifaceted model of care with 10 packaged intervention activities (eg, Safewards). In the trial at 16 weeks, conflict (ie, physical or verbal aggression or absconding) was reduced by 15% in the intervention arm per shift (risk ratio [RR] = 0.85, 95% CI [0.76, 0.94]) and containment events (ie, forced medication, seclusion, or restraint use) were reduced by 26.4% (RR = 0.77, 95% CI [0.66, 0.90]). The second intervention was a staff education program with ongoing monitoring evaluated in a single community-based, long-term neurobehavioral rehabilitation setting. At 15 months, the average number of aggressive incidents toward peers or objects had been reduced by 77%, from 6 per month to 2 per month.

Health care systems seeking to better equip health care teams to provide optimal patient-centered management of distress behaviors will need to look beyond interventions that are directed solely at health care team members or those focused only on delivering individual patient care treatments. Rather, the findings from this review point to the likelihood that multilevel interventions with activities that target health care team members, patient evaluation and management, and likely environmental or policy structures are needed to meaningfully improve patient outcomes. Interventions that address both health care team members and patient care patterns improve patient quality of life and reduce antipsychotic use. While the evidence is inconclusive regarding the effect of these interventions on patient distress, the effect estimates were consistently in the direction of favoring the intervention; confidence intervals, while crossing the null, generally included clinically significant improvements.

Thus, the potential for benefit cannot be ruled out. One challenge with this body of literature is the wide array of outcomes and intervention components, which makes it difficult to evaluate the mechanism of action and related effect. Greater specificity and clarification regarding the intended mechanism of action for each outcome would be beneficial for this field moving forward. Future research in this area would benefit from investigating multilevel, theory-based interventions with clearly articulated mechanisms of action and alignment with intended effects measured at appropriate time points. When the goal is improving staff outcomes, higher system-level targets (eg, supervisory involvement, facility culture) could be explored. In addition, discipline-specific interventions such as the use of social workers for intervention- and patient-centered care approaches could be explored. After effective interventions are identified, it will be critical to develop robust, evidence-based approaches to implement these complex interventions.

CONCLUSIONS

Novel models of health care to reduce distress behaviors among older adults with behavioral care needs that feature both HCW education and training along with patient management intervention activities have beneficial impacts on patient quality of life, reduction in antipsychotic use, and possibly distress behaviors. Less complex interventions, for example those focusing on HCW-only training, appear less likely to lead to desired effects. However, more effective complex interventions raise questions about the challenges of high-fidelity implementation across varied long-term care settings for patients with distress behaviors. Work remains to be done to determine the impact of these interventions on health care staff outcomes such as burnout and system-level outcomes such as utilization.

Main Report

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ABBREVIATIONS TABLE

Abbreviation	Definition
ABMI	Agitation behavior mapping instrument
AICT	Advanced illness care team
BC	Behavioral coordinator
CBS	Challenging Behavior Scale
CI	Confidence interval
CLC	Community living centers
CMAI	Cohen-Mansfield Agitation Inventory
DCM	Dementia care mapping
EPOC	Effective Practice and Organisation of Care
FBFC-CI	Function and Behavior Focused Care for the Cognitively Impaired
FFC-AL-EIT	Function Focused Care for Assisted Living Using the Evidence Integration Triangle
FFC-CI	Function Focused Care Intervention for the Cognitively Impaired
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HCW	Health care worker
HR	Hazard ratio
ICC	Intraclass correlation coefficient
ICU	Intensive care unit
IDD	Intellectual and developmental disabilities
KQ	Key question
MBI	Maslach Burnout Inventory
MD	Mean difference
NPI	Neuropsychiatric Inventory
OECD	Organization for Economic Co-operation and Development
OPAL	Optimizing Prescribing of Antipsychotics in Long-Term Care
OR	Odds ratio
PCC	Person-centered care
PTSD	Posttraumatic stress disorder
QOL	Quality of life
QUALID	Quality of Life in Late-Stage Dementia
RAI-MDS	Resident Assessment Instrument-Minimum Dataset
RCT	Randomized controlled trial
RN	Registered nurse
ROB	Risk of bias
SD	Standard deviation
SE	Standard error
SMD	Standardized mean difference
SMI	Serious mental illness
STAR	Staff Training in Assisted Living Residences

Abbreviation	Definition
STI	Serial Trial Intervention
SUD	Substance use disorder
TREA	Treatment Routes for Exploring Agitation
UC	Usual care
WHELD	Well-being and Health for People Living with Dementia



BACKGROUND

Older adults with comorbid medical disorders (*eg*, dementia, serious mental illness, multiple chronic medical conditions) may experience an increased prevalence of behavioral and psychological symptoms. Exacerbation of these symptoms is likely due to vulnerability to environmental factors such as under- or over-stimulation, or unmet medical, physical, emotional, and social needs that may unintentionally be reinforced by staff or care routines. These behavioral and psychological symptoms, in the context of receiving care across health care settings, can be considered as manifestations of patient distress and may be uncomfortable for both patients and their paid caregivers. Patient distress and associated behaviors can affect patient quality of life, care provision, cost of care, or transition to community-based care settings.¹⁻³

Among patients with dementia, 75% exhibit at least 1 neuropsychiatric symptom.⁴ While mental illness and other cognitive disorders among older adults, including serious mental illness (SMI), substance use disorders (SUD), and intellectual and developmental disabilities (IDD), are less well researched, distress behaviors are also prevalent with these conditions. For example, in 2004, among nursing home residents in the VA health care system, 66% of Veterans with SMI expressed verbal “disruption,” nearly 30% expressed physical aggression, and 58% expressed inappropriate behavior.⁵ Distress behaviors can cause significant challenges to the ability of health care systems generally and for clinical providers in particular to deliver care using traditional, clinician-focused strategies (*eg*, close monitoring, new treatment plans),⁶ as these strategies tend to prioritize diagnostic procedures, close monitoring, and delivery treatments within the context of short stays.⁷ These challenges can lead to staff burnout.^{8,9} In order to better address the patient needs underlying recognized patient distress behaviors and better prepare health care teams to meet these patient needs in a productive and safe work environment, it is imperative that health systems develop high-quality approaches for patients with these complex needs.¹⁰

Existing strategies to manage distress behaviors are largely ineffective and considered not patient centered. For example, antipsychotic medications have been used to manage behaviors perceived as disruptive by health care teams.^{11,12} Between 2011 and 2019, 80% of publicly funded long-stay nursing home residents in the United States received an antipsychotic prescription.¹³ However, reliance on these medications is off-label and not always effective to address behavioral disturbances,¹⁴ and some medications are known to have substantial adverse effects, including an increased risk of death.¹⁵ Historically, restraints are another ineffective approach used to prevent wandering and falls among older adults in institutional settings.¹⁶ However, the use of restraints is still relatively high, especially for older adults with dementia.¹⁷ Given ethical concerns about restricting individual autonomy and the potential harms, advocates increasingly view physical restraints as an untenable approach to manage distress behaviors.¹⁸ For example, the Joint Commission and the Alzheimer’s Association recently announced a collaboration to improve quality and safety in skilled nursing facilities through evidenced-based practice recommendations.^{19,20}

Effective, patient-centered nonpharmacologic approaches are critically needed to better support patients who are at increased risk for distress and related behaviors through centering care provision and accommodation on the patient. Interventions primarily focused on changing health care worker (HCW) skills, patient interactions, and team roles are particularly compelling to promote safe, person-centered, and positive systemic change. For example, Staff Training in Assisted Living Residences (STAR-VA) is a training program for staff working in VA Community Living Centers that aims to support teams in understanding and managing distress behaviors among residents with dementia via a

team-based, behavioral, problem-solving approach. STAR-VA helps teams have realistic expectations of individuals with dementia, communicate effectively, and use the ABC model (identify and change activators and consequences to specific behaviors, and integrate person-centered pleasant events into daily care).²¹

Despite integration of individual patient-level nonpharmacologic approaches into recent guidelines for the care of older adults with dementia, interventions primarily focused on HCWs (*eg*, improving HCW skills and knowledge or adjusting workflow patterns or team roles) have received limitation attention. In addition, while patients with SMI and other psychiatric disorders are overrepresented in residential long-term care settings,²²⁻²⁴ little is known about the use of these strategies among this high-risk population. The goal of this systematic review is to evaluate the effect of interventions designed to address patient distress behaviors, focusing on HCW-focused interventions (*eg*, optimal staffing, staffing education/training). For this review, we focus on interventions to ameliorate patient distress leading to behaviors such as physical or verbal aggression, repeated vocalizations, yelling, pacing, wandering, hoarding, handling objects unsafely, sexual disinhibition, psychosis, disengagement, or apathy.

This review was nominated by the VA Office of Mental Health and Suicide Prevention to inform work being done by the VHA Interoffice of Care for Patients with Complex Problems Steering Committee to support health care delivery for Veterans with distress behaviors.

METHODS

REGISTRATION AND REVIEW

A preregistered protocol for this review can be found on the PROSPERO international prospective register of systematic reviews ([CRD42023402760](#)). A draft version of this report was reviewed by external peer reviewers; their comments and author responses are located in the [Appendix](#).

KEY QUESTIONS AND ELIGIBILITY CRITERIA

The following key questions were the focus of this review:

Key Question 1	What is the effect of health care team-focused interventions designed to manage persistent or recurrent distress behaviors among older adults in long-term residential or inpatient health care settings on patient, staff, and utilization outcomes?
Key Question 2	What is the effect of health care team-focused interventions designed to manage persistent or recurrent distress behaviors among older adults during transitions between health care settings on patient, staff, and utilization outcomes?
Key Question 3	What is the effect of health care team-focused interventions designed to manage persistent or recurrent distress behaviors among older adults in the context of inpatient mental health settings on patient, staff, and utilization outcomes?

Study eligibility criteria are shown in the table below. Overall, we focused on interventions intended to improve health care staff knowledge and behaviors related to distress behavior management. We did not include patient-directed interventions (eg, providing patient-tailored background music). An analytic framework that illustrates the relationship between key questions and eligible interventions and outcomes is provided in the [Appendix](#).

Eligibility Criteria		
	Inclusion	Exclusion
Population	Older adults (≥ 50 years of age) in residential, long-term, inpatient health care settings or who are transitioning between hospital to these settings or to home and who are at elevated risk of persistent or recurrent distress behaviors in health care settings associated with underlying conditions such as neurocognitive disorders (eg, dementia), mental health disorders (eg, serious mental illness, psychosis, PTSD, substance use disorders), and/or other chronic medical illnesses Eligible studies must include at least 75% of participants aged ≥ 50 years Patients could be those identified to be at-risk OR those already displaying disruptive behaviors	Patients not currently in residential or inpatient settings (eg, home-based care, outpatient) Peri-operative or ICU patients Studies with populations < 75% aged ≥ 50 years Patients with primary diagnosis of delirium Intoxicated patients or patients in acute substance withdrawal Pediatric population or populations with < 75% patients < 50 years

Eligibility Criteria		
	Inclusion	Exclusion
Intervention	Staff- or health care unit-focused approaches to build capacity, knowledge, behaviors, or skills intended to reduce or prevent distressed and/or disruptive behaviors among a population of older adults in indicated health care settings Intervention could involve staff or clinic-facing interventions that focus on optimizing facility staffing, staff training, and education, and/or developing and strengthening staff competencies as they relate to managing disruptive behaviors Intervention must be primarily targeted at the health care providers or unit (eg, team, clinical service) as the primary point of deployment that involves a change in the way care is delivered Interventions must specify a primary intent to reduce disruptive and/or distressed behaviors (or have such behaviors as a primary outcome) Interventions could include electronic health record components that involve staff interaction or recognition of at-risk patients	Interventions that target the patient as the level of deployment only and do not involve staff or the health care unit employed by a health care system Interventions that only involve staff for training of the delivery of an individual patient-level therapy for symptom management (eg, pet therapy, music therapy) Interventions focused on management of symptoms of chronic condition only or which mention disruptive behavior as a minor focus of the intervention Pharmacologic interventions
Comparator	Any or none	NA
Outcomes	<i>Patient outcomes:</i> Mental and/or medical symptom improvement, improvement or management of disruptive behavior (to include neuropsychiatric symptoms such as agitation, aggression), patient safety, quality of life <i>Staff outcomes:</i> Morale, provider/staff satisfaction, provider/staff safety, turnover, staff competencies/skills, or staff self-efficacy as they relate to handling disruptive behaviors <i>Utilization outcomes:</i> Length of stay in acute care hospital or nursing home settings, timeliness of discharge, hospital re-admissions, overall costs of care	Studies that do not explicitly state the primary intent to be the improvement of disruptive behaviors must have disruptive behaviors as primary outcome (though data were collected on other secondary outcomes of interest) Neuropsychiatric symptoms such as apathy, depression, delusions, hallucinations, delirium
Timing	Any	NA
Setting	Inpatient medicine, inpatient mental health, residential care/nursing homes, and transitional care, including from hospital or nursing home to community-based or family caregiving	Outpatient, home-based care settings, nonclinical group home settings, emergency departments
Study Design	Randomized trials, nonrandomized trials, controlled before-after studies, interrupted time-series studies or repeated measures studies, retrospective/prospective cohort studies, case-control studies, program evaluations	Patient-level case studies/series, systematic reviews, organizational case studies

Eligibility Criteria		
	Inclusion	Exclusion
Publication Types	Full publication in a peer-reviewed journal	Letters, opinion pieces, editorials, reviews, dissertations, meeting abstracts, and protocols without results Pilot studies (for KQ1 only)
Years	December 2002-present	
Language	No limits	NA
Country	Organization for Economic Co-operation and Development countries (Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States)	Non-OECD countries

Abbreviations. ICU=intensive care unit; PTSD=posttraumatic stress disorder.

SEARCHING AND SCREENING

To identify articles relevant to the key questions (KQs), a research librarian searched Ovid MEDLINE, Elsevier Embase, and Ovid PsycInfo from December 2002 through December 2022 using terms for setting (*residential, transition of care*), *inpatients with mental illness, older adults, older adult inpatients with mental illness, distressed or disruptive behavior* (see [Appendix](#) for complete search strategies). Additional citations were identified from hand-searching reference lists and consultation with content experts. We limited the search to published and indexed articles involving human subjects and OECD countries. Study selection was based on the eligibility criteria described above. Titles, abstracts, and full-text articles were reviewed by 2 investigators. All disagreements were resolved by consensus or discussion with a third reviewer.

DATA ABSTRACTION AND ASSESSMENT

We approached the abstraction and synthesis of each KQ separately, as each KQ focuses on distinct health care settings with different staffing and team dynamics. We expected KQ1 to yield the largest number of available studies based on a recent systematic review conducted by AHRQ²⁵ that included 19 randomized controlled trials (RCTs) and was focused solely on patients with dementia living in nursing home and assisted living settings.

We synthesized available studies following a best-evidence approach. Specifically, we prioritized synthesis of studies with more rigorous designs (*eg*, randomized trials, nonrandomized trials, controlled before-after, interrupted time series) over less rigorous designs (*eg*, retrospective or prospective cohort studies, program evaluations). If we identified a sufficient number of randomized trials, we prioritized these over all other designs. Because this project is intended to inform VA policy and decision-making, we also included all VA-specific studies regardless of design for contextualization and comparison. If VA studies used less rigorous designs, we included them descriptively but did not conduct a formal risk of bias assessments or incorporate them into certainty of

evidence assessments. In addition, given the existence of a prior high-quality systematic review relevant to this topic,²⁵ we abstracted descriptive information about primary studies from those reviews with up to 20% over-reading to verify accuracy of data.

Effect information and population, intervention, and comparator characteristics were abstracted for all prioritized studies. From these studies, we also abstracted key intervention characteristics and evaluated intervention complexity using a modified iCAT-SR tool to inform future intervention implementation.²⁶ We report intervention labels such as “person-centered” based on author description in published papers. To group the prioritized studies conceptually for analysis, we considered multiple approaches and sought input from our technical expert panel and operational partner to identify a meaningful approach that aligns with the way that people caring for patients with distress behaviors group and label patient care activities. Given the complexity and multi-component nature of the interventions, we were unable to group for analysis by any 1 specific intervention activity (*eg*, anti-psychotic medication review). Instead, we grouped studies by current clinical practice approaches adapted from the Alzheimer’s Association Dementia Care Practice Recommendations.²⁷ The Association developed these recommendations to define quality of care across all care settings for patients with dementia. Of the 10 total Association recommendations, we identified 8 that we determined were most relevant to the care of older adults experiencing distress to categorize interventions. For each of these 8, we developed tailored definitions for operationalization and mapped each adapted recommendation to the level at its intended impact (*ie*, patient, staff, environment/setting) (listed and defined in [Appendix](#)). Given the complexity of interventions in the included studies, many interventions targeted more than 1 level. Therefore, our final grouping categories included HCW-focused-only, patient-only (interventions designed to change HCW behaviors and interactions with patients), HCW-/patient-focused, and patient-, HCW-, and environment-focused interventions. We did not include any environment-only studies as these would not meet our eligibility criteria of requiring a health care team or HCW focus. We then abstracted intervention characteristics for all studies.

Information abstracted included a description of the intervention, setting, target patient population, components of the intervention, dose, who delivered the intervention, the disciplines of staff receiving the intervention, the intervention delivery mode, and the underpinning theories. Then, descriptions of interventions were reviewed across included studies and key intervention activities were identified. Intervention activities were mapped to the adapted Alzheimer’s Association practice recommendation categories by 1 reviewer who referenced the original study as needed. A second reviewer corroborated these decisions. Discrepancies were resolved through discussion and consensus between the 2 reviewers (MSB, KMG).

The internal validity (*ie*, risk of bias) of each prioritized study was rated using Cochrane risk of bias tools for randomized trials²⁸ or other intervention study designs.²⁹ All data abstraction was first completed by 1 reviewer and then checked by another; disagreements were resolved by consensus or discussion with a third reviewer (see [Appendix](#) for risk of bias ratings). Risk of bias assessment was completed independently by 2 reviewers and disagreements were resolved by consensus.

SYNTHESIS

When synthesizing evidence for KQ1, we prioritized studies judged as moderate or low risk of bias. When at least 3 studies with the same outcome were available, we synthesized results using 3-level random-effects models that accounted for clustering of observations within studies as well as clustering of comparisons within studies in the case of 3 or more treatment groups. For analyses with

fewer than 20 studies, we used the Knapp-Hartung adjustment to better account for uncertainty in heterogeneity estimates. If meta-analysis was not feasible, we summarized available evidence narratively.

When meta-analysis was possible, bias-adjusted standardized mean differences (SMDs) were used for continuous outcomes and odds ratios (ORs) for binary outcomes. The random effects model used to estimate the overall/pooled effect accounted for shared variance of samples within studies and shared variance among multiple comparisons within studies where applicable. For cluster-randomized trials and stepped-wedge designs, we incorporated a design effect into effect size calculation using intraclass correlation coefficients (ICCs).³⁰ If ICCs were not reported, we used the average of ICCs reported by other studies of the same outcome; if no ICCs were available, an ICC of 0.10 was assumed. If measured constructs were considered not sufficiently conceptually similar, outcome data were synthesized separately.

Heterogeneity was assessed using visual inspection and 95% prediction intervals. Publication bias was assessed using funnel plots (when there were > 10 studies) and Begg's or Egger's regression statistics. Meta-analyses were conducted using the *metafor* package³¹ for R (R Foundation for Statistical Computing, Vienna, Austria).

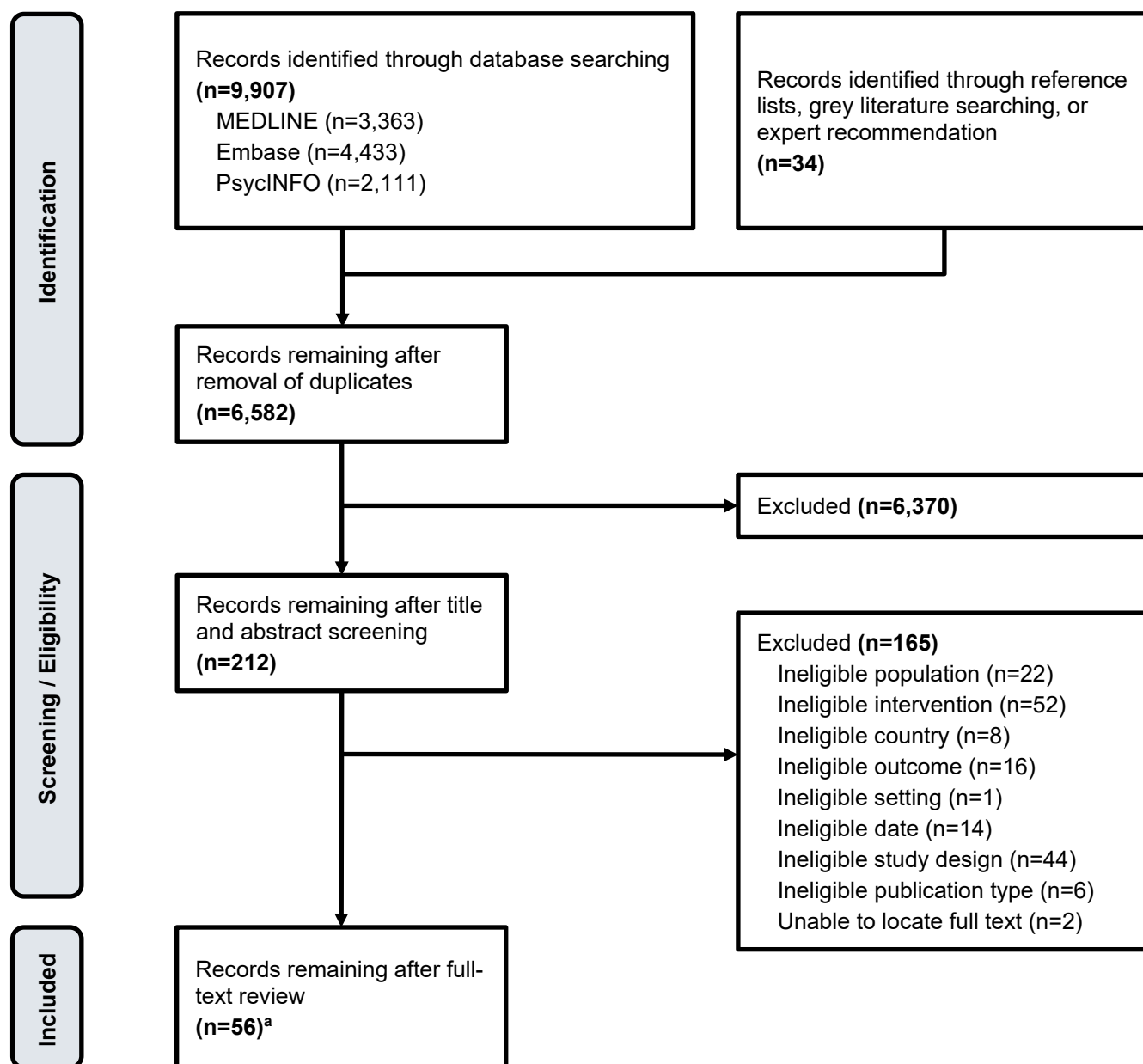
Strength of Evidence

After synthesizing available evidence, we rated the strength of evidence for prioritized outcomes (those outcomes identified by the stakeholders as critical to decision-making with sufficient data for synthesis). Assessment of strength of evidence was guided by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach,³² which requires assessment of 4 domains: risk of bias, consistency, directness, and precision. Additional domains to be used when appropriate are dose-response association, impact of plausible residual confounders, strength of association (magnitude of effect), and publication bias. Domains were considered qualitatively, and a summary rating was assigned after discussion by 3 investigators (high, moderate, or low). When high, moderate, or low ratings were impossible or imprudent to make, evidence was considered insufficient to draw conclusions.

RESULTS

LITERATURE FLOW DIAGRAM

The literature flow diagram summarizes the results of the study selection process. A full list of excluded studies is provided in the [Appendix](#).



Notes. ^a 56 records including 48 unique studies.

OVERVIEW OF INCLUDED STUDIES

We identified 9,907 publications through database searching and an additional 34 articles through hand-searching citations of earlier systematic reviews. After deduplication and title and abstract screening, 212 articles remained for full-text review. 56 publications met eligibility criteria. Among these, there were 43 unique studies included for KQ1,³³⁻⁷⁵ 2 studies for KQ2,^{76,77} and 3 studies for KQ3.⁷⁸⁻⁸⁰ Studies were conducted in the US, Canada, Austria, Finland, France, Germany, Netherlands, Norway, Japan, Australia, and the United Kingdom. Table 1 provides an overview of included studies; additional study and intervention characteristics can be found in the [Appendices](#).

Of the 43 unique studies in KQ1, 42 used more rigorous designs, and 1 program with 4 publications was implemented in the VA. These studies consisted of 1 interrupted time series study, 1 cluster nonrandomized controlled trial, 1 nonrandomized controlled before-after study, and 39 randomized controlled trials. The 39 randomized trials were assessed for risk of bias. The 29 studies determined to have low-to-moderate risk of bias were retained for data abstraction. Among these were 26 cluster-randomized trials, 1 factorial cluster-randomized trial, and 2 stepped-wedge randomized trials.

The 2 studies relevant to KQ2 consisted of 1 interrupted time series study and 1 other study. The 3 studies in KQ3 consisted of 1 cluster-randomized trial, 1 cross-sectional program evaluation, and 1 other. All 5 were retained for data abstraction.

Table 1. Evidence Profile

Number of Studies	48 unique studies (56 articles)
Key Question	KQ1 (<i>N</i> = 43); KQ2 (<i>N</i> = 2); KQ3 (<i>N</i> = 3)
Study Designs	Cluster randomized controlled trial (<i>N</i> = 37); randomized controlled trial (<i>N</i> = 3); cluster nonrandomized trial (<i>N</i> = 1); controlled before-after (<i>N</i> = 1); interrupted time series (<i>N</i> = 1); non-EPOC interrupted time series (<i>N</i> = 2); program evaluation (<i>N</i> = 3)
ROBINS I Risk of Bias	Low (<i>N</i> = 0); moderate (<i>N</i> = 1); serious (<i>N</i> = 3); critical (<i>N</i> = 0)
ROB 2 Risk of Bias	Low (<i>N</i> = 2); Some concerns (<i>N</i> = 27); high (<i>N</i> = 10)
Prioritized for Analysis	KQ1 low/moderate risk of bias randomized studies (<i>N</i> = 29); KQ1 non-EPOC VA studies (<i>N</i> = 1); KQ2 (<i>N</i> = 2); KQ3 (<i>N</i> = 3)
Study Year Range	2005 to 2022
Number of Participants	13,784 (<i>N</i> prioritized for analysis = 9,668)
Mean Age Range	63.86 to 89.8 (NR = 4)
Countries	USA (<i>N</i> = 10); Europe (<i>N</i> = 18); Australia and New Zealand (<i>N</i> = 4); Japan (<i>N</i> = 1); Canada (<i>N</i> = 2)
Intervention Categories (KQ1)	Health care worker (HCW) only (<i>N</i> = 6); patient only (<i>N</i> = 3); patient and HCW (<i>N</i> = 17); patient and HCW and environment (<i>N</i> = 3)
Outcome Levels^a	Patient outcomes (<i>N</i> = 32); staff outcomes (<i>N</i> = 8); utilization outcomes (<i>N</i> = 0)

Notes. ^a Eight studies reported more than 1 outcome type.

Abbreviations. EPOC=Effective Practice and Organisation of Care.

KEY QUESTION 1: LONG-TERM RESIDENTIAL OR INPATIENT HEALTH CARE SETTINGS

Key Points

- Many interventions included more than 1 active component and most often were directed at changing more than 1 HCW behavior; many interventions included a high level of interaction between intervention activities.
- The 3 interventions focusing on patient-facing aspects of the HCW role had mixed results on agitation. Only 1 study measured the impact on quality of life and found no significant effect.
- The 6 studies including HCW-focused intervention activities only suggest distress behaviors may be reduced when measured by the Neuropsychiatric Inventory (NPI) in the short term (*ie*, 30 days, > 8 weeks), but there is no evidence of an effect in the longer term (*ie*, 7 months, 8 months) or when measured by the Cohen-Mansfield Agitation Inventory (CMAI). There is no evidence of improvement in quality of life or reduction in antipsychotic use in the few studies reporting these outcomes.
- Seventeen interventions included both HCW-/patient-focused activities. A summary effect estimate from meta-analysis of 7 studies (9 interventions) did not show a significant reduction in agitation as measured by CMAI (SMD = -0.31, 95% CI [-0.78, 0.16]) or NPI (SMD = -0.47, 95% CI [-1.18, 0.24]). Effects varied substantially across studies. However, interventions were associated with a significant reduction in odds of antipsychotic use (OR = 0.79, 95% CI [0.69, 0.91]), and a medium to large improvement in quality of life as measured by DEMQOL-Proxy, EQ-5D index, or the QUALID (SMD = 0.71, 95% CI [0.39, 1.04]).
- Of the 3 interventions addressing health care teams, patients, and environment activities, only 1 showed an improvement in agitation, though only with short-term (*ie*, 4 months) but not longer-term follow-up (*ie*, 12 months). Antipsychotic use was not reduced.
- Six studies across multiple intervention types examined staff-level outcomes and none demonstrated a beneficial effect.
- Harms were measured using differing definitions at various time points across studies, making it difficult to draw conclusions.
- There were no health care utilization outcomes reported by the abstracted studies.

Patient-Focused Intervention Activities Only

Intervention Characteristics

Three studies tested interventions that focused only on structured patient care activities delivered by HCWs, including a mechanism to detect or diagnose distress behaviors, assessment and care planning, ongoing support for distress behaviors, and/or medical management (Table 2).^{50,54,59} All studies took place in residential facilities and focused on care for patients with dementia. Two studies took place in the United States and described results from the Treatment Routes for Exploring Agitation (TREA) intervention,^{50,54} and 1 study took place in Canada.⁵⁹ The TREA intervention applied a decision tree protocol to detect and diagnose distress behaviors and create tailored care plans for patients.^{50,54} The third study used a patient-centered care theoretical approach to create patient life histories for staff to review and use to inform care and their connections with the residents.⁵⁹ Training for both

interventions was delivered by members of the research team to nursing home staff.^{50,59} Staff training content, strategies, and dose were not clearly described.

Patient-Level Outcomes

Distress behaviors

Agitation (CMAI). The trial that randomized patients to patient life histories versus a medical history control arm⁵⁹ included 73 patients and reported patient agitation using the CMAI. Results were reported at 2 time points that were from baseline to post intervention (which occurred at 20 days), and then follow-up at 46 days. No significant intervention effects were found as measured by CMAI. With the inclusion of cognitive impairment as a covariate in the model to assess differences between groups over time, the 2 groups did not have statistically different changes.

Other measures of agitation. The same life history study also measured agitation using the aggression behavior scale (ABS),⁵⁹ while the other 2 studies examining the TREA intervention measured agitation using the agitation behavior mapping instrument (ABMI).^{50,54} For the life history study,⁵⁹ analysis of ABS change scores from post intervention to follow-up was nonsignificant. Over the 10-day intervention of TREA⁵⁴ during a 4-hour period of greatest agitation compared to the control group, there was a significant decrease in overall agitation from baseline ($p = 0.002$). In a second TREA study,⁵⁰ overall, verbal, and nonaggressive physical agitation scores were significantly reduced compared with a control group during a 2-week observation period.

Quality of life

The life history study⁵⁹ also examined changes in quality of life. Although unadjusted analyses found a significant difference favoring the intervention ($p < 0.01$), the finding was no longer significant after accounting for baseline characteristics including cognitive impairment.

Table 2. Summary of Evidence for Patient-Focused Intervention Activities

Number of Studies	3 studies
ROB 2 Risk of Bias	Some concerns ($N = 3$)
Study Year Range	2007 to 2016
Number of Participants	365
Outcome Measured	
CMAI	1 intervention (1 inadequate data)
Quality of Life	1 intervention (1 significant beneficial effect)

Abbreviations. CMAI=Cohen-Mansfield Agitation Index.

Health Care Worker-Focused Intervention Activities Only

Intervention Characteristics

Six studies tested interventions activities focused solely on improving HCW skills and knowledge or altered HCW responsibilities or team roles (Table 3). These interventions primarily centered on 2 areas: (1) providing general education about dementia and/or (2) building staff skills to cope with distressed behaviors or implementing a tool, such as an assessment to identify the underlying causes of distress.^{38,41,43,51,56,61} These studies all took place in nursing homes or assisted living facilities and tested the interventions among individuals with dementia.



Five of the 6 studies included a general education activity that provided information to HCWs about dementia and the basic principles of distressed behavior.^{38,41,51,56,61} Five of 6 studies provided training in skills and intervention implementation. These studies tested skills-based interventions related to adopting methods of verbal and motor stimulation,⁶¹ directly addressing the distress behaviors,⁵¹ improving communication with residents,^{38,56} developing care plans,^{38,56} and using skills to reduce restraint and medication use.⁴³

Reported training strategies included coaching,^{51,61} supervision,³⁸ role play,⁵⁶ case vignettes,⁵⁶ and guidance groups to apply skills.⁴³ All interventions were delivered in person. Interventions were generally delivered to all HCWs employed at the nursing home or assisted living facility.^{38,41,43,51,56} Intervention dose ranged from a single 2-hour session⁴¹ to a 2-day seminar followed by 6 monthly group meetings.⁴³ The majority of studies delivered the intervention through multiple sessions,^{38,43,51,56,61} and 4 included supervision or coaching after the education intervention.^{38,43,51,56} While most studies did not report the training and credentials of the interventionist, 1 study did report that the training was provided by a clinical psychologist with geriatric mental health experience.⁵⁶ The studies in this section did not refer to a theoretical model used to guide the intervention.

All but 1 study were found to have some concerns for risk of bias (ROB) with 1 low ROB. Common sources of concern for ROB for these studies include issues with randomization, missing patient data, deviations from the intended intervention, and outcome measurement.

Patient-Level Outcomes

Distress behaviors

Agitation (CMAI). Three studies reported patient agitation using the CMAI and none found a significant improvement. One French study of 16 nursing homes provided education on dementia and distress behaviors, as well as pocket training cards offering practical advice on how to handle such behaviors followed by ongoing feedback sessions over 2 months. The study found no significant difference in total CMAI score at 8 or 20 weeks compared to baseline ([Appendix](#)). A second study of 24 Norwegian care homes delivered an education program (MEDCED)⁴³ intended to identify alternative interventions to restraints to manage distress behavior followed by guidance groups over 5 months also did not find a significant difference in CMAI between groups at 7 months. Of note, this study reported a statistically significant reduction in restraint use across both intervention and control groups. The third study evaluated a 6-session manual-based intervention (MARQUE) followed by monthly supervision meetings and did not find a significant reduction in agitation at 8 months (adjusted mean difference [MD] = -0.40, 95% CI [-3.89, 3.09]). A fourth study evaluated a 2-day workshop of a dementia-specific training program (STAR)⁵⁶ followed by 4 individual follow-up sessions over 2 months in 15 assisted living residences. This study reported a significant reduction in distress behaviors at 8 weeks using the agitated behavior in dementia scale (MD = -3.8 vs -0.5; $p < 0.001$).

Neuropsychiatric Inventory (NPI). Four studies assessed intervention effect on patient distress behaviors using the NPI total score. Two studies with longer-term outcomes found no intervention effect, while 2 with shorter-term outcomes found that the intervention reduced patient distress behaviors in the short run. An evaluation of a 120-minute staff training on behavioral and psychological symptoms of dementia at 17 residential care facilities in Japan significantly reduced total NPI score at 30 days compared to standard care ($p = 0.029$), though the method used for calculating the total NPI score appears atypical. The STAR study found a significant reduction in total

NPI at 8 weeks ($p = 0.031$). The longer-term MEDCED study found a nonsignificant difference from baseline to 7 months between arms (5.7 vs 1.8; $p = 0.207$). Similarly, the MARQUE study³⁸ reported a nonsignificant adjusted mean difference of -0.84 (95% CI [-5.51, 3.84]) at 8 months. Finally, 2 studies reported NPI subscales other than agitation without a total score.

Quality of life

Two studies reported patient quality of life and neither found an intervention effect. The 2-month French study provided dementia education, pocket training cards, and ongoing feedback sessions and found no difference at 20 weeks. The MARQUE intervention found no improvement in quality of life at 8 months either as rated by staff (MD = 0.09, 95% CI [-3.87, 4.05]) or by a family carer (MD = -0.03; 95% CI [-2.87, 2.82]).

Antipsychotic use

Two studies reported changes in medication use and neither found an intervention effect. The 2-month French study reported no change in mean number of psychotropic drugs (which included anticholinergics, memantine, antipsychotics, anxiolytics, and antidepressants) at baseline and at 20 weeks for intervention and control groups. The MEDCED intervention designed to reduce restraint use led to a small, nonsignificant increase in use of antipsychotics from 14.1% to 17.1% in both groups at 7 months.

Table 3. Summary of Evidence for Health Care Worker-Focused Intervention Activities

Number of Studies	6 studies
ROB 2 Risk of Bias	Low (N = 1); some concerns (N = 5)
Study Year Range	2005 to 2019
Number of Participants	1,689
Outcome Measured	
CMAI	3 interventions (1 inadequate data; 2 no significant effect)
NPI	4 interventions (1 inadequate data; 2 no significant effect; 1 significant benefit)
Antipsychotic Use	3 interventions (2 inadequate data; 1 no significant effect)
Quality of Life	2 intervention (2 no significant effect)

Abbreviations. CMAI=Cohen-Mansfield Agitation Index; NPI=Neuropsychiatric Inventory; ROB=risk of bias.

Staff Outcomes

Two of the 3 studies that assessed HCW-focused-only interventions used subscales of the caregiver burnout instrument (Maslach Burnout Inventory, MBI).^{38,41} The MBI has 3 subscales (emotional exhaustion, personal accomplishment, depersonalization). The 2 studies measured differences in scores at 30 days and 8 months, respectively, but neither found a difference between the intervention and control groups. The third study⁵⁶ evaluated the STAR intervention (eg, workshops and follow-up sessions on activators and consequences of behavioral distress) in assisted living facilities and measured “sense of competence and satisfaction with patient care” and supervision and coworker relations over an 8 week follow-up period, but also did not find a difference in mean scores.

Utilization Outcomes

No included studies examined utilization outcomes.

Health Care Worker and Patient-Focused Intervention Activities

Intervention Characteristics

Seventeen studies examined interventions directed at both direct patient care activities delivered by HCWs and HCW-focused trainings and role changes (Table 4).^{34,37,39,40,42,45,48,49,53,55,58,62,81-83} Two of the 17 examined this combination of strategies across multiple study arms.^{49,60,84} Studies were conducted in the Netherlands,^{39,45,48,83} UK^{40,55,62,81} USA,^{53,58} Australia,^{82,84} Canada,³⁷ Germany,⁴⁹ and Norway.^{34,42,60}

Five studies examined different outcomes among different patient populations using similar principles inspired by WHELD,^{40,81} and dementia care mapping.⁸⁴ All interventions took place in nursing home settings and, with the exception of 1 study,³⁴ all examined outcomes exclusively in patients with dementia.

All studies implemented at least 2 distinct intervention activities, and 2 studies implemented 5 activities.^{39,42} The most common intervention activity across studies was assessing resident dementia and behaviors to inform individualized care plans.^{34,37,39,40,42,45,48,49,53,58,62,81-83} Other intervention activities that targeted patients included detection of distressed behaviors,^{34,39,42,45,84} medical management,^{37,39,40,42,48,53,55,58,81,83} and ongoing care for distressed behaviors through symptom monitoring, and, in some cases, monitoring how well the care plan was working.^{39,40,42,48,53,58,83} Most medical management activities focused on a review of resident medications, primarily antipsychotics.

The most common intervention activity focused directly on HCWs was education about a specific intervention or approach to reduce distressed behaviors.^{34,37,40,42,45,48,49,51,55,58,60,62,81,82,84} Topics ranged from how to implement a specific care program (eg, Coming to Grips with Challenging Behavior Care Program,⁴⁵ dementia care mapping,^{48,60,84} and patient-centered care^{40,55}) to how to perform case conferences,³⁴ how to develop an individualized care plan,⁶² how to assess distressed behaviors using a specific tool,^{37,49} and how to improve communication skills with residents (social interaction arm).⁸¹ Several studies also tested the effect of general education for staff focused on dementia and distressed behaviors.^{34,37,39,45,49,51,84} Six studies also incorporated changes to how staff functioned as a team. For example, several studies implemented multidisciplinary case conferences or care meetings.^{34,42,45,60} Another study developed a process to create care plans that included input from nurse's aides and other staff.⁵³ Two studies trained staff to take on new roles.^{34,60}

Among studies that reported intervention delivery mode, all but 1 had an in-person component,^{34,37,39,42,45,49,53,55,58,60,81-84} several had a telephone or teleconference component,^{37,82,84} and 1 was internet based.⁶² In 1 study, trainings were delivered by a multidisciplinary team comprised of nurses, physicians, and psychologists^{39,49}; other interventions were delivered by trained (though credentials were unspecified) "therapists,"^{40,62,81} clinical social workers,⁵³ patient-centered care experts,⁸² trained members of the research team,^{34,37,55,60,84} nurses,^{34,58} and dementia care mapping experts.^{48,60} Generally a multidisciplinary team of nursing home staff were trained in each study, including physicians,^{37,39,42,45,53,81,83} psychologists,^{39,45,53} social workers,⁵³ nurses,^{34,37,39,42,45,53,58,60,82-84} care managers,^{40,82,84} nursing home staff,^{40,45,48,49,55,60,81-84} residents,⁴⁰ and other staff (eg, physical

therapists, occupational therapists, nutritionists, pharmacists^{37,53,82}). Targeted professionals were most frequently nurses, nursing home staff, and physicians.

Training approaches and duration differed between studies. The most intensive training lasted 2 days a week for 10 months,⁵⁵ and the study that offered the least amount of training provided a 3-hour lecture.⁶⁰ Many studies used a combination of an initial training activity and follow-up supervision, coaching, or case conferences conducted in-person or via telephone.^{34,37,40,42,55,58,82,84} Some studies also offered different tiers of training to staff. For example, several studies provided a baseline training for multiple staff and additional training in the intervention methodology to onsite champions or intervention teams.^{40,42,49,60} In a few studies, only champions or site implementers received any training.^{34,48,53,81,84} Several studies mentioned theoretical underpinnings for the intervention, including person-centered care,^{40,42,48,81} normalization process theory,⁶² DICE models,³⁷ cognitive behavioral theory,⁴² and the VIPs framework.⁶⁰

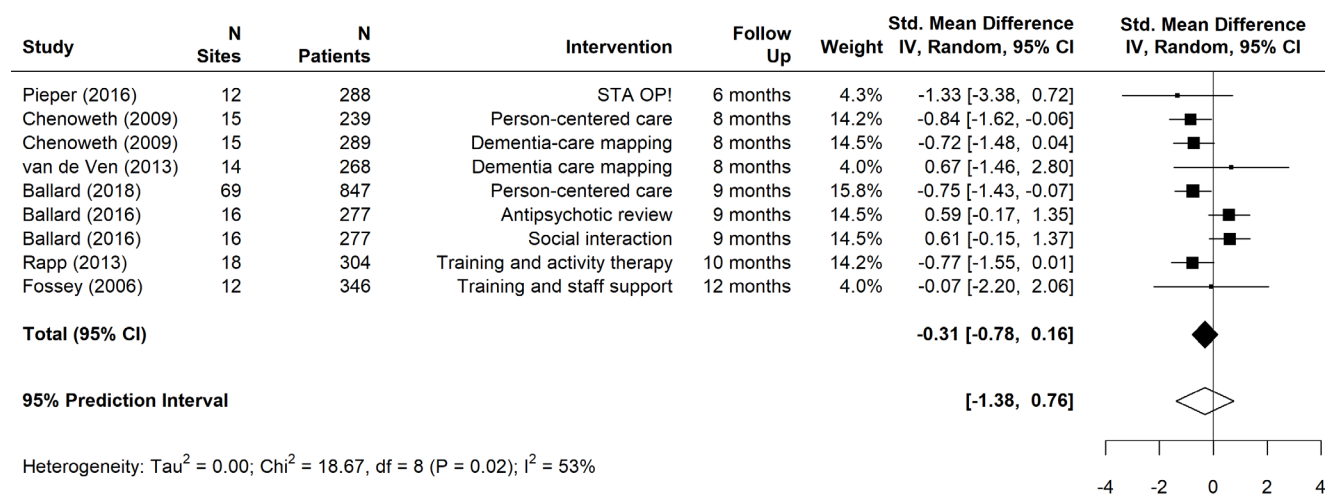
Patient-Level Outcomes

Distress behaviors

Agitation (CMAI). Eleven studies (Table 4 and [Appendix](#)) assessed reductions in agitation using the CMAI.^{40,42,45,48,49,55,62,81-84} Of these, 5 reported reductions in agitation.^{40,42,45,49,84} Specifically, the WHELD intervention,⁴⁰ which combined staff training, social interaction, and guidance on the use of antipsychotic medications in 69 UK care homes across a 9-month period, found significant reduction in agitation compared to treatment as usual (MD = -4.27, 95% CI [-7.39, -1.15]). In the CADRES study,⁸⁴ which compared dementia care mapping and a person-centered care intervention to usual care, CMAI scores were lower in both intervention conditions over an 8-month period (dementia care: MD = 10.9, 95% CI [0.7 to 21.1]; person-centered care: MD = 13.6, 95% CI [3.3, 23.9]). Across a 10-month period, patients with dementia enrolled in the VIDEANT intervention⁴⁹ (consisting of staff training, support, and activity therapy) exhibited significantly less agitation (aMD = 6.24, 95% CI [2.03, 14.14]) than patients in a usual care group. For dementia residents in the Grip on Challenging Behavior care program,⁴⁵ their CMAI change scores were significantly improved compared to the pre-intervention control period (stepped-wedge design) between successive assessments (-2.5 points, 95% CI [-4.3, -0.6]). However, no significant effects were found for the control-to-intervention group compared with those who remained in the control group (0.0 points, 95% CI [-2.3, 2.4]). Last, in a stepwise multicomponent intervention (STA OP!) delivered to nursing home patients with advanced dementia, an overall reduction in agitation was observed compared to usual care from baseline to 6 months (MD = -4.07; 95% CI [-7.9, -0.24]). Finally, the Targeted Interdisciplinary Model for Evaluation and Treatment of Neuropsychiatric Symptoms (TIME) study reported significantly reduced agitation at 8 weeks (SMD = 0.23, $p = 0.026$) and 12 weeks (SMD = 0.29, $p = 0.006$) compared with usual care.⁴²

Interventions in the remaining 6 studies did not significantly reduce agitation^{48,55,62,81-83} and 2 showed a nonsignificant reduction in agitation.^{81,82}

In a meta-analysis of 7 studies (including 9 intervention conditions), health care worker- and patient-focused interventions did not lead to a significant reduction in patient agitation (SMD = -0.31, 95% CI [-0.78, 0.16]). This result may be attributable to substantial variation in effects across studies (95% PI [-1.38, 0.76]), including across studies of the same specific intervention (Figure 1).

Figure 1. Agitation (CMAI) Results

Four studies assessed reductions in agitation using CMAI subscales.^{39,53,60,62} The subscales examined included aggressive,^{39,53} agitation,⁶⁰ physical,^{53,62} and verbal^{39,53,62} domains. Only 1 study of the 4 indicated significant reductions in physically nonaggressive behaviors. Specifically, this study⁵³ examined the effectiveness of an advanced illness care team (AICTs) intervention for nursing home residents living with advanced dementia. The AICTs intervention focused on medical, meaningful activities, psychological, and behavioral domains. Compared to usual care, nursing home residents experienced a significant decrease in physically nonaggressive behaviors across an 8-week period ($p < .05$).

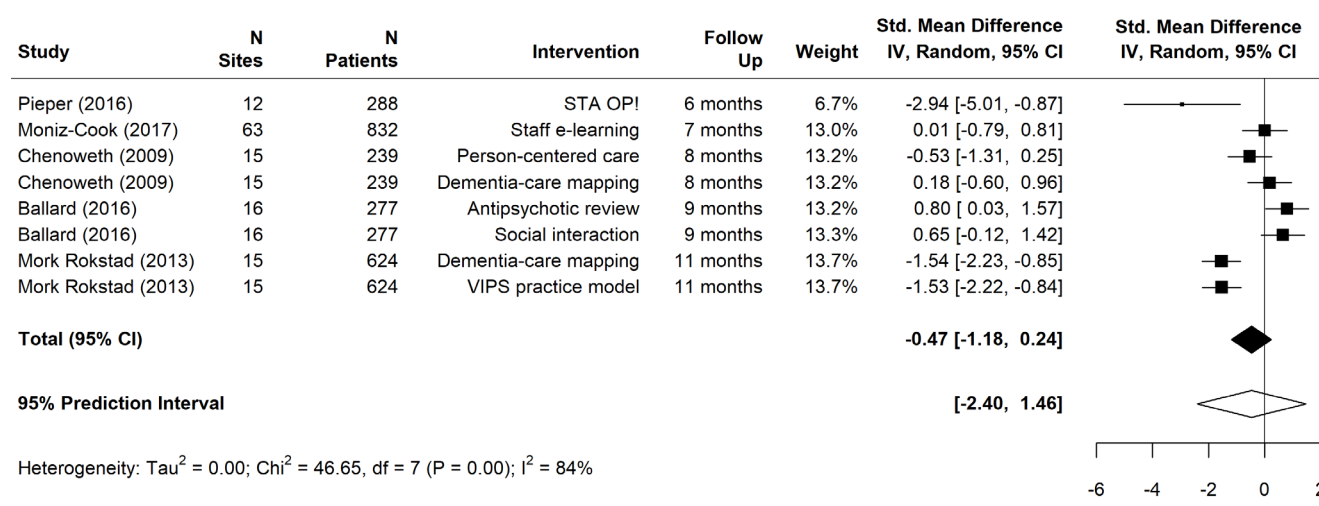
Neuropsychiatric symptoms (NPI). Nine studies examined intervention effects in reducing overall neuropsychiatric behaviors and symptoms using the NPI total scores.^{34,42,45,48,60,62,81,83,84} Three studies^{60,81,83} found significant intervention effects. An evaluation of the impact of antipsychotic review, social interaction, and exercise interventions on neuropsychiatric symptoms at 9-month follow-up indicated significant symptom improvement favoring antipsychotic review (MD = 7.37, 95% CI [1.53, 13.22]) and a social interaction intervention (SMD = 5.45, 95% CI [0.12, 10.77]).⁸¹ The STA OP! study⁸³ also reported an improvement from baseline to 6 months (adjusted MD = -3.57 (95% CI [-6.30, -0.84])). The effects of a person-centered dementia intervention and the VIPS practice model (VPM) compared to education of the nursing home staff about dementia only were significant at 10 months (SMD = -2.7, 95% CI [-4.6, -0.7], SMD = -2.4, 95% CI [-4.1, -0.6], respectively).⁶⁰ In addition, 1 evaluation of a dementia care mapping intervention found that NPI scores decreased in the usual care arm but not in the intervention arm ($p = 0.022$).

Of the other 5 intervention arms from 4 studies, 1 found a non-significant reduction in NPI score with delivery of an interdisciplinary model (TIME; SMD = -0.25, $p = 0.053$). Three found no intervention effects.^{34,45,62} The fifth study did not report a direct statistical comparison, but mean scores over follow-up showed a clinically significant reduction in NPI in the patient-centered care arm but not in the dementia-care mapping arm. For 3 of these, the NPI was the primary outcome for the study.^{34,42,62} Overall, the time period of these interventions ranged between 4 and 20 months.

Eight interventions from 5 studies were included in a meta-analysis that indicated a moderate, though nonsignificant, reduction in neuropsychiatric behaviors (SMD = -0.47, 95% CI [-1.18, 0.24]) at 6-11

months following HCW and patient-focused interventions. The prediction interval for this estimate was -2.40 to 1.46 (Figure 2), suggesting notable heterogeneity across studies.

Figure 2. Neuropsychiatric Symptoms (NPI) Results



A total of 6 studies examined reduction in neuropsychiatric symptoms using NPI subscales.^{34,39,42,48,58,62} The subscales covered affective,³⁴ agitation,^{34,39,48} agitation/aggression,^{39,42} apathy,³⁴ distress, frequency, and incidence,⁶² psychosis,³⁴ and severity⁶² domains. Only 2 studies^{34,42} reduced agitation/aggression and apathy, respectively. In 1 Norwegian study of 33 nursing homes from 20 municipalities,⁴² the TIME intervention was implemented to target moderate-to-severe agitation compared to a control group. A significant between-group difference was evidenced in reducing agitation/aggression at 8 weeks (SMD = 0.32, $p = 0.03$) and at 12 weeks (SMD = 0.47, $p = 0.002$). In a secondary Norwegian study,³⁴ the implementation of a modified comprehensive geriatric assessment alongside regular case conferencing reduced apathy symptoms among nursing home residents at 3 months (SMD = -0.5, 95% CI [-0.9, -0.05]).

The 4 studies that found no or nearly zero intervention effects (compared to usual care, control, or a brief education arm) on reducing NPI agitation subscale scores included a multidisciplinary intervention focused on education and management of neuropsychiatric symptoms,³⁹ dementia care mapping,⁴⁸ e-learning,⁶² and modified comprehensive geriatric assessment and case conferences.³⁴

Other distress behaviors

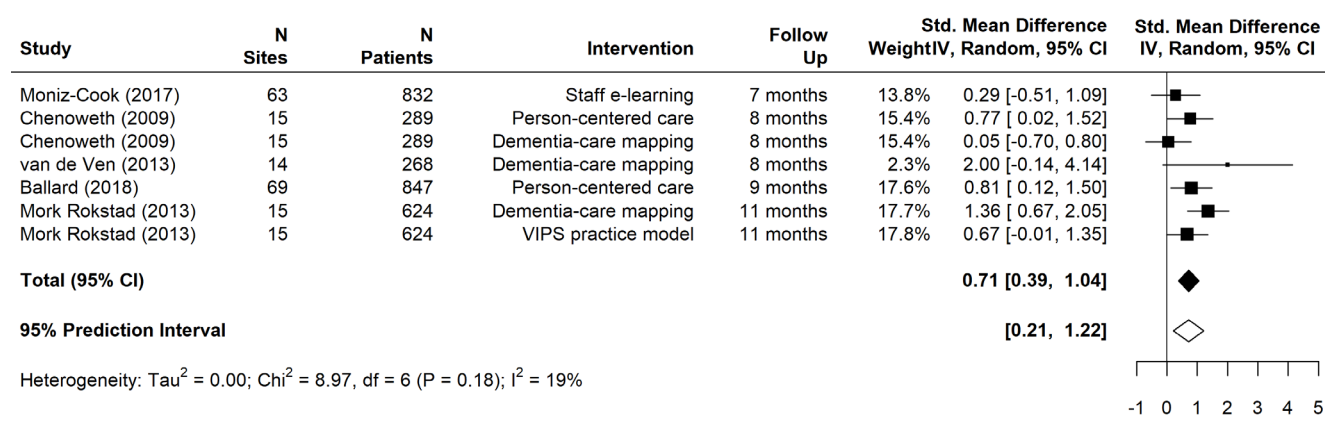
Three studies reported other challenging behaviors^{37,58,62} and none found an intervention effect. The behaviors examined included aggression/wandering behavior as assessed by worsening behavioral symptoms using the Resident Assessment Instrument-Minimum Dataset v 2.0 (RAI-MDS),³⁷ severity, frequency, and increase of resident behavior using the Challenging Behavior Scale (CBS),⁶² and the BEHAVE-Alzheimer's Disease scale.⁵⁸ An educational in-service intervention consisting of evidence-based tools to assess and monitor neuropsychiatric symptoms in dementia with monthly interprofessional team meetings found no effect at 12 months (OR = 0.96, 95% CI [0.8, 1.14]).³⁷ An e-learning intervention found no effects to reduce the incidence of difficult, frequent, or behavioral symptoms in dementia from baseline to 4 and 7 months.⁶² The Serial Trial Intervention (STI) study⁵⁸ focused on the assessment and management of people with late-stage dementia. Compared to control, no significant group differences were found in reducing wandering behaviors at 4 weeks ($p = 0.50$).

Quality of life

A total of 9 studies examined intervention effects to improve quality of life among patient- and health care worker-level interventions.^{33,40,42,48,55,60,62,82,84} Of these studies, 4 improved either overall quality of life using the DEMQOL-Proxy, EQ-5D index (self-report), the Quality of Life in Late-stage Dementia, the QUALID,^{40,42,60} or a facet of quality of life like restless tense behavior as assessed by the QUALIDEM observation tool.³³ The WHELD (staff training and in person-centered care) intervention⁴⁰ compared to treatment as usual found a significant mean difference in improving participant quality of life (MD = 2.54, 95% CI [0.81, 4.28]). The TIME intervention compared to a brief education intervention at 12 weeks (and not at 8 weeks) found a between-group difference in quality of life among those with late-stage dementia (SMD = 0.17, $p = 0.044$). Last, in a dementia care mapping (DCM) or a VIPS practice model (VPM) compared to control at 10 months, quality of life scores favored the DCM versus control arm (SMD = -3.0, 95% CI [-5.5, -0.6]). In the STA OP! intervention study³³ compared to usual care, restless tense behavior symptoms (*ie*, facets of quality of life) improved at 3 months (95% CI [0.36, 1.54]). However, at 6 months the usual care group fared better in restless tense behavior symptoms (95% CI [-1.60, -0.36]).

Seven interventions from 5 studies were included in a meta-analysis measuring quality of life at 7 to 11 months after baseline and found a significant medium to large beneficial effect after HCW-/patient-focused interventions with an SMD of 0.71 (95% CI [0.39, 1.04]; Figure 3). Of note, the prediction interval for this effect estimate suggests marked heterogeneity of treatment effect, ranging from a small to large effect.

Figure 3. Quality of Life Results



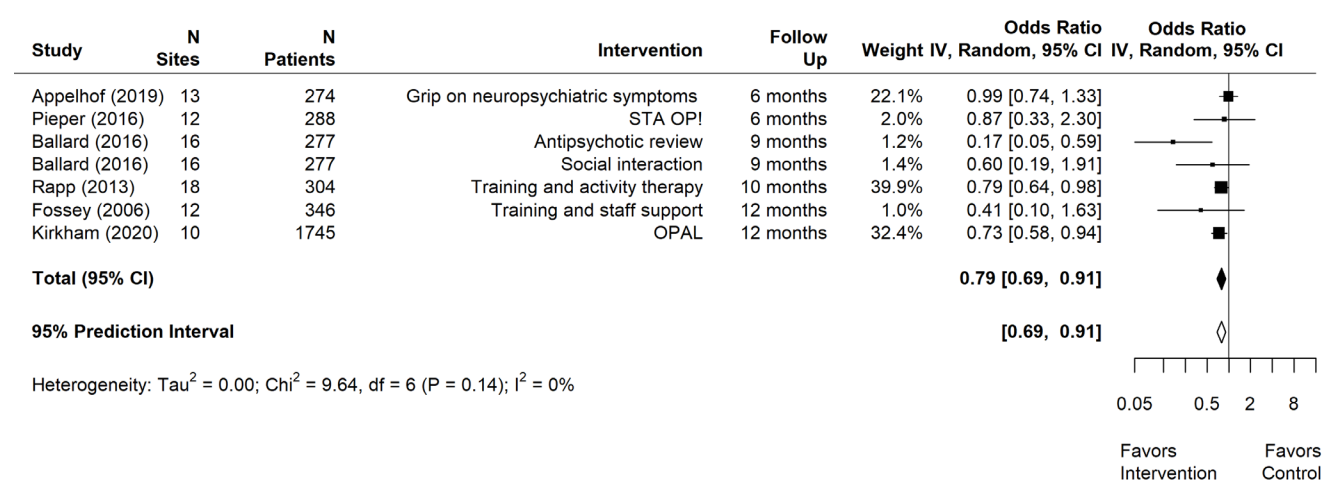
Antipsychotic use

Eight studies assessed effects on antipsychotic medication use (Figure 4).^{37,39,40,45,62,81,83,84} Trials used a cluster-randomized design,^{62,81,83} stepped-wedge design,^{37,39,45} or RCT design.^{40,84} Four of the 8 studies reported changes in reducing antipsychotic medication use.^{37,45,62,81} Seven interventions from 6 studies were included in a meta-analysis and found a reduced odds of antipsychotic use at 6 to 12 months with HCW-/patient-focused interventions (OR = 0.79, 95% CI [0.69, 0.91]).

In a 9-month study⁸¹ that randomized patients to antipsychotic review, social interaction, or exercise alone or in combination, results suggest that antipsychotic review versus no antipsychotic review significantly reduced antipsychotic medication use (OR = 0.17, 95% CI [0.05, 0.59]). None of the other interventions (*eg*, social interaction vs no antipsychotic review; OR = 0.6, 95% CI [0.19, 1.91])

had a significant impact on medication use. The DEMCare e-learning intervention⁶² based on a functional analysis of dementia behaviors was compared to usual care, revealing a small nonsignificant reduction in medication use (chi square > 0.999) from baseline to 7-month follow-up. A multi-component intervention³⁷ that included education in-service, monthly interprofessional team meetings, and evidence-based tools to address neuropsychiatric symptoms reported a reduction in odds of inappropriate antipsychotic prescribing from baseline to 12-month follow-up (OR = 0.73, 95% CI [0.58, 0.94]). In a 20-month study examining the Grip on Challenging Behavior care program,⁴⁵ odds of antipsychotic prescribing were significantly lower compared with control (OR = 0.54, 95% CI [0.37, 0.80]). Similarly, in an enhanced psychosocial care intervention offering training and staff support in the care of patients with dementia,⁵⁵ there was a significant 19.1% reduction in neuroleptic prescription use in the intervention group compared with control (95% CI [0.5%, 37.70%]). Finally, a trial of the VIDEANT intervention (consisting of staff training, support, and activity therapy) found that nursing home residents with dementia in the intervention group compared to controls received fewer neuroleptics (OR 0.79, [95% CI 0.64, 0.98]) within a 10-month period.⁴⁹

Figure 4. Antipsychotic Use Results



Other medication use

In addition to the above, reductions in other medications such as anxiolytics, psychotropics, neuroleptics, and ChEI were examined in 4 studies.^{39,45,49,55} The BEYOND-II trial³⁹ found no evidence of reduced use of anxiolytics (regression coefficient = -0.033, 95% CI [-0.095, 0.029]) nor any psychotropic medication (regression coefficient = -0.023, 95% CI [-0.09, 0.044]) from baseline to 6 months. Similarly, in an enhanced psychosocial care intervention offering training and health care teams support in the care of patients with dementia,⁵⁵ reductions in psychotropics were nonsignificant with a weighted mean difference of -5.9 (95% CI [-27.2, 15.5]). No support for reduction in prescribed anxiolytics was found (*ie*, odds ratios were not significantly lower) after introducing the Grip on Challenging Behavior care program⁴⁵ compared to control. Table 4 presents results for the HCW- and patient-focused interventions.

Table 4. Summary of Evidence for Health Care Worker and Patient-Focused Intervention Activities

Number of Studies	17 studies
ROB 2 Risk of Bias	Low ($N = 1$); some concerns ($N = 15$), high ($N = 1$)
Study Year Range	2006 to 2022
Number of Participants	6,377
Outcome Measured	
CMAI	11 interventions (2 inadequate data; 5 no significant effect; 4 significant benefit)
NPI	10 interventions (1 inadequate data; 4 no significant effect; 3 significant benefit; 2 significant detrimental effect)
Antipsychotic Use	9 interventions (1 inadequate data; 6 no significant effect; 2 significant benefit)
Quality of Life	9 interventions (7 no significant effect; 4 significant benefit)

Abbreviations. CMAI=Cohen-Mansfield Agitation Index; NPI=Neuropsychiatric Inventory; ROB=risk of bias.

Staff Outcomes

Two studies^{48,62} measured staff outcomes; there were no common measures (measures included quality of life as measured by the EQ-5D, attitudes toward people with dementia, and perceived self-efficacy in caring for people with dementia, MBI, stress symptomology, staff job satisfaction). Neither study demonstrated an improvement in staff outcomes at 4 to 8 months.

Utilization Outcomes

No included studies examined utilization outcomes.

Health Care Worker, Patient, and Environment-Focused Intervention Activities

Intervention Characteristics

Three studies conducted in the United States tested similar interventions targeting patients, staff, and environment^{35,36,44} which were based on the social ecological model and social cognitive theory (Table 5). Intervention activities focused on HCWs included skills and implementation training that focused on providing proactive, function-focused care. All 3 interventions also targeted patient behaviors by training staff to develop tailored care plans for residents. One intervention also provided ongoing care to address resident distress by evaluating the effect of the care plan and instituted multidisciplinary team meetings.³⁶ The interventions also included assessments of the physical settings and a review of residential care policies to inform modifications to the environment that would optimize function and physical activity for residents. All interventions were provided to staff in person by a trained nurse. Staff targeted by the training included nurses, social workers, and activity staff.^{35,36,44} One study also included families and residents in the training.⁴⁴ Training was fairly intensive, ranging from 10 hours per week for 12³⁵ or 6 months⁴⁴ to 2 hours per month for 12 months.³⁶

Patient-Level Outcomes

Distress behaviors

Agitation (CMAI). Three studies reported patient agitation using the CMAI; 2 of these studies did not find a significant improvement. One cluster-randomized trial consisted of 4 assisted living facilities, 96 patients, and 76 nursing staff delivering the Function Focused Care Intervention for the Cognitively Impaired (FFC-CI).⁴⁴ The FFC-CI intervention is a 4-component intervention that teaches staff how to engage with patients with dementia in activities that improve function with the aim to reduce behavioral symptoms. Compared to a control group at 3 and at 6 months, no significant reductions in agitation were found as measured by CMAI ($p = 0.18$ and $p = 0.49$, respectively). A second study of 12 US-based nursing homes delivered a Function and Behavior Focused Care for the Cognitively Impaired (FBFC-CI) intervention compared to an educational control arm.³⁵ The FBFC-CI is similar to the FFC-CI, with a joint focus on function and behavior care goals. There were no significant differences in agitation from baseline to 12 months, with a mean difference of -0.06 (95% CI [-2.41, 1.69]). The third study³⁶ evaluated a 12-month, 4-component intervention facilitated by a research nurse who meets with a facility team champion and stakeholder for 2 hours per month, Function Focused Care for Assisted Living Using the Evidence Integration Triangle (FFC-AL-EIT), compared to an education-only arm. Between baseline and 4 months, there was a statistically, though likely not clinically, significant decrease in agitation in the FFC-AL-EIT group compared to the control (treatment group baseline of 14.79 decreased to 14.64 and the control group increased from 14.55 to 14.88, $p = 0.045$). At 12 months this difference was no longer significant ($p = 0.17$).

Antipsychotic use

One study that focused on the delivery of a FBFC-CI intervention compared to an educational control found no decrease in antipsychotic use at 12 months, mean difference -0.44 (95% CI [-2.27, .64]).³⁵

Staff Outcomes

The single study that examined an intervention with HCW, patient, and environment activities used staff-level outcomes related to self-efficacy and job satisfaction.⁴⁴ There was no difference in scores at 3 or 6 months.

Utilization Outcomes

No included studies examined utilization outcomes.

Table 5. Summary of Evidence for Health Care Worker, Patient, and Environment-Focused Intervention Activities

Number of Studies	3 studies
ROB 2 Risk of Bias	Some concerns ($N = 3$)
Study Year Range	2015 to 2021
Number of Participants	491
Outcome Measured	
CMAI	3 interventions (3 no significant effect)
Antipsychotic Use	1 intervention (1 no significant effect)

Abbreviations. CMAI=Cohen-Mansfield Agitation Index; ROB=risk of bias.

Harms (All Intervention Types)

Seven studies reported on patient harms in long-term residential or inpatient health care settings (Table 6).^{37,52,55,57,62} Studies included a range of adverse events, such as falls, hospitalizations, death, and composite endpoints of multiple incidents. Across studies, falls were the most commonly reported adverse event. In a randomized controlled trial of neuroleptic prescription reduction among British nursing home patients, there was no significant difference in the number of patients experiencing falls in the intervention group (91/175, 52%) versus the usual care group at 12 months (90/165, 54%), with a weighted mean difference of 2.6 (95% CI [18.7, 23.8]). A stepped-wedge trial to reduce inappropriate prescribing of antipsychotics in long-term care found no significant difference in the baseline (15.1; SD = 1.3) and 12-month (15.2; SD = 0.8) mean number of falls in the prior month (OR = 1.00, 95% CI [0.83, 1.21]). In an Australian pragmatic cluster-randomized trial of person-centered care, dementia care mapping, and usual care, the proportion of patients with falls decreased with dementia care mapping (change from baseline = -7%) but increased somewhat with person-centered care (change from baseline = 2%). At follow-up, 10% fewer falls were reported among patients receiving dementia care mapping compared with usual care ($p = 0.02$). Reported proportions were adjusted for clinical and demographic characteristics, but importantly, the baseline proportion of patients with falls was much lower in the usual care group than in the intervention groups. This may have attenuated the difference in fall rates between dementia care mapping and usual care groups.

Death was an adverse event or secondary outcome in 2 studies. The first was a cluster-randomized factorial controlled trial evaluating social interaction and/or a review of antipsychotic medication use that was conducted in people with dementia in 16 nursing homes across the United Kingdom and reported death as a secondary outcome. Patients who received the medication review had reduced mortality compared to those who did not receive a review, though this reduction was not statistically significant (OR = 0.67, 95% CI [0.39, 1.14]). An increase in social interaction was associated with significantly reduced mortality (OR = 0.26, 95% CI [0.13, 0.51]). A clustered, randomized implementation trial in 18 nursing homes in Berlin, Germany, implemented guidelines to reduce agitation and review medication use. During the study, 17 residents in the intervention group and 12 residents in the control group died ($p = 0.57$).

Hospitalization was also reported as an adverse event in the German study. 24 intervention group patients and 22 control group patients were hospitalized ($p = 0.97$). In a nonpharmacologic intervention in French nursing homes, a statistically significant difference in mean baseline hospitalizations was observed between the intervention (40, SD = 23) and control (49, SD = 37.1) groups ($p < 0.05$), but there was no significant difference noted at 8 or 20 weeks.

Finally, 2 studies used composite measures to assess adverse events. First, a cluster-randomized trial in the United Kingdom of a staff education and decision support system intervention in care homes used the composite outcome of serious adverse events (*eg*, death, life-threatening event, hospitalization, significant disability or incapacity, medically significant event, alleged or suspected abuse or neglect). Eighty participants in the e-learning intervention experienced a serious adverse event (80/420, 19%), compared to 55 out of 412 (13%) usual care patients. The authors did not perform a statistical analysis between the groups. Second, the Australian trial of person-centered care, dementia care mapping, and usual care also reported a composite endpoint of incidents, capturing falls, injuries, drug errors, and behavioral events. There was no statistically significant difference ($p = 0.89$) when comparing over time across the 3 arms: baseline (PCC 0.43%; DCM 0.40%; UC 0.25%), 4 months (PCC 0.53%; DCM 0.49%; UC 0.37%), and 8 months (PCC 0.44%; DCM 0.46%; UC 0.37%). The authors also separated

the components of the composite endpoint to look at hospitalizations due to falls; however, they determined there were so few incidents that they did not report the number of incidents or complete statistical analysis.

Table 6. Results of Studies Reporting Harms

Study N Clusters N Patients Primary Outcome	Outcome Direction Time Point	Results
Ballard, 2016 ⁸¹ 16 nursing homes 277 patients randomized Primary outcome: CMAI	Death Lower = better 9 months	Antipsychotic review vs no antipsychotic review OR = 0.67 (95% CI [0.39, 1.14]) <i>p</i> value: 0.15 Social interaction vs no social interaction OR = 0.26 (95% CI [0.13, 0.51]) <i>p</i> value: <0.001
Chenoweth, 2009 ⁸⁴ 15 care sites 289 patients randomized Primary outcome: CMAI	Incidents (falls, injuries, drug errors, and behavioral events) Lower = better 4 months 8 months	Baseline Person-centered care: 0.43% Dementia care mapping: 0.40% Usual care: 0.25% 4 months Person-centered care: 0.53% Dementia care mapping: 0.49% Usual care: 0.37% 8 months Person-centered care: 0.44% Dementia care mapping: 0.46% Usual care: 0.37% Arm x time <i>p</i> value: 0.89
Chenoweth, 2009 ⁸⁴ 15 care sites 289 patients randomized Primary outcome: CMAI	Falls Lower = better 4 months 8 months	Baseline Person-centered care: 0.32% Dementia care mapping: 0.27% Usual care 0.13% 4 months Person-centered care: 0.37% Dementia care mapping: 0.24% Usual care 0.27% 8 months Person-centered care: 0.34% Dementia care mapping: 0.20% Usual care: 0.30%

Study N Clusters N Patients Primary Outcome	Outcome Direction Time Point	Results
		Mean difference between person-centered care and usual care: 0.15 (95% CI [0.02, 0.28]), <i>p</i> value: 0.03
		Mean difference between dementia-care mapping and usual care: 0.24 (95% CI [0.08, 0.4]), <i>p</i> value: 0.02
		3 arms x time <i>p</i> value: 0.13
Fossey, 2006 ⁵⁵ 12 nursing homes 346 patients randomized Primary outcome: neuroleptic use	Falls Lower = better 12 months	Training and staff support intervention: 19/175 Usual care: 90/165 Weighted mean difference between training and staff support and usual care: 2.6 (95% CI [-18.7, 23.8]), <i>p</i> value: 0.27
Kirkham, 2020 ³⁷ 10 long-term care facilities Primary outcome: antipsychotic use	Falls in the last 30 days Lower = better 12 months	OPAL intervention baseline mean: 15.1 (SD = 1.3) OPAL intervention at 12-month follow-up mean: 15.2 (SD = 0.8) OR = 1.00 (95% CI [0.83, 1.21]), <i>p</i> value: 0.98
Moniz-Cook, 2017 ⁶² 63 care homes 832 patients randomized Primary outcome: NPI	Serious adverse events (<i>eg</i> , death, life-threatening event, hospitalization, significant disability or incapacity, medically significant event, alleged or suspected abuse or neglect) Lower = better 4 months 7 months	e-learning intervention: 80/420 Usual care: 55/412

Intervention Complexity Across KQ1 (iCAT_SR)

In addition to categorizing the intervention characteristics by intervention activity target, we also rated intervention complexity across intervention types (*eg*, staff only, patient and staff only) (Table 7). As a reminder, our team assessed studies using iCAT domains that were most relevant to the purpose of this systematic review.²⁶ The domains that we used to assess intervention complexity included number of activities, number of actions, number of organization categories, degree of tailoring, degrees of interactions, and nature of the causal pathway. Broadly, across all KQ1 studies, many interventions included more than 1 active component with intervention actions directed at changing more than 1 HCW behavior. For example, Appelhof et al³⁹ tested the BEYOND-II study for young-onset dementia that included 2 active components: staff education and a 5-step care program to manage distress behaviors. The BEYOND-II intervention aimed to (1) increase HCW ability to work in

multidisciplinary teams, (2) train HCWs to design, implement, and evaluate tailored treatment plans for residents, and (3) reduce resident distress behaviors.

In addition, many interventions included a high level of interaction between intervention activities. The Appelhof et al study is an example of a study judged to have a high level of interaction between activities because the steps in the care program to reduce resident distress behaviors were interdependent. As part of the care program, staff observed residents to detect distress behaviors, nurses analyzed these observations to identify unmet needs, and then nurses, physicians, and psychologists met in a multidisciplinary case conference to develop a tailored treatment plan for each resident. Staff then evaluated whether the care plan reduced distress behaviors; if distress behaviors were not reduced, the process was repeated until the team developed a treatment plan that mitigated distress behaviors.

Tested interventions were also fairly flexible indicated by moderate to high degrees of tailoring, often through individualized treatment plans (eg, Appelhof, 2019³⁹). Generally, we assessed studies with more intervention targets to also have higher degrees of tailoring. Interventions displayed the least amount of complexity in the nature of the causal pathways. Specifically, most interventions acted on a clear and short-term causal pathway between the intervention and outcome; only 2 interventions were rated as having a causal pathway that included 3 or more steps. For example, the BEYOND-II intervention was assessed to have a short, linear causal pathway because the treatment plans were hypothesized to have a direct impact on reducing distress behaviors by addressing unmet needs.³⁹ On the other hand, the social interaction intervention arm examined in a study by Ballard et al⁵⁷ was judged to have a more variable, longer causal pathway because staff received education about how to implement social activities to enhance resident interactions with staff, family, and volunteers in an effort to reduce distress behaviors. The causal pathway between staff education about social activities and impacts on distress was determined to be somewhat variable because social interactions do not directly address all unmet needs of residents displaying distress behaviors.

The intended intervention target and the number of targets influenced how complex the interventions were. Among patient-only interventions, levels of complexity were lower across all domains, except for degree of tailoring and degree of interaction. For interventions focused only at the staff level, interventions were slightly more complex than patient-only interventions, but less complex than interventions with more than 1 target. One notable exception to this observation was degree of tailoring, which was lower generally among staff-only interventions than interventions in other component areas, including patient-only interventions. Interventions in the patient and staff and the patient and staff and environment groups were fairly complex across all domains. We observed the most complexity in the domains of number of actions, degree of tailoring, and degree of interactions. Compared with single-target interventions, the multi-target interventions were slightly more complex in the nature of the causal pathway.

Table 7. Intervention Complexity (Assessed by iCAT_SR)

Study	Study Design	Number of Activities	Number of Actions	Number of Organization Categories	Degree of Tailoring	Degree of Interactions	Nature of the Causal Pathway
<i>Patients Only</i>							
Cohen-Mansfield 2007 ⁵⁴	Cluster-randomized trial						
Cohen-Mansfield 2012 ⁵⁰	Cluster-randomized trial						
Eritz 2016 ⁵⁹	Cluster-randomized trial						
<i>Health Care Workers Only</i>							
Deudon 2009 ⁵¹	Cluster-randomized trial						
Fukuda 2018 ⁴¹	Cluster-randomized trial						
Leone 2012 ⁶¹	Cluster-randomized trial						
Livingston 2019 ³⁸	Cluster-randomized trial						
Teri 2005 ⁵⁶	Cluster-randomized trial						
Testad 2016 ⁴³	Cluster-randomized trial						
<i>Health Care Workers and Patients</i>							
Appelhof 2019 ³⁹	Stepped-wedge randomized trial						
Ballard 2018 ⁴⁰	Cluster-randomized trial						
Ballard 2016 ⁵⁷	Cluster-randomized trial (factorial)						
Chapman 2007 ⁵³	Cluster-randomized trial						
Chenoweth 2014-PCC ⁴⁶	Cluster-randomized trial						
Chenoweth 2009 ⁵²	Cluster-randomized trial						
Fossey 2006 ⁵⁵	Cluster-randomized trial						
Moniz-Cook 2017 ⁶²	Cluster-randomized trial						
Kirkham 2020 ³⁷	Stepped-wedge randomized trial						
Klapwijk 2018 ³³	Cluster-randomized trial						
Kovach 2006 ⁵⁸	Cluster-randomized trial						
Lichtwarck 2018 ⁴²	Cluster-randomized trial						

Study	Study Design	Number of Activities	Number of Actions	Number of Organization Categories	Degree of Tailoring	Degree of Interactions	Nature of the Causal Pathway
Mork Rokstad 2013-DBM ⁶⁰	Cluster-randomized trial						
Mork Rokstad 2013-PCC ⁶⁰	Cluster-randomized trial						
Rapp 2013 ⁴⁹	Cluster-randomized trial						
Stensvik 2022 ³⁴	Cluster-randomized trial						
Van de Ven 2013 ⁴⁸	Cluster-randomized trial						
Zwijzen 2014 ⁴⁵	Cluster-randomized trial						
<i>Health Care Workers, Patients, and Environment</i>							
Galik 2015 ⁴⁴	Cluster-randomized trial						
Galik 2021 ³⁵	Cluster-randomized trial						
Resnick 2021 ³⁶	Cluster-randomized trial						

Notes. Grey = unable to assess; darker blue = more complex.

Number of activities = # of active, independent components, *eg*, staff training & patient assessment; number of actions = # of actions/behaviors performed by intervention recipients which the intervention is trying to change, *eg*, multidisciplinary case conferences & medication reviews; number of organization categories = # of organization categories directly engaged by the intervention, *eg*, providers, nurses, administrative staff; degree of tailoring = amount of tailoring allowed across sites or individuals in applying the intervention, *eg*, choice of assessment tools, menu of training topics; degree of interactions = interdependency between intervention activities, *eg*, earlier intervention activities necessary to complete later ones; nature of causal pathway = relationship of steps between intervention and outcome, *eg*, duration from intervention to expected outcomes.

VA-Specific Studies

We identified 5 articles that addressed VA-specific interventions.^{47,85-88} All 4 were program evaluations of the Staff Training in Assisted Living Residences (STAR)-VA program that had been implemented in VA Community Living Centers (CLCs).⁵⁶ Two articles reported on patient outcomes and staff feedback on the program after implementation with 71 Veterans,^{47,56,86} 1 reported outcomes from 302 Veterans from 71 CLCs,⁸⁵ 1 compared use of as-needed psychotropic medications between 229 STAR-VA cases and 1,163 matched comparison cases from CLCs that did not implement STAR-VA,⁸⁸ and 1 evaluated staff injury after STAR-VA training.⁸⁷

In response to limited use of evidence-based nonpharmacologic interventions to address behavioral symptoms impacting the quality of life of Veterans living with dementia, the VA's Office of Mental Health and Suicide Prevention (OMHSP) adapted the STAR program for implementation in Community Living Centers (CLC) to create STAR-VA.⁸⁹ STAR-VA is a manualized, interdisciplinary psychosocial intervention led by a behavioral coordinator (BC) and registered nurse (RN) champion team. BCs are either psychologists, psychiatric mental health nurse practitioners, or psychiatrists. After

attending a 3-day intensive workshop, followed by a 6-month case-focused, competency-based mentorship period to ensure fidelity to the intervention, the BC-RN team assists CLC staff to operationalize 4 inter-related components: (1) develop realistic expectations of a Veteran's needs, based on understanding of how major neurocognitive disorders influence communication and behavior; (2) engage in effective communication approaches, including a technique known as listen with respect, comfort, and re-direct; (3) identify and change activators to and consequences of targeted challenging behaviors; and (4) increase frequency of personally relevant and meaningful pleasant events consistent with the person's current preferences.

The process of delivering these components is highly individualized to each Veteran by using a structured assessment, individualized goal setting, and care planning approach to operationalize the core components. The intervention uses the theory of person-environment fit⁹⁰ and social learning theory.⁹¹ Importantly, these reductions in frequency and severity of targeted behaviors were clinically significant. For example, in 1 analysis ($N = 302$ Veterans), the average target frequency of behavior was reduced from 3-6 times per week to 1-2 times per week.⁸⁵ This same analysis found a reduction in agitation as measured by the CMAI of -2.6 (-10.2% change; $p < 0.001$). Similarly, an earlier analysis of data from 71 Veterans noted a 27.3% reduction in CMAI from 28.5 (SD = 6.6) to 20.8 (SD = 4.8) with a $p < 0.0001$.⁸⁶ Moreover, implementation of STAR-VA resulted in an average reduction in "as needed" psychotropic medication use of 0.92 doses per month (95% CI [-1.82, -0.02]) compared to no reduction in matched CLC controls. Staff feedback on the program in these evaluations was generally positive.^{47,86} In the evaluation of the STAR-VA on staff injury due to assault, a reduction was noted in the year after training ($p = 0.04$), but rose again in the subsequent year.

Considering the key components of STAR-VA, we see a similar intervention complexity to other identified multi-level interventions (eg, those that target both HCW and patient management). Specifically, it features multiple intervention components requiring multiple actions of the involved health care team with significant tailoring to individual patients. Moreover, the interaction between the described components is significant (eg, using effective communication approaches could contribute to increasing frequency of personally relevant and pleasant events).

KEY QUESTION 2: TRANSITIONS AMONG HEALTH CARE SETTINGS

Key Points

- Two studies evaluated patient distress behaviors during or around a transition from 1 residential setting to another residential setting that was engineered to provide a more supportive environment and which required changes in HCW responsibilities and/or workflow patterns.
- One study of 116 patients relocated to a newly built facility with improved features (*eg*, improving lighting, access to indoor ambulation) found a significant reduction in distress behaviors as measured by NPI among the 14 residing in special care units for patients with advanced dementia and no change in the other 112 patients. The second study found no change in “negative affect or inappropriately engaged.”
- We did not identify any eligible studies that evaluated interventions focused on transitions from 1 health care setting to another (*eg*, hospital to home).

Intervention Characteristics

We identified 2 studies that met inclusion criteria to address patient distress behaviors during or around a transition in location.^{76,77} In both studies, patients were transitioned from 1 residential setting to another residential setting that was engineered to provide a more supportive environment. We found no studies addressing distress behavior management during transitions from inpatient settings to long-term care or inpatient/long-term care to home.

Neither study referenced an underlying theory, and only the Australian study included a component of intervention fidelity through the mention of a manualized approach. Using the definitions for iCAT criteria, these interventions were relatively simple compared with interventions in KQ1, including only 1 activity (move to a different setting), a single target (the patient), and with no⁷⁶ to moderate⁷⁷ levels of tailoring. However, in the Australian study, the intervention was directed to both patients and home care staff who were expected to change how they engaged with the patients.

Patient-Level Outcomes

The first relevant study⁷⁶ was conducted in France and evaluated behavioral and psychiatric symptoms changes among 116 residents with dementia who were relocated to a newly built facility featuring improving lighting, access to indoor ambulation, and outdoor spaces for ambulation and leisure. Of the 116 patients, 102 resided in regular units and 14 in special care units that were dedicated to patients with Alzheimer’s disease. Distressed behaviors, as measured by the NPI-NH, were significantly reduced among residents in the special care units at 4 weeks (MD = -10.8, $p < 0.001$) and 12 weeks (MD = -14.08, SE = 2.9, $p < 0.001$). In contrast, there was no decrease in symptoms for those in regular units (MD at 12 weeks = -0.8, $p = 0.45$). The interaction between time and unit type was significant at week 4 (95% CI [-15.6, -3.1]) and week 12 (95% CI [-19.5, -6.8]). This study was considered at moderate risk of bias due to lack of information about dropouts and missing data.

A second study⁷⁷ based in Australia measured behaviors of 55 nursing home residents with moderate-to-severe dementia before and after they were relocated from an outdated facility to a newly built setting made of 5 cottages designed specifically for the needs of 15 patients with dementia per cottage and intended to be “home-like.” In addition to the location change, staff working with residents also received a 1-week training workshop focused on engaging residents with life-skill activities. Resident

distress measured by observer determination of “negative affect or inappropriately engaged” was analyzed for 43 residents with complete data and no significant difference was found in distress over 3 time points (before the transition, after the transition but before the training, and after the training). This study was considered at high risk of bias due to imbalance in disease burden between intervention and control groups, high dropout rate, new replacement participants added after study initiation, and intervention deviations.

KEY QUESTION 3: INPATIENT MENTAL HEALTH SETTINGS

Key Points

- Two primarily staff-focused interventions were evaluated across 3 articles.
- A theoretically driven, multifaceted intervention with 10 packaged activities (*eg*, Safewards) was found to reduce the rate of conflicts per shift by 15% (risk ratio [RR] = 0.85, 95% CI [0.76, 0.94]) and the rate of containment events by 26.4% (RR = 0.77, 95% CI [0.66, 0.90]). A second evaluation of a single-site staff education program with ongoing monitoring reduced the average number of aggressive incidents towards peers or objections by 6 to 2.

Intervention Characteristics

Two interventions (3 studies) focused on staff-facing activities in the inpatient mental health treatment setting.⁷⁸⁻⁸⁰ In both interventions, staff education was a key component. In a randomized trial⁷⁸ of 31 acute inpatient mental health wards from 15 British hospitals, a theoretically driven (*eg*, Safewards), multifaceted intervention with 10 packaged activities (*eg*, de-escalation model, access to distraction and sensory tools for patients, standards of behavior for staff) aimed at staff training was evaluated with respect to the impact on staff-patient conflict and containment.⁷⁸ Both interventions were fairly complex per iCAT standards. They were staff-focused, multi-component interventions that were moderately tailored to address resident and staff behavior.

Patient-Level Outcomes

Conflict was measured by charge nurse observation per shift using a checklist and included 22 types of conflict events including verbal aggression, substance use, and self-harm attempts; containment was similarly measured and accounted for 8 types of containment (*eg*, coerced medication, restraints). At 16 weeks, rate of conflicts was reduced by 15% in the intervention arm per shift (RR = 0.85, 95% CI [0.76, 0.94]) and rate of containment events was reduced by 26.4% (RR = 0.77, 95% CI [0.66, 0.90]). Notably, data collection for the primary outcomes was low due to <50% of data collection forms being submitted; sensitivity analyses showed that missingness was slightly greater in the control group (OR = 0.87, 95% CI [0.74, 1.03]). A later program evaluation⁷⁹ conducted a cross-sectional survey of staff after the government-funded implementation of Safewards across 7 self-selected health services in Australia. After 9-12 months of implementation, 76 staff reported a positive impact of the intervention on verbal conflicts (42% usually or always) and physical conflicts (34% usually or always). Fifty-four percent of staff reported usually or always feeling “positive about being on the unit,” and 38% reported feeling safer. This program evaluation was considered at serious risk of bias largely due to the optional nature of the staff survey.

A second study evaluated the effect of a staff education program that emphasized communication skills, environmental changes, incident reporting, medication management, and resident activities in a community-based, long-term 170 bed neurobehavioral rehabilitation program setting.⁸⁰ Staff received skills assessments, a day-long training, in-service training, and ongoing monitoring to improve staff self-efficacy. At 15 months among 267 patients with a minimum stay of 5 days, the average number of aggressive incidents toward peers or objects per month per quarter had been reduced by 77%, from 6 to 2. This study was considered at serious risk of bias largely due to high turnover of patients, lack of blinded outcomes assessment, and lack of consideration of confounding.

DISCUSSION

Across 43 studies evaluating the impact of health care team-focused interventions on the management of distress behaviors among older adults, the majority of the available literature focused on the evaluation of interventions in the long-term residential health care setting among patients with dementia. Most interventions were fairly complex with multiple active components. Activities were intended to address multiple HCW behaviors and relied on a high level of interaction between intervention activities. Interventions incorporating activities focused only on HCWs through education or skills development may have some short-term benefit on distress behaviors, but there is no evidence supporting longer-term reductions in distress behavior or benefit on patient quality of life.

Interventions that included both HCW education and training, as well as structured patient care activities, were found to improve quality of life and reduce the odds of antipsychotic use; while results were inconclusive about reducing patient distress, these intervention effects were generally in the direction of being beneficial. The few studies that examined staff-level outcomes of long-term health care setting interventions did not observe beneficial effects. There were few studies that examined interventions involving transitions in locations of care or that evaluated multi-faceted interventions from inpatient mental health settings.

The certainty of evidence (COE) ranged from very low to high certainty (Table 8). Within the patient-only intervention category, only 1 study was eligible for GRADE given the few studies in this category and inconsistent effect estimate reporting. This study showed moderate COE of no effect of patient-only interventions on quality of life. Studies in the HCW-only intervention category were graded as low or very low COE due to risk of bias, inconsistency, and serious imprecision. Specifically, 3 studies showed low COE of no effect of HCW interventions on CMAI; 4 studies showed very low COE of no effect on NPI; and 2 studies showed low COE of no effect on quality-of-life outcomes. Eight studies in the HCW-/patient-focused intervention category were rated as high COE for the reduction in antipsychotic use. Eleven showed moderate COE that the health care teams and patient interventions reduced distress behaviors using the CMAI, and 9 showed moderate COE of a reduction using the NPI measure. We also found moderate COE of an increase in quality of life in 8 studies evaluating health care teams and patient interventions. One study in the health care teams and patient and environment intervention category showed moderate COE of no effect of the intervention on antipsychotic use. In the same category, 3 studies showed moderate COE of no effect of the interventions on CMAI outcomes.

Our findings build on those of prior reviews. In particular, a 2016 AHRQ review of nonpharmacologic interventions on agitation and aggression in patients with dementia evaluated a variety of interventions for community settings, nursing homes, or assisted living facilities.²⁵ They grouped long-term setting care models based on underlying theory and approach, specifically dementia care mapping, person-centered care, emotion-oriented care, and interventions to reduce antipsychotics. They found low strength of evidence that the effects of the first 2 are no different from usual care and insufficient evidence to draw conclusions on the latter 2. We included 15 of the studies found in the AHRQ review but grouped studies differently for analysis to capture the multi-level nature of identified interventions and overlapping approaches.

Table 8. Certainty of Evidence

Outcome	Number of Studies	Findings	Certainty of Evidence (Rationale)
<i>Patient Only</i>			
CMAI	1 RCT (73 patients)	Effect estimate NR	Not possible to assess
Quality of life	1 RCT (73 patients)	Effect estimate for the adjusted analysis NR	Moderate (Downgraded for serious imprecision)
<i>Health Care Worker Only</i>			
Antipsychotics	1 RCT (274 patients)	Effect estimate NR	Not possible to assess
CMAI	3 RCTs (898 patients)	Mean difference for 1 study was -0.4, <i>p</i> values ranged from 0.078 to 0.8226 in 2 studies, 1 study showed a decrease compared to control arm.	Low (Downgraded for serious risk of bias and serious imprecision)
NPI	4 RCTs (980 patients)	One study reported mean difference of -0.84, 1 reported <i>F</i> statistic of 4.78, 1 reported a <i>z</i> score of -2.15, and 1 didn't report an effect estimate. <i>P</i> values ranged from 0.726 to 0.029 across 4 studies.	Very low (Downgraded for serious risk of bias, serious inconsistency, and serious imprecision)
Quality of life	2 RCTs (624 patients)	One study reported a mean difference of 0.09 and a <i>p</i> value of 0.9657. One study reported an increase at 8 weeks but not at 20 weeks.	Low (Downgraded for serious inconsistency, and serious imprecision)
<i>Health Care Worker and Patient</i>			
Antipsychotics	8 RCT (3,476 patients)	SMD = 0.43, 95% CI [0.22, 0.84]	High (Not downgraded)
CMAI	11 RCT (4,940 patients)	SMD = -0.31, 95% CI [-0.78, 0.16]	Moderate (Downgraded for serious ROB)
NPI	9 RCTs (3,772 patients)	SMD = -0.47, 95% CI [-1.18, 0.24]	Moderate (Downgraded for serious ROB)
Quality of life	8 RCTs (4,036 patients)	SMD = 0.71, 95% CI [0.39, 1.04]	Moderate (Downgraded for serious imprecision)
<i>Health Care Worker, Patient, and Environment</i>			
Antipsychotics	1 RCT (336 patients)	Difference between groups at 4 months 0.69 (<i>p</i> value 0.584) and 0.44 (<i>p</i> value 0.273) at 12 months	Moderate (Downgraded for serious imprecision)
CMAI	3 RCTs (982 patients)	Mean difference in 1 study was -0.12 at 4 months to -0.06 at 12 months. The other studies did not report effect estimates. <i>P</i> values ranged from 0.729 to 0.05.	Moderate (Downgraded for serious imprecision)

Abbreviations. CMAI=Cohen-Mansfield Agitation Index; NPI=Neuropsychiatric Inventory.

Reducing agitation or neuropsychiatric symptoms was the stated primary objective of most included studies. However, somewhat surprising was the lack of clear impact on patient distress, specifically agitation as measured by the CMAI or multiple neuropsychiatric behaviors and symptoms as measured by the NPI. It is noteworthy that for both instruments, patient distress level was reported by the staff receiving the intervention and not the patients themselves. It is possible that there was an increase in recognition of agitation behaviors due to intervention training or priming effect that balanced out any positive impact by the intervention. Meta-analyses of these outcomes were not statistically significant, which may be driven by a number of factors including heterogeneity of included complex intervention designs, small sample sizes of some included studies, and variation in effects across studies. Because benefits were apparent in some studies, results of these syntheses do not conclusively rule out a beneficial effect of interventions with both patient and HCW activities on patient distress. Instead, findings suggest that there may be contextual and intervention design factors that differ across studies and may contribute to intervention effectiveness. Indeed, the substantial variability in interventions designed to impact the same outcome suggests that results of meta-analysis should be viewed as secondary to findings from the most rigorous individual studies.

Reassuringly, we found evidence of a meaningful improvement in quality of life with interventions acting at both the HCW and patient level, even without a clear pattern of impact on agitation. One explanation is that the impact of these interventions could be felt on overall patient affect rather than distress behaviors. Affect, behavior, and mood are interconnected but distinct concepts in psychology, each contributing to our understanding of emotional and psychological experiences,⁹²⁻⁹⁴ and the link may not be apparent or as strong as anticipated. Given that we found a meaningful improvement in quality of life with interventions acting at both the HCW and patient level, there may be a few mechanisms of action at play that relate to improvements in affect and thereby improve mood over time. One example is that establishing a consistent daily schedule and structured routine can help reduce confusion and anxiety. Another mechanism might relate to social engagement. Promoting social interactions and engagement with health care workers and/or caregivers can reduce feelings of isolation and may enhance opportunities for group activities and companionship. It does not necessarily fully alter agitation, but it may improve quality of life.^{54,95} One challenge with this body of literature is the wide array of outcomes and intervention activities, which makes it difficult to evaluate the mechanism of action and related effect. Greater specificity and clarification regarding the intended mechanism of action for each outcome would be beneficial for this field moving forward.

Of note, we found limited data describing the impact of interventions on clinical team members or the potential mechanism of effect on this key group. Available data came from 6 studies and measured a variety of disparate constructs (*eg*, burnout, self-efficacy in caring for patients with dementia, job satisfaction). Regardless of the intervention components (*ie*, staff, patient, environment), there was consistency in results, in that there was no effect of these interventions on staff-level outcomes. Understanding the impact on HCWs of interventions designed to improve the management of distress behaviors is critical given the shortage of HCWs in long-term care settings and high rates of burnout and turnover. Some HCW outcomes, such as burnout and job stress, may be hard to impact by the types and duration of interventions included in this review because the determinants of these constructs stem from ever-evolving, system-level challenges and complications that exceed challenging interactions with patients with distress behavior (*eg*, understaffing, inadequate wages, job culture). Outcomes that measure more proximal experiences and focus on the relationship between staff and the specific person or people with dementia may be more sensitive to intervention-related effects (*eg*, self-efficacy with managing distress behaviors).

Clinical Implications

In the context of an aging population, health care systems and long-term care facilities manage increasingly complex patients, many of whom may exhibit behaviors reflecting distress due to unaddressed personal needs and behavioral manifestations of an underlying illness or disease regardless of distress. Such behaviors can be further exacerbated by triggers or a stressful environment. The goal is not necessarily to eradicate challenging behavior but to find optimal ways to curb these behaviors and help staff be more aware of how they can empower themselves and the patient in managing these symptoms. The true goal in dementia care, or any other illness that causes distress behaviors, should transcend the focus on reducing agitation or aggression, and instead should be to improve and address patient needs. However, distress behaviors can also cause distress for HCWs and overwhelm limited resources in long-term care settings, restricting the ability to identify appropriate safe care settings for older individuals and placing tremendous pressure on family members.

Health care systems seeking to better equip health care teams to provide optimal patient-centered management of distress behaviors will need to look beyond interventions that are directed solely at health care team members or that only address patient care management patterns. The findings from this review point to the importance of multi-level interventions with activities that target health care team members, patient evaluation and management, and, likely, environmental or policy structures. This is in keeping with recent trends in care for older adults with cognitive impairment that call to enhance the quality and efficiency of care, caregiver training, and interdisciplinary longitudinal care.^{96,97} The necessity for such complexity requires anticipation and attention to real world contextual factors that will require investment of time and resources to ensure successful, high-fidelity adoption especially across community-based long-term care facilities with widely varying resources and contexts. The VA has multiple resources as a national integrated health care system including long-term care as well as extensive implementation science expertise that could be leveraged for future multi-level interventions.

Limitations

It is important to note limitations of both the identified literature and our approach to conducting this review. With respect to the identified literature, the majority of included studies focused on care for patients with dementia in long-term care settings. While this field is on the forefront of managing distress behaviors, there are likely strategies and interventions being used in other settings (eg, inpatient general medicine) that could be applied across patient populations that have not made it into the published peer reviewed literature. Moreover, the interventions were almost universally complex in nature, combining components directed at multiple behaviors and clinical practices. Therefore, it was not possible to group studies for analysis based on individual intervention components (eg, antipsychotic medication review or individualized care planning) to determine which were most effective. After much consideration, we grouped studies based on intervention components identified conceptually in alignment with clinical guidance used to care for this patient population in practice. This approach likely explains the important heterogeneity in effects found in our meta-analyses. Other approaches might have led to different results. In addition, we had sought to identify interventions focused on transitions between care settings (eg, inpatient to skilled nursing facilities) and found very little addressing this vulnerable time point. Many studies described interventions with insufficient detail for replication and appropriate fidelity monitoring. We note that staff turnover is often quite high in long-term care settings, and few included studies actually reported the rates of turnover. High turnover of staff could limit the impact of interventions dedicated to skills training and knowledge gain given the need to retrain new staff. Included studies were conducted across multiple countries, which

could introduce local cultural differences and heterogeneity of regulations and clinical settings in a way that impacts how distress behaviors are managed.

There were multiple limitations with respect to the type and detail provided on outcomes reported. First, the specific definition of distress behaviors varied across studies. In addition, there were limited data on adverse events, and it was difficult to compare adverse events across studies because of differing definitions of, and time points for, measuring adverse events. For example, the definition of falls was either not explicit or varied across studies: an observed fall was an adverse event in 1 study, but other study teams did not specify whether the fall was defined as needing medical treatment or was self-reported). Similarly, there was relatively limited detail on clinical staff-level outcomes for these interventions, which is problematic because 1 of the desired outcomes of improved distress behavior management is reducing the stress and burden on staff caregivers. Further, there was no information on how these interventions impact health care utilization. We were frequently unable to pool all identified studies for a given outcome due to heterogeneity of timing of follow-up, approach to measurement, and lack of reporting of an ICC or verification that clustering was incorporated into the analytic model. This final issue is significant in this field of study as a cluster-randomized trial is the most appropriate study design to evaluate interventions delivered at the clinic or care team level, and meta-synthesis is only valid with incorporation of statistical methods to account for the effect of clustering.

In order to focus the scope of the review, we did not include search terms or eligibility criteria that would have allowed inclusion of workplace violence. Nor did we seek to include literature employing trauma-informed care, which could be informative. Literature in this area may offer translatable insights that could apply to our target population of interest. In addition, it is possible we missed studies that evaluated interventions that were not focused specifically on distress behavior management but which could have had a secondary impact. In particular, we excluded studies focused on managing delirium, as we considered the implicit short-term nature of this condition to be a distinct construct from persistent or recurrent distress behaviors with different underlying causes; however, it is possible that interventions designed to address delirium could provide relevant lessons. We purposefully did not limit the sample to studies focused on older adults with dementia in order to identify potentially effective interventions from other patient populations. However, all the studies for KQ1 focused primarily on patients with dementia. Finally, we limited our data abstraction and analysis to studies found to have low or moderate risk of bias, though studies having a higher risk of bias could provide ideas about intervention types to explore for future study.

FUTURE RESEARCH

In Table 9, we make suggestions on how future studies can improve the current evidence base and move the field toward identifying more effective interventions to improve the care for older adults with distress behaviors. Expanding exploration of interventions in older adult populations without dementia will be critical. One specific population of relevance for the VA is aging Veterans with posttraumatic stress disorder (PTSD), a condition that can accelerate cognitive decline and may increase distress behaviors.⁹⁸ Multi-level, theory-based interventions with clearly articulated mechanisms of action and alignment with intended effects measured at appropriate time points should be pursued and could provide key data needed to foster appropriate comparisons. When the goal is improving staff outcomes, higher system-level targets could be explored. After effective interventions are identified, it will be critical to develop robust, evidence-based appropriate approaches to the implementation of these complex interventions. To better understand the balance in cluster-randomized trials, greater description of site characteristics including staff turnover and leadership structure would be helpful.

Similarly, more information about who delivered the intervention and the nature of their qualifications would support replication. After effectiveness is established, it will be important to explore how patients with different types of distress behaviors and health histories (*eg*, PTSD) might respond differently to such interventions. Further, implementation-based research and pragmatic trial designs may be useful methodologic approaches to advance this field.

Table 9. Evidence Gaps

PICOTS Domain	Areas for Future Exploration
Population	Older adults with complex behaviors at increased risk of distress behaviors who do not have dementia Adults with varying stages of illness and comorbidity to explore heterogeneity of treatment effects
Intervention	Multi-level, theory-based interventions with clearly articulated mechanisms of action and alignment with intended effect Consideration of higher-level components (<i>eg</i> , health care system culture or administration) for interventions intended to impact staff outcomes Interventions that incorporate environmental changes Interventions that incorporate trauma-informed care principles
Comparator	Clearly defined usual care (<i>eg</i> , staffing levels, organization factors) Health care staff education only
Outcomes	Harms (<i>eg</i> , self-injury, HCW injury) Health care utilization (<i>eg</i> , hospital readmission, ER visits) Proximal HCW outcomes (<i>eg</i> , self-efficacy for managing distress behaviors) Healthcare worker demonstrated competency in patient-centered approaches to distress behavior management Healthcare worker turn-over Studies using cluster-randomized trial designs should report the intraclass correlation coefficient (ICC) or models that account for the effect of clusters
Timing	Medium (3-6 months) and long-term outcomes (>6 months) If transitions of care, short-term after transition
Setting	Health care settings other than nursing homes and long-term care facilities (<i>eg</i> , inpatient medical/surgical units, ICUs, psychiatric inpatient settings) Transitions of care between health care settings or health care settings and home

CONCLUSIONS

Novel interventions to reduce distress behaviors among older adults that feature both HCW education and training along with patient management intervention activities appear to have some beneficial impact on patient quality of life, reduction in antipsychotic use, and possibly distress behaviors. Less complex interventions, for example those focusing solely on HCW-only training, appear less likely to lead to desired effects. While more effective, complex interventions raise important questions about the challenges of high-fidelity implementation across varied long-term care settings for older adults with distress behaviors. Work remains to be done to determine the impact of these interventions on important health care staff outcomes such as burnout and systems-level outcomes such as utilization.

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Appendix

SEARCH STRATEGIES

Librarian searcher: Sarah Cantrell, MLIS; Duke University Medical Center Library & Archives, Duke University School of Medicine

Peer review of search conducted by: Samantha Kaplan, PhD, MLS; Duke University Medical Center Library & Archives, Duke University School of Medicine

Database: MEDLINE (via Ovid)

Search date: 12/14/2022

note: Ovid MEDLINE(R) ALL 1946 to December 13, 2022

Search Set	Search Statement	Results
1 <i>setting – residential</i>	residential facilities/ or exp assisted living facilities/ or exp long-term care/ or exp homes for the aged/ or exp nursing homes/ or exp skilled nursing facilities/ or exp intermediate care facilities/ or ("nursing home" or "nursing homes" or "assisted living" or "homes for the aged" or "home for the aged" or "homes for the elderly" or "home for the elderly" or snf or "skilled nursing facility" or "skilled nursing facilities").ti,ab. or (residential adj3 (care or healthcare or treat* or therap*).ti,ab. or ((residential or rehab*) adj3 facilit*).ti,ab. or ((home or homes or facility or facilities or house or houses or housing) adj3 (aged or elderly or geriatric or "old adult" or "old adults" or "older adult" or "older adults" or "old person" or "older person" or "old people" or "older people" or senior or seniors)).ti,ab. or ((longterm or "long term" or extended) adj3 (care or healthcare or facilit*).ti,ab.	128,335
2 <i>setting – transition of care</i>	continuity of patient care/ or exp "hospital to home transition"/ or exp patient transfer/ or exp transitional care/ or (continuity adj3 (care or healthcare)).ti,ab. or ((transition or transitions or transitioned or transitioning or transitional) adj3 (care or healthcare or home or homes or house or houses or housing)).ti,ab. or (("patient transfer" or "patient transfers") adj3 (residence or residences or residential or home or house or homes or houses)).ti,ab. or (hospital* adj3 (residence or residences or residential or home or house or homes or houses) adj3 (transition or transitions or transitioned or transitioning or transitional)).ti,ab. or ((home or home-based) adj3 ("primary care" or "primary healthcare")).ti,ab.	45,337
3 <i>Inpatients w/ mental illness</i>	((inpatient* or in-patient* or (hospital* adj2 patient*)) adj4 ("mental health" or "mental illness" or "mental illnesses" or "mentally ill" or psychiatric or neuropsychiatric)).ti,ab.	17,802
4 <i>Older adults</i>	exp middle aged/ or exp aged/ or exp "health services for the aged"/ or (aged or aging or "older adult" or "older adults" or "old person" or "older person" or "old people" or "older people" or "old folk" or "old folks" or "older folk" or "older folks" or elder or elders or elderly or senior or seniors or geriatric or geriatrics or retired or retiree or retirees).ti,ab.	6,122,348
5 <i>older adult inpatients w/ mental illness</i>	3 and 4	7,527
6 <i>Combining settings</i>	1 or 2 or 5	177,096
7 <i>Disruptive behavior</i>	exp psychological distress/ or exp psychomotor agitation/ or exp problem behavior/ or violence/ or exp impulsive behavior/ or anger/ or	188,857

	exp hostility/ or exp wandering behavior/ or ((disrupt* or neuropsych* or problem or problematic or challenging or danger* or violent* or aggress* or distress* or uncooperative or "not cooperative" or anger or angry or hostile* or impulsive*) adj6 (behav* or demeanor or conduct or action or actions or symptom or symptoms)).ti,ab. or ((abus* or nonsens* or inappropriate* or expressive) adj2 (language or speech)).ti,ab.	
8	<i>concept combination</i>	6 and 7
9	<i>date limit 2000 - present</i>	limit 8 to da=20000101-20231231
10	<i>study design exclusion</i>	9 not (case reports or editorial or letter or comment or congress).pt.
		4218
		3530
		3,363

Database: Embase (via Elsevier)

search date: 12/14/2022

note: Search from the Results page

Search Set	Search Statement	Results
1 <i>setting – residential</i>	'assisted living facility'/exp OR 'long term care'/de OR 'home for the aged'/exp OR 'nursing home'/exp OR ('nursing home' OR 'nursing homes' OR 'assisted living' OR 'homes for the aged' OR 'home for the aged' OR 'homes for the elderly' OR 'home for the elderly' OR snf OR 'skilled nursing facility' OR 'skilled nursing facilities'):ti,ab OR (residential NEAR/3 (care OR healthcare OR treat* OR therap*)):ti,ab OR ((residential OR rehab*) NEAR/3 facilit*):ti,ab OR ((home OR homes OR facility OR facilities OR house OR houses OR housing) NEAR/3 (aged OR elderly OR geriatric OR 'old adult' OR 'old adults' OR 'older adult' OR 'older adults' OR 'old person' OR 'older person' OR 'old people' OR 'older people' OR senior OR seniors)):ti,ab OR ((longterm OR 'long term' OR extended) NEAR/3 (care OR healthcare OR facilit*)):ti,ab	271,864
2 <i>setting – transition of care</i>	'hospital to home transition'/exp OR 'transitional care'/exp OR (continuity NEAR/3 (care OR healthcare)):ti,ab OR ((transition OR transitions OR transitioned OR transitioning OR transitional) NEAR/3 (care OR healthcare OR home OR homes OR house OR houses OR housing)):ti,ab OR (('patient transfer' OR 'patient transfers') NEAR/3 (residence OR residences OR residential OR home OR house OR homes OR houses)):ti,ab OR (hospital* NEAR/3 (residence OR residences OR residential OR home OR house OR homes OR houses) NEAR/3 (transition OR transitions OR transitioned OR transitioning OR transitional)):ti,ab OR ((home OR home?based) NEAR/3 ('primary care' OR 'primary healthcare')):ti,ab	33,684
3 <i>inpatients w/ mental illness</i>	((inpatient* OR in?patient*) NEAR/4 ('mental health' OR 'mental illness' OR 'mental illnesses' OR 'mentally ill' OR psychiatric OR neuropsychiatric)):ti,ab OR (hospital* patient* NEAR/4 ('mental health' OR 'mental illness' OR 'mental illnesses' OR 'mentally ill' OR psychiatric OR neuropsychiatric)):ti,ab OR (hospital* NEAR/2 patient*)	33,489
4 <i>older adults</i>	'middle aged'/exp OR 'aged'/exp OR 'elderly care'/de OR 'geriatric care'/exp OR (aged OR aging OR 'older adult' OR 'older adults' OR 'old person' OR 'older person' OR 'old people' OR 'older people' OR 'old folk' OR 'old folks' OR 'older folk' OR 'older folks' OR elder OR elders	5,804,962

		OR elderly OR senior OR seniors OR geriatric OR geriatrics OR retired OR retiree OR retirees):ti,ab	
5	<i>older adult inpatients w/ mental illness</i>	#3 AND #4	9,072
6	<i>combining settings</i>	#1 OR #2 OR #5	310,907
7	<i>disruptive behavior</i>	'distress syndrome'/exp OR 'agitation'/exp OR 'disruptive behavior'/exp OR 'impulsiveness'/exp OR 'anger'/exp OR 'hostility'/exp OR 'wandering behavior'/exp OR ((disrupt* OR neuropsych* OR problem OR problematic OR challenging OR danger* OR violent* OR aggress* OR distress* OR uncooperative OR 'not cooperative' OR anger OR angry OR hostile* OR impulsive*) NEAR/6 (behav* OR demeanor OR conduct OR action OR actions OR symptom OR symptoms)):ti,ab OR ((abus* OR nonsens* OR inappropriate* OR expressive) NEAR/2 (language OR speech)):ti,ab	288,415
8	<i>concept combination</i>	#6 AND #7	7616
9	<i>date limit 2000 - present</i>	#8 AND [01-01-2000]/sd	6969
10	<i>study design exclusion</i>	#9 NOT ('case report'/exp OR 'case study'/exp OR 'editorial'/exp OR [editorial]/lim OR 'letter'/exp OR [letter]/lim OR 'note'/exp OR [note]/lim OR [conference abstract]/lim OR 'conference abstract'/exp OR 'conference abstract'/it)	4,433

Database: APA PsycINFO (via Ovid)

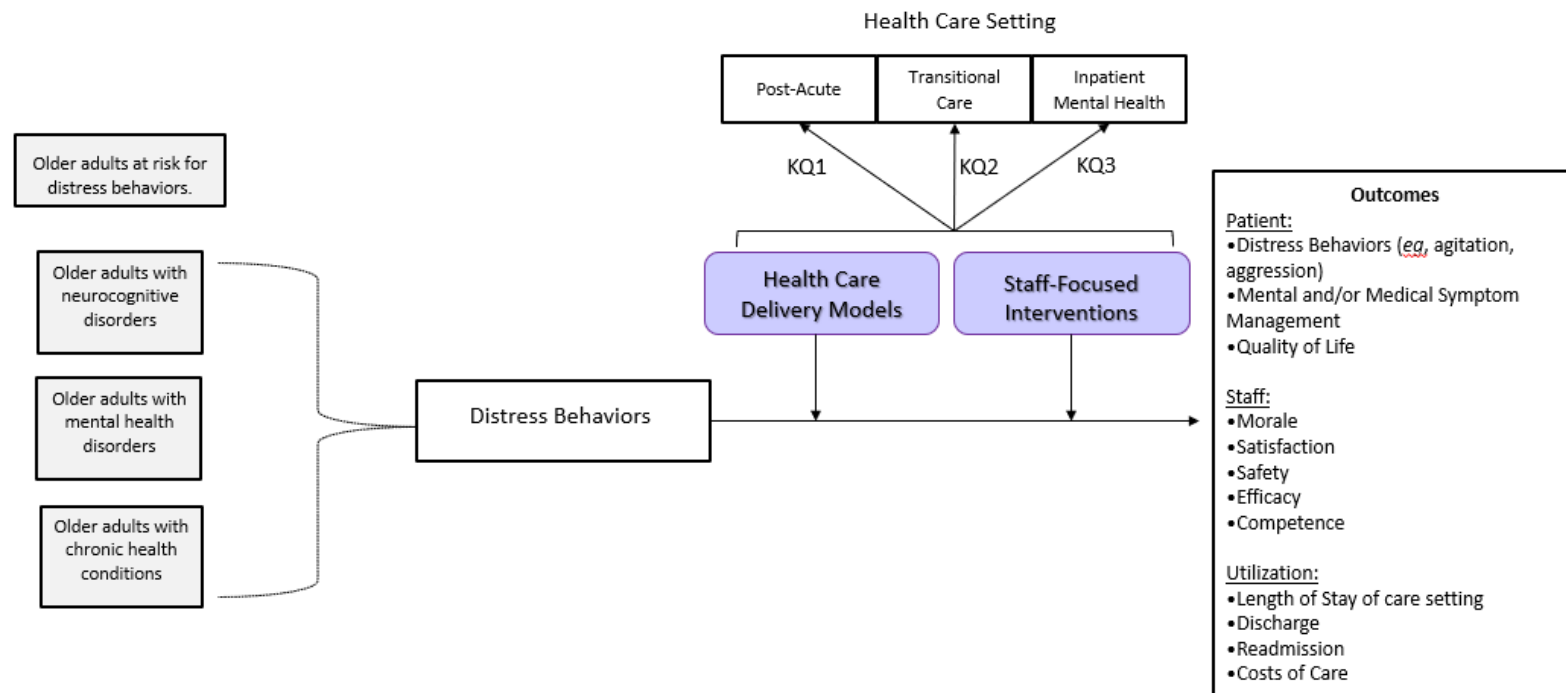
search date: 12/14/2022

note: APA PsycINFO 1806 to December Week 1 2022

Search Set	Search Statement	Results
1 <i>setting – residential</i>	"Residential Care Institutions"/ or exp nursing homes/ or exp "nursing home residents"/ or assisted living/ or "long term care"/ or ("nursing home" or "nursing homes" or "assisted living" or "homes for the aged" or "home for the aged" or "homes for the elderly" or "home for the elderly" or snf or "skilled nursing facility" or "skilled nursing facilities").ti,ab. or (residential adj3 (care or healthcare or treat* or therap*).ti,ab. or ((residential or rehab*) adj3 facilit*).ti,ab. or ((home or homes or facility or facilities or house or houses or housing) adj3 (aged or elderly or geriatric or "old adult" or "old adults" or "older adult" or "older adults" or "old person" or "older person" or "old people" or "older people" or senior or seniors)).ti,ab. or ((longterm or "long term" or extended) adj3 (care or healthcare or facilit*).ti,ab.	45,947
2 <i>setting – transition of care</i>	"Continuum of Care"/ or "client transfer"/ OR (continuity adj3 (care or healthcare)).ti,ab. or ((transition or transitions or transitioned or transitioning or transitional) adj3 (care or healthcare or home or homes or house or houses or housing)).ti,ab. or (("patient transfer" or "patient transfers") adj3 (residence or residences or residential or home or house or homes or houses)).ti,ab. or (hospital* adj3 (residence or residences or residential or home or house or homes or houses) adj3 (transition or transitions or transitioned or transitioning or transitional)).ti,ab. or ((home or home-based) adj3 ("primary care" or "primary healthcare")).ti,ab.	8,151

3	<i>inpatients w/ mental illness</i>	((inpatient* or in-patient* or (hospital* adj2 patient*)) adj4 ("mental health" or "mental illness" or "mental illnesses" or "mentally ill" or psychiatric or neuropsychiatric)).ti,ab.	18,093
4	<i>older adults</i>	"older adulthood"/ or "geriatric patients"/ or "middle adulthood"/ OR (aged or aging or "older adult" or "older adults" or "old person" or "older person" or "old people" or "older people" or "old folk" or "old folks" or "older folk" or "older folks" or elder or elders or elderly or senior or seniors or geriatric or geriatrics or retired or retiree or retirees).ti,ab.	451,157
5	<i>older adult inpatients w/ mental illness</i>	3 and 4	2,473
6	<i>combining settings</i>	1 or 2 or 5	55,550
7	<i>disruptive behavior</i>	"Distress"/ OR "Agitation"/ OR "Violence"/ OR "Patient Violence"/ OR "Impulsiveness"/ OR "Anger"/ OR "Anger Expression"/ OR "Hostility"/ OR "Wandering Behavior"/ OR ((disrupt* or neuropsych* or problem or problematic or challenging or danger* or violen* or aggress* or distress* or uncooperative or "not cooperative" or anger or angry or hostile* or impulsive*) adj6 (behav* or demeanor or demanour or conduct or action or actions or symptom or symptoms)).ti,ab. or ((abus* or nonsens* or inappropriate* or expressive) adj2 (language or speech)).ti,ab.	191,082
8	<i>concept combination</i>	6 and 7	3509
9	<i>date limit 2000 - present</i>	limit 8 to yr="2000 -Current"	2688
10	<i>limit</i>	limit 9 to "0110 peer-reviewed journal"	2274
11	<i>limit</i>	limit 10 to (journal article or reviews)	2111

ANALYTIC FRAMEWORK



STUDY CHARACTERISTICS

Refer to the main report's reference list for full citations.

STUDY CHARACTERISTICS FOR STUDIES RATED AS LOW OR SOME CONCERNS FOR RISK OF BIAS

Study	Sample Size Follow-Up	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest
						Study Funding Source
KQ1						
Appelhof, 2019 ³⁹	N=274	Residents with a dementia diagnosis with a symptom onset before the age of 65 who resided on the Young-Onset Dementia Special Care Unit	Health care team + patient	Care as usual	Patient outcomes	Some concerns
Linked study:	6 months, 12 months, 18 months					Conflicts of interest: None
van Duinen-van den, 2018 ⁹⁹						Funding from Netherlands Organization for Health Research and Development, the Archipel Care Group in the Netherlands, the Florence Care Group in the Netherlands, the Dutch YOD Knowledge Center, and the Dutch Alzheimer Society
van Duinen-van den Ijsse ¹⁰⁰						
Ballard, 2016 ⁸¹	N=277	Residents with dementia who had a Clinical Dementia Rating and the Functional Assessment Staging	Health care team + patient	Care as usual	Patient outcomes	Low
	9 months					Conflicts of interest: first author reports grants and personal fees from Acadia, Lundbeck, personal fees from Napp, Roche, Orion, Bial, Bristol-Myers Squibb, Otsuka, and Novartis.
						Funded by the National Institute for Health Research Grants for

Study	Sample Size Follow-Up	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest Study Funding Source
Ballard, 2018 ⁴⁰	N=847	Residents in a nursing home were eligible for the study if they met criteria for dementia (defined as a score 1 or greater on the Clinical Dementia Rating – CDR)	Health care team + patient	Care as usual	Patient outcomes	Some concerns
Linked studies: Romeo, 2019 ¹⁰¹	9 months	Eligible nursing homes had at least 60% of residents with dementia				Conflicts of interest: first author reports grants and personal fees from Acadia, Lundbeck, personal fees from Napp, Roche, Orion, Bial Bristol Myer Squibb, Otusaka, Novartis and Sunovion, outside the submitted work Funded by the National Institute of Health Research, Programme Grant for Applied Research
Chapman, 2007 ⁵³	N=118 8 weeks	Residents having either Alzheimer's or advanced dementia and needing assistance on 4 or more Activities of Daily Living (ADLs), scoring 23 or less on the Mini-Mental state examination (MMSE), and 4 or more on the Global Deterioration Scale (GDS)	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: NR Conflicts of interest: Grant from the Dementia Grants Program, New York State Department of Health
Chenoweth, 2009 ⁵²	N=289 4 months and 8 months	Residents with a diagnosis of dementia, with low cognitive function and "persistent need driven behaviors that made it difficult for staff to provide quality care"	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None Australian Health Ministers' Advisory Council
Chenoweth, 2014 ⁴⁶	N=601 8 months	Permanent residents with a dementia diagnosis that had been admitted at least 3 months prior to baseline and assessed "high care needs" and presence of agitation	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None

Study	Sample Size Follow-Up	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest
						Study Funding Source
						Unknown
Cohen-Mansfield, 2007 ⁵⁴	N=167 10 days	Inpatient nursing home residents with diagnosed dementia	Patient only	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None National Institutes of Health
Cohen-Mansfield, 2012 ⁵⁰	N=125 2 weeks	Nursing home residents who had been in the nursing home at least 3 weeks, were at least 60 years old, and have been identified by nursing staff as agitated at least several times per day	Patient only	Care as usual	Patient outcomes	Some concerns Conflicts of interest: NR National Institutes of Health
Deudon, 2009 ⁵¹	N=1369 8 weeks and 20 weeks	Facilities with 'sufficient' patients with a diagnosis of dementia according to the (International Classification of Diseases) ICD 10 criteria, an MMSE score <=24 and presenting at least 1 of the following behavioral and psychological symptoms of dementia (BPSD) at least once a week: opposition, denial of care, aberrant motor behavior, agitation, delusions, hallucinations or screaming	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None Grant from the French Ministry of Health and the Fondation Mederic Alzheimer
Eritz, 2016 ⁵⁹	N=73 19 days and 46 days	Residents over age 65 residing in one of 6 long-term care (LTC) facilities in a mid-sized metro area, who were identified by senior nursing staff as having symptoms consistent with a dementia diagnosis	Patient only	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None No
Fossey, 2006 ⁵⁵	N=346 12 months	12 eligible nursing homes within a minimum of 25% of patients with dementia and were taking neuroleptics and the patients in them (of which the numbers varied)	Health care team, Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: last author has spoken at educational events sponsored by Janssen and is a paid consultant for Bristol-Myers Squibb

Study	Sample Size Follow-Up	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest Study Funding Source
Fukuda, 2018 ⁴¹	N=400	Care staff (care workers, nurses, OTs, clinical psychologists) working in Japanese long term care facilities, who worked at least 4 days a week, who had length of service longer than 1 year	Health care team only	Care as usual	Staff outcomes	Grant from the Alzheimer's Society, funded by the Community Fund
	1 month					Some concerns
						Conflicts of interest: None Funded by the Research Funding for Longevity Sciences from the National Center for Geriatrics & Gerontology
Galik, 2015 ⁴⁴	N=96	Residents of the AL who were at least 55 years of age, had a Mini-Mental State Exam (MMSE) score of 15 or less, and an anticipated stay > 6 months	Health care team + patient + environment	Care as usual	Patient outcomes	Some concerns
	3 months and 6 months					Conflicts of interest: NR
						National Institute on Aging grant
Galik, 2021 ³⁵	N=336	Residents of the nursing home who were at least 55, spoke English, and scored ≤ 15 on the Mini-Mental State Examination (MMSE)	Health care team + patient + environment	Care as usual	Patient outcomes	Some concerns
	4 months and 12 months					Conflicts of interest: NR
						Robert Wood Johnson Foundation Nurse Faculty Scholar Grant
Kirkham, 2020 ³⁷	N=10 LTC homes - estimated total 150 residents per home	Long-term care (LTC) homes with higher potential need, determined by the prevalence of potentially inappropriate antipsychotic use in the year preceding recruitment	Health care team + patient	Care as usual	Patient outcomes	Some concerns
	Every 3 months for 12 months					Conflicts of interest: Last author - site investigator for clinical research trials sponsored by Roche
						Canadian Frailty Network Interdisciplinary Fellowship Award and by the Canadian Consortium on Neurodegeneration in Aging

Study	Sample Size Follow-Up	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest Study Funding Source
Klapwijk, 2018 ¹⁰² Linked study Pieper 2016 ⁸³	N=288 3 months and 6 months	Residents with Reisberg Global Deterioration Scale Score 5 (moderate dementia), 6 (moderately severe dementia), or 7 (severe dementia). Having a behavioral problem or an indication of being in pain and screened for the absence of a psychiatric diagnosis	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None Innovatiefonds Zorgverzekeraars, the Netherlands
Kovach, 2006 ⁵⁸	N=114 2 weeks and 4 weeks	Mini-Mental State Examination (MMSE) score indicating moderate to severe cognitive impairment, advanced functional impairment (ie, functional assessment staging [FAST], no chronic psychiatric diagnosis other than dementia-associated diagnosis and at least 4 weeks post admission to skilled nursing care at this nursing home.	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: NR National Institute of Nursing Research
Leone, 2012 ⁶¹	N=230 4 weeks and 17 weeks	Residents had to have a diagnosis of AD or related pathology, an MMSE score below 24, and present all the diagnostic criteria for apathy	Health care team only	Care as usual	Patient outcomes	Some concerns Conflicts of interest: NR Funding from the Federation of scientific cooperation
Litchwarck, 2018 ⁴²	N=229 8 weeks and 12 weeks	Probable dementia, defined as a Clinical Dementia Rating (CDR)15 score of 1 or higher, a moderate to high degree of agitation, defined as a score of at least 6 on the single agitation/aggression item of the Neuropsychiatric Inventory Nursing Home version (NPI-NH)16, and being a long-term patient, residing in the nursing home for at least 2 weeks before inclusion	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None Funded in total by a grant from the Innlandet Hospital Trust
Livingston, 2019 ³⁸	N=404 8 months	Eligible care homes with at least 17 residents with dementia, agreed to the mandatory training for all eligible staff and the intervention implementation plans, and more that 60% of staff agreeing to participate. Staff were eligible if they worked during the day providing in-person care to residents with dementia.	Health care team only	Care as usual	Patient outcomes	Low Conflicts of interest: first author has received consultancy fees from Otsuka Pharmaceutical

Study	Sample Size Follow-Up	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest Study Funding Source
Moniz-Cook, 2017 ⁶²	N=832 residents 609 staff 4 to 11 months	Resident lived in recruited care home, met the diagnostic criteria for dementia, and exhibited at least 4 problems on the challenging behavior stratum.	Health care team + patient	Care as usual	Patient outcomes	The UK Economic and Social Research Council and the National Institute of Health Research Some concerns Conflicts of interest: None National Institute for Health Research under its Programme Grants for Applied Research
Mork Rokstad, 2013 ⁶⁰ Linked study: Rosvik, 2013 ¹⁰³	N=624 10 months	Resident of a participating nursing home with dementia (all stages)	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: Pharmaceutical company consultation Research Council of Norway
Rapp, 2013 ⁴⁹	N=304 10 months	Nursing homes in good standing with local nursing home authorities (thus ensuring comparable nursing staff-to-resident ratios and provision of social workers, physical therapists, and occupational therapists on site), overall nursing home size between 100 and 200 residents, and a ratio of 50% to 70% of residents suffering from dementia	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None German Federal Ministry for Health
Resnick, 2021 ³⁶	N=550 4 months and 12 months	(1) aged 65 years or older; (2) able to speak English; (3) living in a participating assisted living setting at the time of recruitment; and (4) able to recall at least 1 of 3 words as per the Mini-Cog	Health care team + patient + environment	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None National Institute of Aging
Stensvik, 2022 ³⁴	N=309 3 months	Residents must be set up for "long-term stay," have been a resident at least 60 days, life expectancy of at least 6 months	Health care team + patient	Care as usual	Patient outcomes	Some concerns Conflicts of interest: None The study was funded by University College/NTNU

Study	Sample Size Follow-Up	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest Study Funding Source
Teri, 2005 ⁵⁶	N=254	Resident: diagnosed with Alzheimer's disease or related dementia, had problems with depression, anxiety, or agitation rated by staff as at least moderately distressing to the resident or requiring help, and, had a family member with power of attorney capable of providing consent Staff: direct care day staff who work at least one full shift, 2 days per week	Health care team only	Care as usual	Patient outcomes Staff outcomes	Department of Public Health and Nursing, and The Norwegian Nurses Organisation
	8 weeks					Some concerns Conflicts of interest: None This study was supported in part by a Pioneer Award from the Alzheimer's Association
Testad, 2016 ⁴³	N=274	NR	Health care team only	Care as usual	Patient outcomes	Some concerns
	7 months					Conflicts of interest: None Norwegian Research Council
Van de Ven 2013 ⁴⁸ Linked studies: Van de Ven 2014 ¹⁰⁴ Van de Ven 2012 ¹⁰⁵	N=816	Both residents and staff of care homes were included in the population. For inclusion, residents were required to have a dementia diagnosis by an elderly-care physician, approval of the elderly-care physician for inclusion, be at least 65 years old, have at least one NPS, and have the ability to use the common areas such as the shared living room, for at least 4 hours per day.	Health care team + patient	Care as usual	Patient outcomes Staff outcomes	Some concerns
						Conflicts of interest: NR Netherlands Organization for Health Research and Development. The first and second authors were financially supported by the funding bodies.
Zwijssen, 2014 ⁴⁵	N=395	All of the residents of the DSCU were included in (analysis of) the care program, including residents without challenging behavior	Health care team + patient	Care as usual	Patient outcomes	Some concerns
	Every 4 months for 20 months					Conflicts of interest: None Netherlands Organization for Health Research and Development

Study	Sample Size <i>Follow-Up</i>	Population	Intervention Categories	Comparator	Outcomes Assessed	Risk of Bias Rating
						Conflicts of Interest
						Study Funding Source
KQ2						
El Haddad, 2018 ⁷⁶	N=116	Nursing home residents who lived in a nursing home for at least 30 days	N/A	Care as usual	Patient outcomes	Moderate
	1 week, 4 weeks, 12 weeks					Conflicts of interest: None
						Not Reported
KQ3						
Bowers, 2015 ⁷⁸	N=564	Nursing staff at 31 psychiatric wards across 15 hospitals in the national health service	N/A	Care as usual	Staff outcomes	Some concerns
	NR					Conflicts of interest: None
						National Institute of Health Research grant

STUDY CHARACTERISTICS FOR STUDIES RATED AS HIGH RISK OF BIAS

Study	Sample Size Follow-Up	Population	Intervention Characteristics	Comparator	Outcomes Assessed	Risk of Bias Rating
KQ1 High/Serious ROB						
Bakker, 2011 ⁷⁰	N=168 13 weeks and 6 months	Participants met DSM-IV classification of dementia, amnesic disorder or other cognitive disorder and were at least 65 years old, and experiencing at least 3 neuropsychiatric symptoms (on NPI), with a mini-mental stat exam score between 18-27 and Barthel Index between 5-19	Multidisciplinary coordination In-person	Care as usual	Patient outcomes	High Conflicts of interest: Not reported Netherlands Organisation for Health Research and Development
Davison, 2007 ⁷²	N=203 (90 staff; 113 residents) 6 months	Nurses and nursing assistants who volunteered to participate in the study; residents with dementia and challenging behaviors who were selected by senior staff	Skills/knowledge of staff In-person	Care as usual	Provider outcomes	High Conflicts of interest: Not reported Not reported

Study	Sample Size Follow-Up	Population	Intervention Characteristics	Comparator	Outcomes Assessed	Risk of Bias Rating
Denormandie, 2014 ⁶⁶	N=459 <i>between 6 and 7 months after the last of the 3 training sessions</i>	65+ years of age		Care as usual	Patient outcomes	N/A Conflicts of interest: Not reported Not reported
Gates, 2005 ⁷⁴	N=138 <i>1 week and 6 months</i>	Full-time nursing assistants who provided full-time care provided to residents, and did not work for an outside employment agency	Skills/Knowledge of staff In-person	Care as usual	Staff outcomes	High Conflicts of interest: Not reported National Institute for Nursing Research and the National Institute for Occupational Safety and Health
Irvine, 2012a ⁶⁸	N=103 <i>8 weeks and 16 weeks</i>	NR	Skills/knowledge of staff In-Person	Care as usual	Staff outcomes	High Conflicts of interest: None National Institute on Aging
Irvine, 2012b ⁶⁷	N=159 <i>1 month</i>	Nurse aides who worked in the six long-term care facilities participating in the study.	Skills/Knowledge of staff Internet-based	Care as usual	Staff outcomes	High Conflicts of interest: Not reported Grant from the National Institute on Aging to Oregon Center for Applied Science
McCabe, 2015 ⁶⁵	N=391 <i>3 months and 6 months</i>	Residents with a dementia diagnosis and a symptom onset before the age of 65 who resided on the YOD SCU for at least 1 month	Skills/knowledge of staff In-person	Care as usual	Patient outcomes	High Conflicts of interest: None This study was supported by a grant from the National Health and Medical Research Council
Pieper, 2016 ⁶⁴	N=288	Moderate to severe cognitive impairment (GDS 5-7)	Skills/knowledge of staff	Care as usual	Patient outcomes	High

Study	Sample Size Follow-Up	Population	Intervention Characteristics	Comparator	Outcomes Assessed	Risk of Bias Rating
	3 months and 6 months	No psych diagnosis other than dementia Significant behavioral challenges (NPI-NH > 4 or CMAI > 44) Written proxy consent available	In-person			Conflicts of interest: None Innovatiefonds Zorgverzekeraars (Dutch funding agency)
Smeets, 2021 ⁶³	N=380 6 months, 12 months, and 18 months	All residents living in the 31 Dementia Special Care Units (DSCUs) were eligible to participate in the study if they had a diagnosis of dementia.	Multidisciplinary coordination; Skills/knowledge of staff In-person	Care as usual	Patient outcomes	High Conflicts of interest: None Netherlands Organization for Health Research and Development for funding. Supported by the Dutch association for residential and home care organizations, and the Dutch Health Care Inspectorate
Testad, 2005 ⁷³	N=151 6 months and 12 months	NR	Skills/knowledge of staff; increasing capacity of staff	Care as usual	Patient outcomes	High Conflicts of interest: None Norwegian Research Council
Testad, 2010 ⁷¹	N=211 7 months	Diagnosis of dementia based on medical records and corroborated with a Functional Assessment Staging (FAST) score	Skills/knowledge of staff	Care as usual	Patient outcomes	High Conflicts of interest: Last author has received honorary and research support from Lundbeck, Novartis, GE Health, and Merck Serono Norwegian Research Council
Wilkes, 2005 ⁷⁵	N=23 3 months and 6 months	NR	Other In-person	Care as usual	Patient outcomes	N/A Conflicts of interest: Not reported Not reported

Study	Sample Size Follow-Up	Population	Intervention Characteristics	Comparator	Outcomes Assessed	Risk of Bias Rating
Wingenfeld, 2011 ⁶⁹	N=202 6 months	Age of resident 60 years or older, receiving inpatient care (exclusion of short-term care guests), Stayed in the living area for at least 1 month, Completed the first and the last survey	Skills/knowledge of staff In-person	Care as usual	Patient outcomes	N/A Conflicts of interest: None Not reported
KQ2 High/Serious ROB						
Smith, 2010 ⁷⁷	N=90 3 times per month x 7 months ; falls 8 months prior and 8 months after transition	Residents of an existing NH setting (The Hammond Village; Sinclair Home) who were moved to Southwood Cottages when the Sinclair Home was closed; also included new residents to the Southwood Cottages not in the Sinclair Home - from community or other "aged-care facilities"	Skills/knowledge of staff; other: environmental changes (transition to) In-person	Care as usual	Patient outcomes	Serious Conflicts of interest: Not reported Hammond Care postgraduate research scholarship to the University of Sydney
KQ3 High/Serious ROB						
Fletcher, 2019 ⁷⁹	N=103 12 months	Current staff on 14 wards from 6 of the seven health services that implemented Safewards	Skills/knowledge of staff In-person	Care as usual	Staff outcomes	Serious Conflicts of interest: None Australian Government Research Training Program Scholarship; NHMRC PhD Research Scholarship; Office of the Chief Mental Health Nurse, in the Department of Health and Human Services, Government of Victoria
Narevic, 2011 ⁸⁰	N=267 Over 15 months	Patients who were admitted to the facility for at least five consecutive days during the study period	Skills/knowledge of staff In-person	Care as usual	Patient outcomes	Serious Conflicts of interest: Not reported Not reported

STUDY CHARACTERISTICS FOR STAR-VA STUDIES

Study	Sample Size Follow-Up	Population	Intervention Characteristics	Comparator	Outcomes Assessed	Conflict of Interest Funding
Jedele 2020 ⁸⁵	N=302 patients (71 Community Living Centers) 6 months	Veterans were enrolled if they had dementia and repeated distressing behaviors. Veterans were excluded if these behaviors were directly related to delirium, acute medical illness, or acute psychotic symptoms. Veterans were also excluded if they were deemed medically unstable or receiving hospice care.	Training included 4 core components: appropriate expectations of individuals with dementia, effective verbal and nonverbal communication, utilizing the ABC behavioral model, increasing person-centered pleasant events in daily care.	Baseline rates of patient outcomes	Patient outcomes (distress behaviors)	Conflict: none declared Funding: Quality Enhancement Research Initiative Partnered Evaluation Grant and matching support from the Office of Mental Health and Suicide Prevention, Veterans Health Administration
Karel 2016 ⁸⁶	N=71 patients; 126 staff (17 Community Living Centers) 6 months	126 staff from 12 sites provided anonymous survey feedback. Veterans were enrolled if they had dementia and repeated distressing behaviors. Veterans were excluded if these behaviors were directly related to delirium, acute medical illness, or acute psychotic symptoms.	Sixteen mental health providers and 16 nurse champions completed the STAR-VA psychotherapy training program from 17 community living centers that completed the 6-month telephone consultation period	Baseline rates of target behaviors and Cohen-Mansfield agitation inventory	Patient outcomes (challenging behaviors); provider outcomes (perceived feasibility and effectiveness)	Conflict: not reported Funding: Mental Health Services, Department of Veterans Affairs Central Office
Karlin 2014 ⁴⁷	N=21 Mental health providers; 71 veterans 6 months	21 mental health providers were psychologists. Staff Partners included nursing assistants, registered nurses, recreation therapists, social workers, occupational therapists, and physical therapists. Of the 71 Veterans, 64 completed the intervention.	Intervention consisted of 3 primary components (identifying and changing activators and results of challenging behaviors; increasing personally important pleasant events; promoting communication and expectations)	Baseline rates of patient outcomes	Patient outcomes (challenging behaviors); provider outcomes (self-efficacy/skill development; utility and effectiveness of STAR-VA)	Conflict: not reported Mental Health Services, VA Central Office
Mohr 2022 ⁸⁷	120 unique CLCs within the VA (2013-2017)		STAR-VA consisted of realistic expectations of residents, adjusting interpersonal interactions and environment, as well as promoting individual pleasant events.	Pre-intervention data (2012)	Patient outcomes (disruptive behaviors); provider outcomes (staff injury after STAR-VA training)	Conflict: none declared Department of Veterans Affairs, Veterans Health Administration Office of Research and Development, QUERI, and HSR&D
McConeghy 2021 ⁸⁸	229 STAR-VA sites; 1,163 untrained sites	17- 23 CLC sites enrolled in STAR-VA per year; patients enrolled included Veterans with diagnosis of dementia, distressed behaviors occurring at least weekly. Veterans with mental illness, delirium, or hospice care were	Intervention consisted of 3 primary components (identifying and changing activators and results of challenging behaviors;	Comparator data from non-STAR-VA sites	Patient outcomes (psychotropic drug use)	Conflict: none declared Department of Veterans Affairs, Veterans Health

Study	Sample Size Follow-Up	Population	Intervention Characteristics	Comparator	Outcomes Assessed	Conflict of Interest Funding
	(2013-2017)	excluded. The same criteria were applied to control patients who did not reside at a pilot STAR-VA site.	increasing personally important pleasant events; promoting communication and expectations)			Administration, Offices of Mental Health and Suicide Prevention and Geriatrics and Extended Care, and the Office of HSR&D Partnered QUERI

Abbreviations. ABC=activators, behaviors, consequences.

INTERVENTION CHARACTERISTICS

Refer to the main report's reference list for full citations.

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
<i>Patient-Only</i>						
Cohen-Mansfield 2007 ⁵⁴	Nursing home	TREA involves assessing the nature of a patient's unmet need (eg, loneliness, boredom, discomfort), presumably leading to a disruptive behavior, and then having a prescribed response to the unmet need. Person-centered care with decision tree protocol	Delivered for 10 consecutive days. The exact time of the interventions varied depending on the resident's medical and psychological condition.	Not specified	Cohen-Mansfield J. Theoretical frameworks for behavioral problems in dementia. Alz Care Quart. 2000.	Detection and diagnosis Assessment and care planning
USA	Patients with dementia excluding those with physically aggressive behaviors		Research assistant	In-person		
Treatment Routes for Exploring Agitation (TREA)						
Cohen-Mansfield 2012 ⁵⁰	Nursing home	TREA involves assessing the nature of a patient's unmet need (eg, loneliness, boredom, discomfort), presumably leading to a disruptive behavior, and then having a prescribed response to the unmet need. Person-centered care with decision tree protocol	A "short presentation of the intervention or a request to staff for a care activity and observation as to whether that presentation resulted in a change in agitation, interest, or pleasure. Those activities with the most beneficial effect during the trials were subsequently used during the 2-week treatment phase during the 4 hours identified as having the highest levels of agitation"	NH staff	Cohen-Mansfield J. Theoretical frameworks for behavioral problems in dementia. Alz Care Quart. 2000.	Detection and diagnosis Assessment and care planning
USA	Patients with dementia		Research assistant	In-person		
Treatment Routes for Exploring Agitation (TREA)						
Eritz 2016 ⁵⁹	Long-term care facilities	Life History Intervention: Resident life histories were gathered and used to inform care and connection of staff with residents.	Not clearly reported; staff presented with patient history once verbally and then the materials were placed in patient rooms and medical charts for review.	Nurses, special care aids, resident care coordinator, registered psychiatric nurses.	Person-centered care model	Assessment and care planning
Canada	Patients with dementia		Research team	In-person		

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
<i>Staff-Only</i>						
Deudon 2009 ⁵¹	Nursing home	Staff education program with instruction cards about general guidelines and nonpharmacologic interventions plus individual coaching	After initial 90-minute training session, individual coaching 2 hrs. twice a week for 1 month, then 1 session a week in the second month	NH staff	NR	General education Skills & Implementation training
France	Patients with dementia		"Two independent professionals with extensive experience of working with residents with dementia"	In-person		
Fukuda 2018 ⁴¹	Residential aged care facilities	Education program using guidelines for Initial Coping with behavioral and psychological symptoms of dementia (BPSD)	30-min educational lecture about BPDS and 90-min explanation of how to use the BPDS Guidelines	All care staff	NR	General education
Japan	Patients with dementia		Researchers	In-person		
Leone 2012 ⁶¹	Nursing homes	Staff education and coaching sessions on Alzheimer's disease and pathologies and approaches to handling patient apathy	Initial training: 2 hrs; Second phase: 2-hr training sessions twice/wk for 1 month; Third phase: workshops 2 hrs/week for 4 weeks	All staff members	NR	General education Skills & implementation training
France STIM-EHPAD	Patients with dementia		NR	In-person		
Livingston 2019 ³⁸	Care homes	6 skills sessions with topics included "getting to know person with dementia", "pleasant events", improving communication, "understanding agitation", "practical responses and making a plan", "work works? Using skills and strategies in the future" + monthly supervision meetings	6 sessions	Care assistants, nurses, activities coordinators, managers	NR	General education Skills & implementation training
UK Managing Agitation and Raising Quality of Life (MARQUE)	Patients with dementia		Facilitators, psychologist	in-person		

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
Teri 2005 ⁵⁶	Assisted living facilities	STAR includes a series of modules for staff on the activators, behaviors, and consequences of behavioral distress to alter the subsequent sequence of events; Workshops include lecture and discussion, role playing, observation of video case vignettes, and handouts	Two half-day group workshops and four individualized sessions over 2 months.	Assisted-living staff	Integrated model of person–environment fit and social learning theory	General education Skills & implementation training
USA	Patients with dementia			In-person		
Staff Training in Assisted-living Residences (STAR)			A clinical psychologist and a graduate student in nursing, each with geriatric mental health experience.			
Testad 2016 ⁴³	Care homes	Educational intervention to understand unmet needs to reduce restraint use + guidance groups to support care staff finding alternative solutions to restraint and medications	2-day seminar (16 h) and followed by 1-h monthly seven step guidance groups over 6 months.	All staff working at the care home.	Relation Related Care	Skills & implementation training Staffing [guidance groups]
Norway	Patients with dementia			In-person		
Trust Before Restraint			Clinical research nurses			
Staff + Patient						
Appelhof, 2019 ³⁹	Nursing home	An educational program combined with an intervention to manage neuropsychiatric symptoms (NPS) through 5 steps: evaluation of psychotropic drug prescription, detection, analysis, treatment, and evaluation of NPS.	Two training sessions (2.5 and 1.5 hours)	MDs; Psychologists; Nurses	NR	General education Detection and diagnosis Assessment and care planning Medical management Ongoing care for BPS of dementia and support ADLs
Netherlands	Young-onset dementia		nurse, physician, psychologist	In-person		
BEYOND-II Study						
Ballard 2018 ⁴⁰	Nursing homes	The WHELD program combines “staff training, social interaction, and guidance on use of antipsychotic medications” Sessions were manualized and involved didactic sessions, experiential learning, individual goal setting, also included on-site consultation and coaching	Orientation phase: 1 month (spent 2 whole days or 4 half days in each home)	Care home managers, staff teams, local WHELD champions, and residents	NR (Noted to promote person-centered care)	Medical management Ongoing care for BPS of dementia and support ADLs Skills & implementation Assessment and care planning
UK	Patients with dementia		Intervention delivery phase: 8 months (months 2-9) -Months 2-5: Training delivered to WHELD champions 1 day (6 hours) per month for each care home -Months 6-9: On-site consultation sessions totaling 8 hours per month with each care home.			
WHELD			WHELD therapists provided training to WHELD champions			

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention	Intervention Delivery Mode		
Intervention Name						
			(care staff), and WHELD champions then implemented what they learned to nursing homes			
Ballard 2016 ⁵⁷	Nursing homes	Compared 3 intervention intended to deliver person-centered care: 1) antipsychotic review, 2) intervention to increase social interaction, 3) exercise intervention (factorial design: 2x2x2); all received patient-centered care training	NR	Nursing home staff, physicians	NR	<i>Antipsychotic review</i>
UK	Patients with dementia		The interventions were delivered by a therapist who had attended an intensive 10-day training program and who coordinated the delivery of the intervention into all homes assigned to that intervention. In each home a minimum of 2 lead staff members were trained to implement the intervention.	In-person	(Noted to promote person-centered care; "primarily used tools developed for the Focused Intervention for Training of Staff or FITS program)	Medical management Ongoing care for BPNS Skill & implementation
WHELD						<i>Social interactions with pleasant activities</i> Skills & implementation General education Assessment and care planning
Chapman 2007 ⁵³	Nursing home	The Advanced Illness Care Teams (AICTs) addressed four domains of care: (1) medical issues, (2) meaningful activities, (3) psychological problems, and (4) behavioral concerns	Each AICT met five times (weeks 1, 2, 3, 5, and 8) during the eight-week intervention period.	NH Staff including physicians, nurses, social workers, psychologists, physical and occupational therapists, and nutritionists.	Care models based on Volicer 2001; Volicer & Bloom-Charette, 1999; McCallion et al, 1999, and Cohen-Mansfield, et al, 1989.	Staffing Medical management Assessment and care planning Ongoing care for BPS of dementia and support ADLs
USA	Patients with dementia		Experienced and licensed clinical social workers provided in-person or telephone consultation to the AICTs during meetings and conducted treatment fidelity checks.	In-person		
The Advanced Illness Care Teams (AICTs)						
Chenoweth 2014 ⁴⁶	Residential aged care homes	Staff training focused on paying attention to the residents' feelings when agitated, interacting with residents in a person-centered way and using person-centered care planning to meet the residents' psychosocial needs, followed by on-site supervision in these processes and telephone support.	32 hours off-site training, plus on-site supervision for 2-16 hrs. plus telephone support	Nurses; CNAs; Care managers; Diversion/ Recreation Therapist	NR	Assessment and care planning Skills & implementation training
Australia	Patients with dementia		Two experts in PCC and 1 PCC trainer from Alzheimer's Australia			
PerCEN study						

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
Chenoweth 2009 ⁵² Person-centered care (PCC) arm Australia CADRES study	Nursing home Patients with dementia	Staff training challenging beliefs about dementia, staff then developed and implemented care plans with new knowledge, plus PI support by phone.	PCC: 2-day training session for 2 care staff members + 2 site visits + regular phone support x 4-month intervention period	Nurses; other types of aides; case managers 2 staff members at each nursing home In person; telephone	NA	general education Assessment and care
Chenoweth 2009 ⁵² Dementia-care mapping (DCM) arm Australia CADRES study	Nursing home Patients with dementia	Staff training followed by structured observations and implementation of patient care plans designed by study investigators, plus PIs for support by phone	Unspecified training for 2 local staff + 6 hours per day x 2 days observations + telephone support during 4-month intervention period Researchers with accredited training	2 staff members at each nursing home In person; telephone	NA	Skills & implementation training Detection and diagnosis Assessment and care planning
Fossey 2006 ⁵⁵ UK	Nursing home Elderly mentally impaired (>25% with dementia)	Training and support intervention delivered to nursing home staff focusing on alternatives to drugs for the management of agitated behavior in dementia, specifically person-centered care and skills development.	Two days a week for 10 months plus weekly supervision Trial clinician	NH staff In-person	NR	Skills & implementation training Medical management
Moniz-Cook 2017 ⁶² UK ResCare	Care home Patients with dementia	E-learning (Functional Analysis training) and decision support to help care home staff support residents with commonly occurring challenging behaviors using simulated case studies.	Internet-based training and decision-support algorithm Specialist dementia care therapist	Care staff Internet-based	NPT- Normalization process theory (May et al, 2007)	Skills & implementation training Assessment and care planning
Kirkham 2020 ³⁷ Canada The Optimizing Prescribing of Antipsychotics in	Long term care homes with high antipsychotic use	An educational in-service of evidence-based tools to assess and monitor NPS, monthly interdisciplinary team meetings about the reduction of antipsychotics	One 90-minute education session followed by three monthly team meeting. Study investigators	Physicians, nurses, pharmacists, other health professionals In-person; teleconferencing	DICE model (Kales, 2015)	General education Skills & implementation training Medical management Assessment and care planning

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
Long-term care (OPAL) program						
Klapwijk 2018 ³³	Nursing homes	A stepwise multicomponent intervention to reduce both behavioral symptoms and psychotropic drug use: 1) care needs assessment, 2) pain and physical needs assessment, 3) affective needs assessment, 4) nonpharmacologic comfort treatment, 5) consultation with other disciplines or trial psychotropic drugs. Process repeated if symptoms continued	Unspecified frequency for training over first 3 months of study period.	Care staff including physicians and nurses.	Skills training	Assessment and care planning
Netherlands	Patients with dementia				Patient assessment	Medical management
STA OP!			Unspecified	In-person	Multidisciplinary coordination meetings+	Ongoing care for behavioral-psychological symptoms of dementia and support ADLs Staffing
Kovach 2006 ⁵⁸	Nursing homes	A 5-step clinical protocol for assessment and management of unmet needs: 1) physical needs assessment, 2) affective needs assessment, 3) trial individualized nonpharmacologic comfort treatments, 4) trial analgesics, 5) consultation with other disciplines or trial psychotropic drug	One 7-hour education session + twice weekly check-ins	Nurses with at least 6 months experience caring for patients with dementia and work 32 hours or more per week on dayshift.	Consequences of need-driven dementia theory (Kovach et al 2005). J Nurs Scholarsh. 2005;37:134-140.	Skills and implementation training
USA	Patients with dementia		2 APNs			Medical management
Serial Trial Intervention (STI)				In-person		Assessment and care planning Ongoing care for behavioral-psychological symptoms of dementia and support ADLs Staffing
Lichtwarck 2018 ⁴²	Nursing homes	An interdisciplinary multi-component intervention including education on NPS and dementia (both arms), comprehensive patient assessment and tailored treatment plan creation with 3 phases: registration and assessment phase, guided reflection phase, action and evaluation phase.	2-hour lecture on NPS and dementia + 3 hour lecture and role play +supervision of first case conference meeting; 3 nurses responsible for implementation at each received an additional 3 hours of training	MDs; Nurses	Cognitive behavioral therapy and person-centered care	Skills & implementation training
Norway	Patients with dementia			In-person		Medical management
Targeted interdisciplinary model for evaluation and treatment of neuropsychiatric symptoms (TIME)						Detection and diagnosis Assessment and care planning Staffing Ongoing care for behavioral-psychological symptoms of dementia and support ADLs

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
Mork Rokstad 2013 ⁶⁰	Nursing homes	DCM: a 4–6-hour observational process by external experts and information provided to staff to implement PCC and develop staff skills.	DCM: a basic DCM certification course for 2 care staff per ward. Rest of staff received 3-hour lecture.	Nurses; care staff members	NR	Skills & implementation training Assessment and care planning
Norway	Patients with dementia		DCM certification (who provided training: NR)	In-person		
Dementia Care Mapping (DCM); VIPS Practice Model (VPM)			Lecture by researchers			
		VPM: a weekly consensus meeting to analyze challenging patient-nurse interaction chaired by nurses and with patient's primary nurse representing patient.	VPM: 3-hour training by all staff + 3-day course for local leader	Nurses; care staff members	VIPS framework	Skills & implementation training Assessment and care planning Staffing
			For VPM, trainings conducted by the researchers; 3-hour introductions for both arms given by researchers			
Rapp 2013 ⁴⁹	Nursing homes	Intervention includes training of nursing home staff (symptomatology and cases of behavioral symptoms, standardized assessments and pharmacologic and nonpharmacologic interventions), use of physical and activity therapy, and optimization of pharmacologic interventions	2 four-hour education segments in one day for staff	Nursing home staff	NR	General education Skills & implementation Assessment and care planning
Germany	Patients with dementia		Primary care psychiatrists trained in individual 4-hour sessions each.	Primary care psychiatrists		
VIDEANT			Physician and a nurse specialized in geriatric psychiatry	In person		
Stensvik 2022 ³⁴	nursing homes	Monthly modified case conference, assessments of NPS, individualized care plans	4-hour training to train RN and NH leadership at each site to lead the intervention + monthly assessments followed by case conferences	Nurses	NR	Detection and diagnosis Assessment and care planning Staffing Skills & implementation training General education
Norway	Residents of regular care units		Researcher RNs	In person		

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
van de Ven 2013 ⁴⁸	Care homes	Method of creating action plans based on systematic observations of individual patients; at least 2 cycles of observation, feedback, and action plans	2 staff from each home attended basic (4-day course) and advanced training (3-day course) on DCM	Staff members	Person-centered care principles	Skills & implementation training Assessment and care planning staffing Ongoing care for behavioral-psychological symptoms of dementia and support ADLs
Netherlands	Patients with dementia		1 day training for all staff at participating homes			
Dementia-Care Mapping (DCM)			DCM Netherlands			
Zwijzen 2014 ⁴⁵	Nursing homes	A care program with structured process of detection, analysis, treatment, and evaluation of treatment of challenging behavior and pre-arranges multidisciplinary consultation. Baseline training on models of challenging behavior, negative consequences of psychoactive medications, and alternative approaches.	1 full day of training broken into 2 training meetings, 2 weeks apart	Staff (nurses, psychologists, and elderly care physicians)	NR	Skills & implementation training General education Detection and diagnosis Staffing Assessment and care planning Ongoing care for behavioral-psychological symptoms of dementia and support ADLs
Netherlands	Patients with dementia		NR	In-person		
Coming to Grips with Challenging Behavior Care Program						
Staff + Patient + Environment						
Galik 2015 ⁴⁴	Assisted living	FFC-CI is a 4-component intervention: 1) evaluation of person-environment fit; 2) education; 3) establishing goals for residents; 4) mentoring and sustainability	10hr /week for 6 months	Direct care workers, other members of health care team, families, residents	Social ecological model & social cognitive theory	Skills & implementation training Supportive and therapeutic environments Assessment and care planning
USA	MMSE score of <15; anticipated stay > 6 months		Study-supported nurse	In-person		
The Function Focused Care Intervention for the Cognitively Impaired (FFC-CI)						
Galik 2021 ³⁵	Nursing homes	Four intervention components: 1) assessment of policies and environment, 2) education and training, 3) resident Goal setting, 4) ongoing training and motivation for staff	10 hours per week for 12 months	Nurses; facility-based champions (nurses or activity staff)	Social ecological model & social cognitive theory	Skills & implementation training Supportive and therapeutic environments Assessment and care planning
USA	MMSE score of <15; anticipated stay > 6		Function and Behavior Focused Care Research Nurse	In-person		
Function and Behavior Focused Care for the						

Study	Setting	Narrative Description of Intervention	Dose of Intervention	Staff Disciplines Receiving Intervention	Underpinning Theories	Core Components
Country	Target Patient Population		Who Delivered Intervention			
Intervention Name				Intervention Delivery Mode		
Cognitively Impaired (FBFC-CI)						
Resnick 2021 ³⁶	Assisted living facilities	Intervention has a multistep approach: 1) recurrent local stakeholder multidisciplinary team meetings, 2) environmental and policy assessments, 3) function focused care plans for residents, 4) environmental and policy assessment and ongoing mentoring	Monthly meeting over 12 months; 2 hours per month	Nurses; social workers; activities director	Social cognitive therapy, social ecological model, evidence integration triangle model	Supportive and therapeutic environments Assessment and care planning Ongoing care for BPS of dementia and support ADLs Staffing Skills & implementation training
USA	Assisted living residents, able to recall at least 1 of 3 words as part of mini cog.		Research nurse facilitator	Facility champion		
Focused Care for Assisted Living Using the Evidence Integration Triangle (FFC-AL-EIT)				In-person; internet-based		

INTERVENTION CODING DOMAINS AND OPERATIONALIZED DEFINITIONS

Coding domains are adapted from the Alzheimer's Association Dementia Care Practice Recommendations: [Dementia Care Practice Recommendations | Alzheimer's Association](#).¹⁰

Patient-Level	Definition
Detection and diagnosis	Mentoring/identifying for symptoms or unmet needs
Assessment and care planning	Individualized care plan development
Ongoing care for behavioral-psychological symptoms of dementia and support ADLs	Ongoing monitoring and/or evaluating effectiveness of practices and adjusting as needed
Medical management	Medication review (<i>eg</i> , antipsychotic medications)
	Addressing uncontrolled medical diagnoses
	Addressing uncontrolled psychological diagnoses
Staff-Level	
Information, education, and support	Education programs about dementia specifically and general nonpharmacologic approaches to addressing unmet needs and managing distress behaviors
	Would NOT include training on a change in process or protocol otherwise captured in other domains
Staffing	Care coordination (<i>eg</i> , multidisciplinary team meetings)
	Changes to team composition (<i>eg</i> , hiring a new discipline)
Environment	
Supportive and therapeutic environments	Approaches that impact or adjust physical environment to meet patient needs
Transitions	
Transitions and coordination of services	Approaches related to preparing for transitions from one care level to another

STUDIES EXCLUDED DURING FULL-TEXT SCREENING

Citation	Exclude Reason
Allen, 2000 ¹	Ineligible population
Almutairi, 2022 ²	Ineligible intervention
Andersen, 2017 ³	Ineligible study design
Anonymous, 2002 ⁴	Ineligible publication type
Appelhof, 2018 ⁵	Ineligible outcome
Arco, 2006 ⁶	Ineligible study design
Ayalon, 2009 ⁷	Ineligible publication type
Bakerjian, 2020 ⁸	Ineligible intervention
Beck, 2002 ⁹	Ineligible intervention
Bharani, 2005 ¹⁰	Ineligible publication type
Bhat, 2020 ¹¹	Ineligible population
Bielderma, 2021 ¹²	Ineligible population
Bird, 2009 ¹³	Ineligible intervention
Bjorkdahl, 2013 ¹⁴	Ineligible population
Blair, 2017 ¹⁵	Ineligible population
Boettcher, 2004 ¹⁶	Ineligible study design
Borbasi, 2010 ¹⁷	Ineligible publication type
Bradshaw, 2004 ¹⁸	Ineligible population
Buisson, 2019 ¹⁹	Ineligible study design
Burack, 2012 ²⁰	Ineligible study design
Burgio, 2004 ²¹	Ineligible study design
Burgio, 2002 ²²	Ineligible date
Carbone, 2021 ²³	Ineligible intervention
Chao, 2005 ²⁴	Ineligible country
Chen, 2016 ²⁵	Ineligible country
Chenoweth, 2007 ²⁶	Ineligible study design
Chiappinotto, 2022 ²⁷	Ineligible intervention
Chou, 2016 ²⁸	Ineligible intervention
Chou, 2011 ²⁹	Ineligible country
Chrzescijanski, 2007 ³⁰	Ineligible study design
Chung, 2004 ³¹	Ineligible country
Ātoban Arguvanli, 2015 ³²	Ineligible population
Cohen-Mansfield, 2006 ³³	Ineligible intervention
Cohen-Mansfield, 2010 ³⁴	Ineligible intervention
Cohen-Mansfield, 2014 ³⁵	Ineligible intervention
Crotty, 2004 ³⁶	Ineligible intervention
da Silva Serelli, 2017 ³⁷	Ineligible country
Dechamps, 2010 ³⁸	Ineligible study design
DeYoung, 2002 ³⁹	Ineligible study design

Citation	Exclude Reason
DiBartolo, 2013 ⁴⁰	Ineligible study design
Dichter, 2015 ⁴¹	Ineligible study design
Dobbs, 2018 ⁴²	Ineligible outcome
Duinen-van den Ijssel, 2020 ⁴³	Ineligible outcome
Egan, 2007 ⁴⁴	Ineligible intervention
Eggermont, 2010 ⁴⁵	Ineligible intervention
Eisch, 2000 ⁴⁶	Ineligible intervention
Engst, 2004 ⁴⁷	Ineligible intervention
Fitzler, 2016 ⁴⁸	Ineligible study design
Fitzwater, 2002 ⁴⁹	Ineligible study design
Garland, 2007 ⁵⁰	Ineligible intervention
Gerdner, 2005 ⁵¹	Ineligible intervention
Gerolimatos, 2018 ⁵²	Ineligible study design
Gillis, 2019 ⁵³	Ineligible study design
Gonzalez-Fraile, 2021 ⁵⁴	Ineligible study design
Graske, 2019 ⁵⁵	Ineligible setting
Hawranik, 2008 ⁵⁶	Ineligible intervention
Hazelhof, 2014 ⁵⁷	Ineligible intervention
Henskens, 2018 ⁵⁸	Ineligible intervention
Hicks-Moore, 2005 ⁵⁹	Ineligible intervention
Hicks-Moore, 2008 ⁶⁰	Ineligible intervention
Holle, 2015 ⁶¹	Ineligible outcome
Holm, 1999 ⁶²	Ineligible date
Hong, 2011 ⁶³	Ineligible intervention
Hsu, 2015 ⁶⁴	Ineligible study design
Husebo, 2011 ⁶⁵	Ineligible intervention
Husebo, 2015 ⁶⁶	Ineligible outcome
Irvine, 2013 ⁶⁷	Ineligible outcome
Isaac, 2021 ⁶⁸	Ineligible study design
Jervis, 2002 ⁶⁹	Ineligible intervention
Kerssens, 2014 ⁷⁰	Ineligible intervention
Kim, 2005 ⁷¹	Ineligible intervention
Klapwijk, 2018 ⁷²	Ineligible outcome
Koczy, 2011 ⁷³	Ineligible outcome
Kolanowski, 2011 ⁷⁴	Ineligible intervention
Koskas, 2011 ⁷⁵	Ineligible study design
Kovach, 2004 ⁷⁶	Ineligible intervention
Kramarz, 2022 ⁷⁷	Ineligible study design
Kuiper, 2009 ⁷⁸	Unable to locate full text
Landreville, 2005 ⁷⁹	Ineligible study design
Landreville, 2011 ⁸⁰	Unable to locate full text

Citation	Exclude Reason
Lamppu, 2021 ⁸¹	Ineligible intervention
Lay, 2015 ⁸²	Ineligible population
Lay, 2015 ⁸³	Ineligible outcome
Lichtenberg, 2005 ⁸⁴	Ineligible study design
Loi, 2017 ⁸⁵	Ineligible intervention
Lykkeslet, 2016 ⁸⁶	Ineligible study design
Maidment, 2020 ⁸⁷	Ineligible outcome
Manepalli, 2009 ⁸⁸	Ineligible study design
Massaia, 2001 ⁸⁹	Ineligible intervention
McAiney, 2007 ⁹⁰	Ineligible outcome
McCreedy, 2022 ⁹¹	Ineligible intervention
McGill, 2018 ⁹²	Ineligible population
Meehan, 2001 ⁹³	Ineligible intervention
Mickus, 2002 ⁹⁴	Ineligible date
Monette, 2008 ⁹⁵	Ineligible study design
Moniz-Cook, 1998 ⁹⁶	Ineligible study design
Morgan, 2005 ⁹⁷	Ineligible intervention
Morley, 2013 ⁹⁸	Ineligible publication type
Muniz, 2021 ⁹⁹	Ineligible intervention
O'Connell, 2020 ¹⁰⁰	Ineligible population
Oh, 2005 ¹⁰¹	Ineligible study design
Opie, 2002 ¹⁰²	Ineligible date
Orrell, 2007 ¹⁰³	Ineligible intervention
Park, 2012 ¹⁰⁴	Ineligible population
Pouwels, 2019 ¹⁰⁵	Ineligible study design
Ray, 2017 ¹⁰⁶	Ineligible intervention
Resnick, 2016 ¹⁰⁷	Ineligible study design
Robert, 2021 ¹⁰⁸	Ineligible intervention
Rose, 2014 ¹⁰⁹	Ineligible population
Rosewarne, 1997 ¹¹⁰	Ineligible date
Rota-Bartelink, 2011 ¹¹¹	Ineligible intervention
Roth, 2002 ¹¹²	Ineligible date
Ryan, 2018 ¹¹³	Ineligible study design
Ryden, 2000 ¹¹⁴	Ineligible date
Samus, 2013 ¹¹⁵	Ineligible outcome
Sanchez, 2016 ¹¹⁶	Ineligible intervention
Sansone, 2000 ¹¹⁷	Ineligible population
Shah, 1998 ¹¹⁸	Ineligible date
Sidani, 2012 ¹¹⁹	Ineligible study design
Simard, 2010 ¹²⁰	Ineligible intervention
Sloane, 2004 ¹²¹	Ineligible intervention

Citation	Exclude Reason
Smit, 2012 ¹²²	Ineligible outcome
Smith, 2010 ¹²³	Ineligible population
Sprangers, 2015 ¹²⁴	Ineligible study design
Stacpoole, 2015 ¹²⁵	Ineligible study design
Stancliffe, 1999 ¹²⁶	Ineligible date
Sutor, 2002 ¹²⁷	Ineligible publication type
Thomas, 2005 ¹²⁸	Ineligible population
Thomas, 2017 ¹²⁹	Ineligible intervention
Tjia, 2017 ¹³⁰	Ineligible study design
Torres-Castro, 2022 ¹³¹	Ineligible study design
Totsika, 2008 ¹³²	Ineligible study design
Traynor, 2018 ¹³³	Ineligible intervention
Tseng, 2019 ¹³⁴	Ineligible country
Turner, 2009 ¹³⁵	Ineligible study design
Tyrer, 2017 ¹³⁶	Ineligible study design
van de Ven, 2012 ¹³⁷	Ineligible study design
van der Velde-van Buuringen, 2021 ¹³⁸	Ineligible intervention
van Duinen-van den, 2018 ¹³⁹	Ineligible population
van Weert, 2005 ¹⁴⁰	Ineligible study design
Veltro, 2006 ¹⁴¹	Ineligible population
Verbeek, 2010 ¹⁴²	Ineligible study design
Verbeek, 2014 ¹⁴³	Ineligible intervention
Vink, 2013 ¹⁴⁴	Ineligible intervention
Volicer, 2006 ¹⁴⁵	Ineligible intervention
Wells, 2000 ¹⁴⁶	Ineligible date
Williams, 2011 ¹⁴⁷	Ineligible population
Williams, 2017 ¹⁴⁸	Ineligible outcome
Wouters, 2017 ¹⁴⁹	Ineligible intervention
Yang, 2021 ¹⁵⁰	Ineligible country
Yang, 2016 ¹⁵¹	Ineligible country
Zijlmans, 2011 ¹⁵²	Ineligible population
Zijlmans, 2015 ¹⁵³	Ineligible population
Zoder-Martell, 2014 ¹⁵⁴	Ineligible population
Zwijssen, 2015 ¹⁵⁵	Ineligible outcome

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RISK OF BIAS ASSESSMENTS

KQ1 RANDOMIZED CONTROLLED TRIALS (ROB-2)

Study	Risk of bias domains						Overall
	D1	D2	D3	D4	D5		
Appelhof 2019	+	+	+	+	+	+	+
Bakker 2011	+	+	+	+	+	+	+
Ballard 2016	+	+	+	+	+	+	+
Ballard 2018	+	+	+	+	+	+	+
Chapman 2007	+	+	+	+	+	+	+
Chenoweth 2009	+	+	+	+	+	+	+
Chenoweth 2014	+	+	+	+	+	+	+
Cohen-Mansfield 2007	+	+	+	+	+	+	+
Cohen-Mansfield 2012	+	+	+	+	+	+	+
Davison 2007	+	+	+	+	+	+	+
Deudon 2009	+	+	+	+	+	+	+
Eritz 2016	+	+	+	+	+	+	+
Fossey 2006	+	+	+	+	+	+	+
Fukuda 2018	+	+	+	+	+	+	+
Galik 2015	+	+	+	+	+	+	+
Galik 2021	+	+	+	+	+	+	+
Gates 2005	+	+	+	+	+	+	+
Irvine 2012a	+	+	+	+	+	+	+
Irvine 2012b	+	+	+	+	+	+	+
Kirkham 2020	+	+	+	+	+	+	+
Klapwijk 2018	+	+	+	+	+	+	+
Kovach 2006	+	+	+	+	+	+	+
Leone 2012	+	+	+	+	+	+	+
Lichtwarck 2018	+	+	+	+	+	+	+
Livingston 2019	+	+	+	+	+	+	+
McCabe 2015	+	+	+	+	+	+	+
Moniz-Cook 2017	+	+	+	+	+	+	+
Mork Rokstad 2013	+	+	+	+	+	+	+
Pleper 2016	+	+	+	+	+	+	+
Rapp 2013	+	+	+	+	+	+	+
Resnick 2021	+	+	+	+	+	+	+
Smeets 2021	+	+	+	+	+	+	+
Stensvik 2022	+	+	+	+	+	+	+
Teri 2005	+	+	+	+	+	+	+
Testad 2005	+	+	+	+	+	+	+
Testad 2010	+	+	+	+	+	+	+
Testad 2016	+	+	+	+	+	+	+
van de Ven 2013	+	+	+	+	+	+	+
Zwijsen 2014	+	+	+	+	+	+	+

Domains:
D1: Bias arising from the randomization process.
D2: Bias due to deviations from intended intervention.
D3: Bias due to missing outcome data.
D4: Bias in measurement of the outcome.
D5: Bias in selection of the reported result.

Judgement
High
Some concerns
Low

KQ3 RANDOMIZED CONTROLLED TRIALS (ROB-2)

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Bowers 2015						
		Domains: D1: Bias arising from the randomization process. D2: Bias due to deviations from intended intervention. D3: Bias due to missing outcome data. D4: Bias in measurement of the outcome. D5: Bias in selection of the reported result.				Judgement  High  Some concerns  Low	

KQ2 NONRANDOMIZED COMPARISON STUDIES (ROBINS-I)

		Risk of bias domains							
		D1	D2	D3	D4	D5	D6	D7	Overall
Study	El Haddad 2018								
	Smith 2010								
		Domains: D1: Bias due to confounding. D2: Bias due to selection of participants. D3: Bias in classification of interventions. D4: Bias due to deviations from intended interventions. D5: Bias due to missing data. D6: Bias in measurement of outcomes. D7: Bias in selection of the reported result.							Judgement  Serious  Moderate  Low

KQ3 NONRANDOMIZED COMPARISON STUDIES (ROBINS-I)

		Risk of bias domains							
		D1	D2	D3	D4	D5	D6	D7	Overall
Study	Fletcher 2019								
	Narevic 2011								

Domains:

D1: Bias due to confounding.

D2: Bias due to selection of participants.

D3: Bias in classification of interventions.

D4: Bias due to deviations from intended interventions.

D5: Bias due to missing data.

D6: Bias in measurement of outcomes.

D7: Bias in selection of the reported result.

Judgement

 Serious

 Moderate

 Low

 No information

RESULTS FOR HEALTH CARE WORKER-FOCUSED INTERVENTION COMPONENTS ONLY

Study	Outcome Direction Follow-Up	Results
N Clusters N Patients Primary outcome		
<i>Health Care Teams-Only Interventions</i>		
Deudon, 2009 ⁵¹	CMAI	Baseline
16 nursing homes	Lower=better	Staff training to manage behavioral and psychological symptoms of dementia: 53.08 (SD=18.1)
306 patients randomized	8 weeks	Control: 48.21 (SD=15.9)
Primary outcome: CMAI and observation scale	20 weeks	8 weeks
		Staff training to manage behavioral and psychological symptoms of dementia: 45.48 (SD=13.9)
		Control: 45.59 (SD=13.9)
		20 weeks
		Staff training to manage behavioral and psychological symptoms of dementia: 47 (SD=16)
		Control: 47.54 (SD=18.1)
Testad, 2016 ⁴³	CMAI	Baseline
24 care homes	Lower=better	Trust before restraint: 40.1 (SD=12.5)
274 patients randomized	7 months	Control: 44.8 (SD=14.4)
Primary outcome: use of restraint		7 month follow-up
		trust before restraint: 37 (SD=11.6)
		Control: 41.2 (SD=14.3)
		P value 0.078
Livingston 2019 ³⁸	CMAI	Baseline
20 clusters	Lower=better	Managing agitation and raising quality of life: 42 (SD=16)
404 patients randomized	8 months	Treatment as usual: 44 (SD=15)
Primary outcome: CMAI		8 months follow-up
		Managing agitation and raising quality of life: 42 (SD=16)
		Treatment as usual: 44 (SD=17)
		Adjusted mean difference=-0.40 (95% CI [-3.89, 3.09]) (p value 0.8226)

Study	Outcome	Results
N Clusters N Patients Primary outcome	Direction Follow-Up	
Deudon, 2009 ⁵¹ 16 nursing homes 306 patients randomized Primary outcome: CAMI and observation scale	Observation Scale Lower=better 8 weeks 20 weeks	Baseline Staff training to manage behavioral and psychological symptoms of dementia: 22.22 (SD=31.9) Control: 13.26 (SD=20) 8 weeks Staff training to manage behavioral and psychological symptoms of dementia: 11.73 (SD=21.6) Control: 10.89 (SD=19.8) 20 weeks Staff training to manage behavioral and psychological symptoms of dementia: 7.58 (SD=14.7) Control: 9.91 (SD=15.8)
Fukuda, 2018 ⁴¹ 17 long term care or nursing facilities 400 patients randomized Primary outcome: NPI	NPI Lower=better 30 days	Baseline Educational intervention mean: 27.5 (SD=22.6) Control mean: 25.5 (SD=27.3) 30-day follow-up Educational intervention mean: 22.7 (SD=23.4) Control mean: 25.1 (SD=26.7)
Teri, 2005 ⁵⁶ 4 assisted living residencies 31 patients randomized Primary outcome: NR	NPI Lower=better 8 weeks	Baseline STAR mean: 12.6 (SD=13.4) Control mean: 6.7 (SD=10.6) 8 weeks STAR mean: 9.1 (SD=9.3) Control mean: 9.4 (SD=13.2) Z score -2.15 (p value 0.031)
Testad, 2016 ⁴³ 24 care homes 274 patients randomized Primary outcome: use of restraint	NPI Lower=better 7 months	Baseline Trust before restraint mean: 12.1 (SD=12.3) Control mean: 18.2 (SD=17.5) 7 months Trust before restraint mean: 17.7 (SD=19.9) Control mean: 19.8 (SD=19.4) (p value 0.207)

Study	Outcome Direction Follow-Up	Results
N Clusters N Patients Primary outcome		
Livingston, 2019 ³⁸	NPI	Baseline
	Lower=better	Managing agitation and raising quality of life: 14 (SD=14)
20 clusters	8 months	Treatment as usual: 16 (SD=16)
404 patients randomized		
Primary outcome: CMAI		8 months follow-up
		Managing agitation and raising quality of life: 14 (SD=16)
		Treatment as usual: 16 (SD=14)
		Adjusted mean difference: -0.84 (95% CI [-5.51, 3.84]) (p value 0.726)
Leone, 2012 ⁶¹	NPI-ES- Affective	Baseline
	Lower=better	Stimulation intervention group
24 care homes	4 weeks	Affective subgroup mean 3.56 (SD=4.93)
274 patients randomized	3 months	Usual care
Primary outcome: NR		Affective subgroup mean 4.76 (SD=6.43)
		4 weeks
		Stimulation intervention group
		Affective subgroup mean 5.84 (SD=6.32)
		Usual care
		Affective subgroup mean 4.36 (SD=5.71)
		Mean difference: 2.52 (SD=6.08) (p value < 0.01)
		3 months
		Stimulation intervention
		Affective subgroup mean 4.41 (SD=6.21)
		Usual care
		Affective subgroup mean 4.70 (SD=5.70)
		Mean difference: 0.83 (SD=6.13) (p value < 0.01)
	NPI-ES- Apathy	Baseline
	Lower=better	Stimulation intervention group
	4 weeks	Affective subgroup mean 5.91 (SD=4.65)
	3 months	Usual care
		Affective subgroup mean 5.18 (SD=4.64)
		4 weeks
		Stimulation intervention group
		Affective subgroup mean 6.21 (SD=4.53)

Study	Outcome	Results
N Clusters N Patients Primary outcome	Direction Follow-Up	
		Usual care Affective subgroup mean 4.72 (SD=4.29) Mean difference: 0.42 (SD=5.14) (p value > 0.05)
		3 months Stimulation intervention Affective subgroup mean 5.94 (SD=4.63) Usual care Affective subgroup mean 5.10 (SD=4.65) Mean difference: -0.05 (SD=5.83) (p value > 0.05)
NPI-ES- Hyperactivity Lower=better 4 weeks 3 months		Baseline Stimulation intervention group Affective subgroup mean 6.27 (SD=8.23) Usual care Affective subgroup mean 5.89 (SD=8.45)
		4 weeks Stimulation intervention group Affective subgroup mean 7.0 (SD=9.06) Usual care Affective subgroup mean 6.15 (SD=8.12) Mean difference: 0.76 (SD=4.31) (p value p > 0.05)
		3 months Stimulation intervention Affective subgroup mean 7.47 (SD=11.82) Usual care Affective subgroup mean 6.69 (SD=8.33) Mean difference: 1.2 (SD=9.81) (p value > 0.05)
NPI-ES- Psychotic Lower=better 4 weeks 3 months		Baseline Stimulation intervention group Affective subgroup mean 2.15 (SD=4.48) Usual care Affective subgroup mean 2.16 (SD=5.02)
		4 weeks Stimulation intervention group

Study	Outcome	Results
N Clusters N Patients Primary outcome	Direction Follow-Up	
		Affective subgroup mean 3.12 (SD=5.96) Usual care Affective subgroup mean 1.28 (SD=2.87) Mean difference: 0.99 (SD=5.65) (p value < 0.01) 3 months Stimulation intervention Affective subgroup mean 2.77 (SD=5.69) Usual care Affective subgroup mean 2.18 (SD=4.30) Mean difference: 0.49 (SD=6.3) (p value < 0.01)
Deudon, 2009 ⁵¹	NPI-hyperactivity	Baseline
16 nursing homes	Lower=better	Staff training to manage behavioral and psychological symptoms of dementia: 49.89 (SD=53.1)
306 patients randomized	8 weeks	Control 35.68 (SD=40)
Primary outcome: CMAI and OS	20 weeks	8 weeks
		Staff training to manage behavioral and psychological symptoms of dementia: 43.62 (SD=51.2)
		Control 39.1 (SD=41.4)
		20 weeks
		Staff training to manage behavioral and psychological symptoms of dementia: 44.87 (SD=51.7)
		Control 42.2 (SD=55.9)
	NPI-psychosis	Baseline
	Lower=better	Staff training to manage behavioral and psychological symptoms of dementia: 10.22 (SD=14.7)
	8 weeks	Control 6.14 (SD=10.6)
	20 weeks	8 weeks
		Staff training to manage behavioral and psychological symptoms of dementia: 8.46 (SD=13.3)
		Control 7.02 (SD=12.4)
		20 weeks
		Staff training to manage behavioral and psychological symptoms of dementia: 8.68 (SD=13.5)
		Control 6.5 (SD=11.4)
Testad, 2016 ⁴³	NPI-agitation scale	Baseline
24 care homes	Lower=better	Trust before restraint mean: 4.6 (SD=6.4)
	7 months	Control mean: 5.3 (SD=7.2)

Study	Outcome Direction Follow-Up	Results
N Clusters N Patients Primary outcome 274 patients randomized Primary outcome: use of restraint		7 months Trust before restraint mean: 5.5 (SD=8.6) Control mean: 6.6 (SD=8.5) P value 0.702
Teri 2005 ⁵⁶ 4 assisted living residencies 31 patients randomized Primary outcome: NR	Agitated behavior in dementia Lower=better 8 weeks	Baseline STAR 9.4 (SD=6.5) Control 9.4 (SD=9) 8 weeks STAR 5.6 (SD=5.1) Control 9 (SD=9) Z score -6.75 (p value <0.001)
Deudon, 2009 ⁵¹ 16 nursing homes 306 patients randomized Primary outcome: CMAI and OS	Difference in overall score on sub-index Uncertain 8 weeks 20 weeks	Baseline Staff training to manage behavioral and psychological symptoms of dementia: 31.02 (SD=5.50) Control 31.29 (SD=9.3) 8-week follow-up Staff training to manage behavioral and psychological symptoms of dementia 32.2 (SD=5.4) Control 32.61 (SD=10.1) 20-week follow-up Staff training to manage behavioral and psychological symptoms of dementia: 31.78 (SD=7.2) Control 30.78 (SD=8.6)
Deudon, 2009 ⁵¹ 16 nursing homes 306 patients randomized Primary outcome: CMAI and observation scale	Psychotropic drugs Lower=better 8 weeks 20 weeks	Baseline Intervention: 2.52 (SD=1.3) Control: 2.68 (SD=1.65) 8-week follow-up Intervention: 2.62 (SD=1.3) Control: 2.76 (SD=1.6) 20 week follow-up Intervention: 2.51 (SD=1.3) Control: 2.81 (SD=1.6)

Study	Outcome Direction Follow-Up	Results
N Clusters N Patients Primary outcome		
Testad 2016 ⁴³ 24 care homes 274 patients randomized Primary outcome: use of restraint	Antipsychotics Lower=better 7 months	Baseline Trust before restraint: 14.70% Control: 35.90% 7 month follow-up Trust before restraint: 17.70% Control 38.40%
Livingston, 2019 ³⁸ 20 clusters 404 patients randomized Primary outcome: CMAI	Psychotropic medication Lower=better 8 months	Baseline Managing agitation and raising quality of life: 75/189 Treatment as usual 107/215 8 month follow-up Managing agitation and raising quality of life: 66/155 Treatment as usual 78/163 Adjusted odds ratio: 1.20 (95% CI [0.61, 2.39]) (p value 0.597)
Livingston, 2019 ³⁸ 20 clusters 404 patients randomized Primary outcome: CMAI	DEMQOL-Proxy Higher=better 8 months	Managing agitation and raising quality of life vs treatment as usual adjusted mean difference: 0.09 (95% CI [-3.87, 4.05])

RESULTS FOR HEALTH CARE TEAM AND PATIENT INTERVENTIONS

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up Primary outcome	
<i>Health Care Team and Patient Interventions</i>		
Lichtwarck, 2018 ⁴²	CMAI	Baseline
	Higher=better	TIME intervention: 68.5 (95% CI [64.5, 72.5])
33 nursing homes	8 weeks	Usual care: 70.2 (95% CI [66.5, 74.0])
229 patients	12 weeks	
Primary outcome: NPI		8 weeks
		TIME intervention: 61.5 (95% CI [57.4, 65.7])
		Usual care: 68 (95% CI [64.3, 71.8])
		Mean difference: 0.23 (p value 0.026)
		12 weeks
		TIME intervention: 59.4 (95% CI [55.2, 63.6])
		Usual care: 67.1 (95% CI [63.3, 70.9])
		Mean difference: 0.29 (p value 0.006)
Pieper, 2016 ⁸³	CMAI	Baseline
	Lower=better	STA OP! mean: 46 (SD=17.2)
12 nursing homes	3 months	Usual care mean: 47.7 (SD=19)
288 patients randomized	6 months	
Primary outcome: CMAI and NPI		Overall adjusted mean difference between the intervention and control baseline to 6 months -3.45 (95% CI [-7.68, 0.78]) (p value 0.05)
Moniz-Cook, 2017 ⁶²	CMAI	Baseline
	Lower=better	Staff e-learning mean: 54.61 (SD=20.43)
63 care homes	4 months	
832 patients randomized	7 months	Usual care mean: 53.3 (SD=16.49)
Primary outcome: NPI		Difference in change between baseline to 7-month follow-up between groups with clustering: 0.045
Chenoweth, 2009 ⁸⁴	CMAI	Baseline
	Lower=better	Person-centered care mean: 47.5 (SD=9.1)
15 care sites	4 months	Dementia-care mapping mean: 46.1 (SD=6.5)
289 patients randomized	8 months	UC mean: 50.3 (SD=6.8)
Primary outcome: CMAI		4-month follow-up
		Person-centered care mean: 41.7 (SD=9.2)

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		dementia-care mapping mean: 45.1 (SD=6.6) UC mean: 58.7 (SD=6.9)
		8-month follow-up Person-centered care mean: 37.2 (SD=9.1) Dementia-care mapping mean: 43.7 (SD=6.5) UC mean: 57.7 (SD=6.8)
		Person-centered care vs UC mean difference: 13.6 (95% CI [3.3, 23.9]) (p value 0.01)
		Dementia-care mapping vs UC mean difference: 10.9 (95% CI [0.7, 21.1]) (p value 0.04)
		Arm x time p value: 0.005
van de Ven, 2013 ⁴⁸ 14 care homes 268 patients randomized Primary outcome: CMAI	CMAI Lower=better 4 months 8 months	Baseline Dementia care mapping mean: 46.61 (SE=1.91) Usual care mean: 45.29 (SE=1.56)
		4 months Dementia care mapping: 47.86 (SE=1.88) Usual care mean: 44.32 (SE=1.63)
		8 months Dementia care mapping: 48.18 (SE=2.3) Usual care mean: 45.81 (SE=1.97)
		Mean difference: 2.4 (95% CI [-2.7, 7.6]) (p value 0.34)
		Interaction between group and time: p value 0.473
Chenoweth, 2014 ⁸² 38 clusters 601 patients randomized Primary outcome: NR	CMAI Lower=better 6 months 8 months	Baseline Person-centered care mean: 64 (95% CI [56, 72]) Usual care and usual environment: 52 (95% CI [43, 61])
		6 months follow-up Person-centered care mean: 58 (95% CI [49, 67])

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
		Usual care and usual environment mean: 53 (95% CI [43, 63]) 8 months follow-up Person-centered care mean: 46 (95% CI [37, 56]) Usual care and usual environment: 51 (95% CI [41, 62]) Person-centered care vs usual care and usual environment p value: 0.06
Ballard, 2018⁴⁰ 69 clusters 832 patients randomized Primary outcome: QOL	CMAI Lower=better 9 months	WHELD (staff training in person-centered care) mean: -4.13 Continuous mean: 0.14 Mean difference (in longitudinal change): -4.27 (SE=1.59) (95% CI [-7.39, -1.15])
Ballard, 2016⁸¹ 16 nursing homes 277 patients randomized Primary outcome: CMAI	CMAI Lower=better 9 months	Baseline Antipsychotic review mean: 46.54 (SD=15.97) No antipsychotic review Baseline mean: 47.06 (SD=15.87) 9-month follow-up Antipsychotic review mean: 49.1 (SD=20.14) No antipsychotic review mean: 46.16 (SD=18.17) Antipsychotic review vs no antipsychotic review: 4.6 (95% CI [-1.43, 10.63]) Baseline Social interaction mean: 47.91 (SD=16.74) No Social interaction mean: 45.57 (SD=14.92) 9-month follow-up: Social interaction mean: 50.75 (SD=21.77) No social interaction mean: 44.6 (SD=15.72) Social interaction vs no social interaction: 4.96 (95% CI -1.33, 11.25)

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
Rapp, 2013 ⁴⁹	CMAI	Training and activity therapy mean: 52.94 (SD=22.97)
18 nursing homes	Lower=better	Treatment as usual mean: 53.86 (SD=16.64)
304 patients randomized	10 months	10 months
Primary outcome: CMAI		Training and activity therapy mean: 46.24 (SD=16.27)
		Treatment as usual mean: 56.38 (SD=17.23)
		Mean difference: 6.24 (95% CI [2.03, 14.14]) p value (0.009)
Fossey, 2006 ⁵⁵	CMAI	Baseline
12 nursing homes	Lower=better	Training and staff support mean: 41.6 (SD=7.2)
346 patients randomized	12 months	Usual care mean: 42 (SD=5.6)
Primary outcome: neuroleptic use		12-month follow-up
		Training and staff support vs usual care weighted mean difference: 0.3 (95% CI [-8.3, 8.9])
Zwijzen, 2014 ⁴⁵	CMAI	Grip on Challenging Behavior mean
17 dementia special care units	Lower=better	T1 (4 months): 47 (SD=18)
659 patients randomized	20 months	T2 (8 months): 52 (SD=19)
Primary outcome: CMAI		T3 (12 months): 51 (SD=18)
		T4 (16 months): 50 (SD=17)
		T5 (20 months): 51 (SD=19)
		Usual care mean
		T0 (Baseline): 51 (SD=18)
		T1 (4 months): 55 (SD=19)
		T2 (8 months): 53 (SD=20)
		T3 (12 months): 53 (SD=20)
		T4 (16 months): 56 (SD=22)
Chapman, 2007 ⁵³	CMAI-aggressive behavior subscale	Baseline
2 nursing homes	Lower=better	AICT mean: 1.18 (SD=0.47)
118 patients randomized	8 weeks	Usual care: 1.23 (SD=0.48)
Primary outcome: NR		8 weeks
		AICT mean: 1.10 (SD=0.25)
		Usual care: 1.16 (SD=0.39)

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
		F statistic 0.06
	CMAI-physically nonaggressive behavior Lower=better 8 weeks	Baseline AICT mean: 1.64 (SD=1.10) Usual care: 1.36 (SD=0.52) 8 weeks AICT mean: 1.30 (SD=0.60) Usual care: 1.29 (SD=0.49)
		F statistic: 4.22 (p value ≤ 0.05)
	CMAI- verbally agitated behavior Lower=better 8 weeks	Baseline AICT mean: 1.44 (SD=0.48) Usual care: 1.44 (SD=0.61) 8 weeks AICT mean: 1.28 (SD=0.42) Usual care: 1.36 (SD=0.53)
		F statistic: 1.43
Moniz-Cook, 2017 ⁶² 63 care homes 832 patients randomized Primary outcome: NPI	CMAI-physical/ aggressive Lower=better 4 months 7 months	Baseline Staff e-learning mean: 17.2 (SD=9.47) Usual care mean: 16.94 (SD=7.79) 7 month mean difference 0.39 (95% CI [-1.77, 2.55])
	CMAI-physical/ nonaggressive Lower=better 4 months 7 months	Baseline Staff e-learning mean: 19.55 (SD=8.93) Usual care mean: 19.29 (SD=8.62) 7 month mean difference: 0.46 (95% CI [-1.66, 2.58])
	CMAI-verbal/ aggressive Lower=better 4 months 7 months	Baseline Staff e-learning mean: 5.68 (SD=3.21) Usual care mean: 5.49 (SD=3.14) 7 month mean difference: 0.60 (95% CI [-0.16, 1.36])
	CMAI-verbal/ nonaggressive	Baseline

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
	Lower=better 4 months 7 months	Staff e-learning mean: 12.13 (SD=6.4) Usual care mean: 11.58 (SD=5.68) 7 month mean difference: 0.63 (95% CI [-1.17, 2.43])
Appelhof, 2019 ³⁹ 13 special care units 274 patients randomized Primary outcome: CMAI	CMAI-aggressive Lower=better 9 months CMAI-verbal Lower=better 9 months	Grip on neuropsychiatric symptoms vs usual care regression coefficient: 0.495 (95% CI [-0.448, 1.438]) (p value 0.303) Regression coefficient: -0.176 (95% CI [-1.065, 0.713]) (p value 0.697)
Rokstad, 2013 ⁶⁰ 15 nursing homes 624 patients randomized Primary outcome: BARS	CMAI-agitation Lower=better 11 months	Baseline DCM mean 18.8 (SD=9.2) VPM mean 19.7 (SD=9.8) Control 17.6 (SD=8.4) 11- month follow-up DCM: 17.2 (SD=9) VPM: 18.5 (SD=8.6) Control: 17.8 (SD=8) DCM vs control regression coefficient: -2 (95% CI [-5.1, 1.1]) (p value 0.19) VPM vs control regression coefficient: 1.1 (95% CI [-3.8; 1.6]) (p value 0.42)
Lichtwarck, 2018 ⁴² 33 nursing homes 229 patients Primary outcome: NPI	NPI Lower=better 8 weeks 12 weeks	Baseline TIME mean: 44.2 (95% CI [39.9, 48.0]) Brief education-only intervention mean: 49.0 (95% CI [45.0, 53.0]) 8 weeks TIME mean: 33.7 (95% CI, 29.3, 38.2) Brief education-only intervention: 41.3 (95% CI [37.3, 45.4]) Standard mean difference: 0.12 (p value 0.317) 12 weeks TIME mean: 31.1 (95% CI [26.7, 35.6]) Brief education-only intervention: 41.4 (95% CI [37.3, 45.5])

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
Standard mean difference: 0.25 (p value 0.053)		
Stensvik, 2022 ³⁴	NPI-Q 12 item scale	Baseline
17 nursing home	Lower=better	Modified comprehensive geriatric assessment and case conferences mean: 4.5 (SD=5.2)
309 patients randomized	3 months	Usual care mean: 4.9 (SD=5.4)
Primary outcome: neuropsychiatric symptoms		3 months
		Modified comprehensive geriatric assessment and case conferences mean: 3.9 (SD=3.7)
		Usual care mean: 5.4 (SD=6)
		Difference -1 (95% CI [-2.4, 0.5]) (p value 0.19)
Pieper, 2016 ¹⁰⁶	NPI-NH	Baseline
12 nursing homes	Lower=better	STA OP! mean: 17 (SD=16.4)
288 patients randomized	3 months	Usual care mean: 14.3 (SD=12.9)
Primary outcome: CMAI and NPI	6 months	Overall adjusted mean difference: -5.70 (95% CI [-8.88, -2.52]) (p value < 0.001)
Moniz-Cook, 2017 ⁶²	NPI	Baseline
63 care homes	Lower= better	Staff e-learning mean: 20.06 (SD=15.66)
832 patients randomized	4 months	Usual care mean: 22.28 (SD=16.22)
Primary outcome: NPI	7 months	7- month follow-up mean difference in score: 0.18 (95% CI [-3.68, 4.04])
Chenoweth, 2009 ⁸⁴	NPI	Baseline
15 care sites	Lower=better	Person-centered care mean: 21.3 (SD=9.8)
289 patients randomized	4 months	Dementia-care mapping mean: 12.7 (SD=5.1)
Primary outcome: CMAI	8 months	UC mean: 16.9 (SD=5.3)
		4-month follow-up
		Person-centered care mean: 14.5 (SD=6.9)
		Dementia-care mapping mean: 16.8 (SD=5.1)
		UC mean: 20.2 (SD=5.4)
		8-month follow-up
		Person-centered care mean: 12.6 (SD=6.9)
		Dementia-care mapping mean: 13.5 (SD=5.1)
		UC mean: 15.3 (SD=5.3)

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
Arm x time p value: 0.30		
van de Ven, 2013 ⁴⁸ 14 care homes 268 patients randomized Primary outcome: CMAI	NPI- NH Lower=better 4 months 8 months	Baseline Dementia care mapping: 5.35 (SD=0.94) Usual care: 6.28 (SD=0.88) 4 months Dementia care mapping: 7.19 (SD=0.95) Usual care: 4.45 (SD=0.88) 8 months Dementia care mapping: 6.28 (SD=0.92) Usual care: 4.45 (SD=0.88)
Arm x time interaction P value = 0.022		
Ballard, 2016 ⁸¹ 16 nursing homes 277 patients randomized Primary outcome: CMAI	NPI Lower=better 9 months	Baseline Antipsychotic review mean: 12.52 (SD=13.89) No antipsychotic review Baseline mean: 15.93 (SD=15.96) 9-month follow-up Antipsychotic review mean: 14.62 (SD=13.36) No antipsychotic review mean: 13.05 (SD=11.13) Antipsychotic review vs no antipsychotic review: 7.37 (95% CI [1.53, 13.22]) (p value 0.02) Baseline Social interaction mean: 15.05 (SD=15.51) No social interaction mean: 12.99 (SD=14.25) 9-month follow-up: Social interaction mean: 14.89 (SD=12.35) No social interaction mean: 12.86 (SD=12.43) Social interaction vs no social interaction: 5.45 (95% CI [0.12, 10.77]) (p value <0.05)

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
Rokstad, 2013 ⁶⁰	NPI-Q	Baseline
15 nursing homes	Lower=better	DCM mean: 5.2 (SD=4.7)
624 patients randomized	11 months	VPM mean: 6.9 (SD=5.1)
Primary outcome: BARS		Control mean: 4.1 (SD=3.9)
		11 months
		DCM mean: 5.3 (SD=5.5)
		VPM mean: 6.2 (SD=5.6)
		Control mean: 5.5 (SD=4.5)
		DCM vs control adj. regression coefficient: -2.7 (95%CI [-4.6, -0.7]) (p value 0.01)
		VPM vs control adj. regression coefficient: -2.4 (95% CI [-4.1, -0.6]) (p value 0.01)
Zwijzen, 2014 ⁴⁵	NPI-NH	Grip on Challenging Behavior mean:
17 dementia special care units	Lower=better	T1 (4 months): 1.9 (SD=2.2)
659 patients randomized	20 months	T2 (8 months): 2.4 (SD=2.2)
Primary outcome: CMAI		T3 (12 months): 2.4 (SD=2.3)
		T4 (16 months): 2.4 (SD=2.3)
		T5 (20 months): 2.4 (SD=2.4)
		Usual care mean:
		T0 (Baseline): 2.7 (SD=2.2)
		T1 (4 months): 3.0 (SD=2.5)
		T2 (8 months): 3.0 (SD=2.5)
		T3 (12 months): 2.3 (SD=2.3)
		T4 (16 months): 3.3 (SD=2.8)
Lichtwarck, 201 ⁴²	NPI-agitation/aggression	Baseline
33 nursing homes	Lower=better	TIME mean: 8.7 (95% CI [8.1, 9.4])
229 patients	8 weeks	Brief education-only intervention mean: 8.4 (95% CI [7.8, 9.0])
Primary outcome: NPI	12 weeks	8 weeks
		TIME mean: 6.1 (95% CI [5.4, 6.8])
		Brief education-only intervention mean: 6.8 (95% CI [6.2, 7.5])
		Standardized mean difference: 0.32 (p value 0.031)
		12 weeks

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
		TIME mean: 5.7 (95% CI [4.9, 6.4]) Brief education-only intervention mean: 7 (95% CI [6.3, 7.6]) Standardized mean difference: 0.47 (p value 0.002)
Stensvik, 2022 ³⁴ 17 nursing home 309 patients randomized Primary outcome: neuropsychiatric symptoms	NPI-affective subscale Lower=better 3 months	Baseline Modified comprehensive geriatric assessment and case conferences mean: 0.7 (SD=1.1) Usual care mean: 1 (SD=1.4) 3 months Modified comprehensive geriatric assessment and case conferences mean: 0.6 (SD=1) Usual care mean: 0.8 (SD=1.4) Difference: 0.05 (95% CI [0.67, -0.2]) (p value 0.67)
	NPI-agitation subscale Lower=better 3 months	Baseline Modified comprehensive geriatric assessment and case conferences mean: 1.4 (SD=1.9) Usual care mean: 1.7 (SD=2.1) 3 months Modified comprehensive geriatric assessment and case conferences mean: 1.5 (SD=2) Usual care mean: 2 (SD=2.5) Difference: -0.2 (95% CI [0.54, -0.8]) (p value 0.54)
Stensvik, 2022 ³⁴ 17 nursing home 309 patients randomized Primary outcome: neuropsychiatric symptoms	NPI-apathy Lower=better 3 months	Baseline Modified comprehensive geriatric assessment and case conferences mean: 0.7 (SD=1.1) Comparator mean: 0.6 (SD=1.1) 3 months Modified comprehensive geriatric assessment and case conferences mean: 0.5 (SD=0.8) Comparator mean: 0.9 (SD=1.3) Difference: -0.5 (95% CI [-0.9, -0.05]) (p value 0.03)
	NPI-psychosis Lower=better 3 months	Baseline Modified comprehensive geriatric assessment and case conferences mean: 0.8 (SD=1.2) Usual care mean: 0.8 (SD=1.2)

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
		3 months Modified comprehensive geriatric assessment and case conferences mean: 0.8 (SD=1.2) Usual care mean: 0.9 (SD=1.3) Difference -0.25 (95% CI [-0.5, 0.1]) (p value 0.11)
Appelhof, 2019 ³⁹ 13 special care units 274 patients randomized Primary outcome: CMAI	NPI-subscale for agitation/aggression. Lower=better 6 months	Grip on neuropsychiatric symptoms vs usual care Regression coefficient: -0.001 (95% CI [-0.09, 0.087]) (p value 0.975)
Moniz-Cook, 2017 ⁶² 63 care homes 832 patients randomized Primary outcome: NPI	NPI-distress Lower=better 4 months 7 months	Baseline Staff e-learning mean: 4.77 (SD=6.63) Usual care mean: 4.82 (SD=6.5) Mean difference in score: 0.12 (95% CI [-1.64, 1.88])
	NPI-frequency Lower=better 4 months 7 months	Baseline Staff e-learning mean: 12.12 (SD=7.1) Usual care mean: 12.66 (SD=7.5) 7 months Staff e-learning mean: 11.65 (SD=6.92) Usual care mean: 11.65 (SD=6.43) Difference in mean: 0.6 (95% CI [-1.18, 2.38])
	NPI-incidence Lower=better 4 months 7 months	Baseline Staff e-learning mean: 4.86 (SD=2.4) Usual care mean: 4.8 (SD=2.34)
Moniz-Cook, 2017 ⁶² 63 care homes 832 patients randomized Primary outcome: NPI	NPI-Severity Lower=better 7 months	Baseline Staff e-learning mean: 7.55 (SD=4.8) Usual care mean: 7.97 (SD=4.87) 7 months Staff e-learning mean: 7.29 (SD=4.44) Usual care mean: 7.25 (SD=4.45) Difference in mean: 0.45 (95% CI [-1.03, 1.93])

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
van de Ven, 2013 ⁴⁸	NPI-agitation subscale	Baseline
	Lower=better	Dementia care mapping mean: 0.63 (SD=0.17)
14 care homes	4 months	Usual care mean: 0.77 (SD=0.16)
268 patients randomized	8 months	
Primary outcome: CMAI		4 months
		Dementia care mapping mean: 0.62 (SD=0.17)
		Usual care mean: 0.49 (SD=0.16)
		8 months
		Dementia care mapping mean: 0.52 (SD=0.17)
		Usual care mean: 0.6 (SD=0.16)
		P value: 0.862
Zwijzen, 2014 ⁴⁵	NPI - subscale for agitation	OR 0.82 (95% CI 0.48, 1.39) (p value 0.47)
	Lower=better	
17 dementia special care units	20 months	
659 patients randomized		
Primary outcome: CMAI		
Kovach, 2006 ⁵⁸	BEHAVE-Alzheimer's Disease (AD) scale- o used to assess less subtle behavioral symptoms of discomfort, such as aggression and wandering	Baseline
	Lower=better	STI: 7.43 (SD=6.75)
14 long-term care facilities		Control: 6.80 (SD=5.47)
127 patients randomized		
Primary outcome: NR		2 weeks
		STI: 5.56 (SD=5.64)
		Control: 6.15 (SD=5.55)
		4 weeks
		STI: 4.68 (SD=4.06)
		Control: 4.96 (SD=4.39)
		F statistic: 0.70 (p value 0.5)
Moniz-Cook, 2017 ⁶²	Challenging Behavior Scale difficulty	Baseline
	Lower=better	Staff e-learning mean: 11.22 (SD=10.37)
63 care homes	4 months	Usual care mean: 11.03 (SD=10.59)
832 patients randomized	7 months	
Primary outcome: NPI		
	Challenging Behavior Scale frequency	Baseline

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
	Lower=better 4 months 7 months	Staff e-learning mean:21.42 (SD=14.59) Usual care mean: 21.38 (SD=14.87) Mean difference in score: 0.69 (95% CI [-1.67, 3.05])
	Challenging Behavior Scale (frequency × difficulty) Lower=better 4 months 7 months	Baseline Staff e-learning mean: 34.99 (SD=35.16) Usual care mean: 34.64 (SD=35.65) Mean difference in score: -0.19 (95% CI [-6.69, 6.31])
	Challenging Behavior Scale incidence Lower=better 4 months 7 months	Baseline Staff e-learning mean: 7.07 (SD=4.04) Usual care mean: 6.93 (SD=4.55) Chi square 0.116
Kirkham, 2020 ³⁷ 10 long term care facilities Primary outcome: Antipsychotic use	Behavioral symptoms Lower=better 12 months	OPAL: 14.9 (SD=1.6) Self at baseline prior to intervention: 14.3 (SD=1.4) 12 months OR: 0.96 (95% CI 0.8, 1.14) (p value 0.6)
Appelhof, 2019 ³⁹ 13 special care units 274 patients randomized Primary outcome: CMAI	Antipsychotic use Lower=better 6 months	Grip on neuropsychiatric symptoms vs usual care Regression coefficient: -0.002 (95% CI [-0.064, 0.06]) (p value 0.956)
Pieper, 2016 ⁶³ 12 nursing homes 288 patients randomized Primary outcome: CMAI and NPI	Antipsychotic use Lower=better 3 months 6 months	STA OP!: 51/ 144 Usual care: 51/ 138 OR 0.87 (95% CI 0.33, 2.30) (p value 0.78)
Moniz-Cook, 2017 ⁶² 63 care homes 832 patients randomized Primary outcome: NPI	Antipsychotic use Lower=better 7 months	Baseline Staff e-learning: 30/202 Usual care:36/226 7 month follow-up Staff e-learning: 34/202

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
		Usual care: 39/ 226 Chi-square >0.999
Chenoweth, 2009 ⁸⁴	Antipsychotic use Lower=better	Baseline
15 care sites	4 months	Person-centered care: 0.42%
289 patients randomized	8 months	Dementia-care mapping: 0.15%
		Usual care: 0.19%
Primary outcome: CMAI		4 months Person-centered care: 0.30%
		Dementia-care mapping: 0.19%
		Usual care: 0.14%
		8 months Person-centered care: 0.34%
		Dementia-care mapping: 0.15%
		UC: 0.14%
		Baseline to 8 month x person-centered care and dementia-care mapping vs usual care interaction p value: 0.66
Ballard, 2018 ⁴⁰	Antipsychotic use Lower=better	Change in use from baseline WHELD (staff training in person-centered care): -0.1%
69 clusters	9 months	Change in use from baseline treatment as usual: -0.2%
832 patients randomized		Relative risk at 9 months: 1.06 (95% CI [0.62 1.82]) p value 0.82
Primary outcome: QOL		
Ballard, 2016 ⁸¹	Antipsychotic use Lower=better	Antipsychotic review vs no antipsychotic review OR 0.17 (95% CI [0.05, 0.59]) (p value 0.006)
16 nursing homes	9 months	Social interaction vs no social interaction OR 0.6 (95% CI [0.19, 1.91]) (p value 0.4)
277 patients randomized		
Primary outcome: CMAI		
Kirkham, 2020 ³⁷	Antipsychotic use Lower=better	Baseline weighted mean: 28.6 (SD=1.3)
10 long term care facilities	12 months	OPAL 12-month follow-up weighted mean: 24.0 (SD=1.5)
		OR 0.73 (95% CI [0.58, 0.94]) (p value 0.01)

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
Primary outcome: Antipsychotic use		
Zwijnsen, 2014 ⁴⁵	Antipsychotic use	Intervention
	Lower=better	T1 (4 months): 23.3%
17 dementia special care units	20 months	T2 (8 months): 25.9%
659 patients randomized		T3 (12 months): 24.3%
		T4 (16 months): 23.0%
Primary outcome: CMAI		T5 (20 months): 22.6%
		Control
		T0 (Baseline): 27.9%
		T1 (4 months): 28.1%
		T2 (8 months): 27.4%
		T3 (12 months): 26.0%
		T4 (16 months): 20.0%
Appelhof, 2019 ³⁹	PDU Anxiolytics	Grip on neuropsychiatric symptoms vs usual care regression coefficient:
	Lower=better	-0.033 (95% CI [-0.095, 0.029]) (p value 0.301)
13 special care units	6 months	
274 patients randomized	PDU Any psychotropic medication	Regression coefficient: -0.023 (95% CI [-0.09, 0.044]) (p value 0.505)
Primary outcome: CMAI	Lower=better	
	6 months	
Fossey, 2006 ⁵⁵	Neuroleptics	Training and staff support vs Usual care weighted mean difference: 19.10% (95% CI [0.50%, 37.70%]) (p value 0.045)
	Lower=better	
12 nursing homes	12 months	
346 patients randomized	Psychotropics	Training and staff support vs Usual care weighted mean difference: -5.9 (95% CI [-27.2, 15.5]) (p value 0.56)
Primary outcome: neuroleptic use	Lower=better	
	12 months	
Rapp, 2013 ⁴⁹	Neuroleptics	Baseline
	Lower=better	Training and activity therapy: 0.263 (SD=0.052)
18 nursing homes	12 months	Treatment as usual: 0.264 (SD=0.091)
304 patients randomized		

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
Primary outcome: CMAI		12 months Training and activity therapy: 0.23 (SD=0.06) Treatment as usual: 0.26 (SD=0.05) Adjusted mean difference: 0.03 (95% CI [0.01, 0.05]) (p value 0.04)
	Cholinesterase inhibitors Lower=better 12 months	Baseline Training and activity therapy: 0.084 (SD=0.022) Treatment as usual : 0.086 (SD=0.024) 12 months Training and activity therapy : 0.19 (SD=0.06) Treatment as usual : 0.08 (SD=0.05) Adjusted mean difference: 0.09 (95% CI [0.05, 0.11]) (p value 0.01)
Zwijssen, 2014 ⁴⁵ 17 dementia special care units 659 patients randomized Primary outcome: CMAI	Anxiolytics Lower=better 20 months	Grip on Challenging Behavior: T1 (4 months): 21.7% T2 (8 months): 17.3% T3 (12 months): 17.6% T4 (16 months): 18.4% T5 (20 months): 21.2% Usual care: T0 (Baseline): 23.5% T1 (4 months): 21.3% T2 (8 months): 25.1% T3 (12 months): 27.6% T4 (16 months): 26.2%
Lichtwarck, 2018 ⁴² 33 nursing homes 229 patients Primary outcome: NPI	Quality of Life in Late-stage Dementia Lower=better 8 weeks 12 weeks	Baseline TIME intervention mean: 28.6 (95% CI [26.7, 30.4]) Brief education-only intervention mean: 29.4 (95% CI [27.6, 31.2]) 8- week follow-up TIME intervention mean: 28.5 (95% CI [26.6, 30.4]) Brief education-only intervention mean: 29 (95% CI [27.2, 30.8]) Standardized mean difference: -0.03 (p value 0.691)

Study	Outcome Direction Follow-Up	Results
N clusters N patients Primary outcome		
Klapwijk, 2017 ¹⁰² 12 nursing homes 288 patients Primary outcome: CMAI	QOL- Care Relationship Higher=better 3 months 6 months	12 week follow-up TIME intervention mean: 27.2 (95% CI [25.3, 29.1]) Brief education-only intervention mean: 29.6 (95% CI [27.8, 31.5]) Standardized mean difference: 0.17 (p value 0.044)
		Baseline to 3 months STA OP! vs usual care regression coefficient: 0.19 (SE=0.21) (95% CI [-0.22, 0.61]) 3 months to 6 months STA OP! vs usual care regression coefficient: 0.03 (SE=0.22) (95% CI [-0.4, 0.47])
	QOL- Positive Affect Higher=better 3 months 6 months	Baseline to 3 months STA OP! vs usual care regression coefficient: 0.06 (SE=0.31) (95% CI [-0.55, 0.66]) 3 months to 6 months STA OP! vs usual care regression coefficient: -0.21 (SE=0.32) (95% CI [-0.84, 0.43])
	QOL- Negative Affect Higher=better 3 months 6 months	Baseline to 3 months STA OP! vs usual care regression coefficient: 0.27 (SE=0.18) (95% CI [-0.07, 0.62]) 3 months to 6 months STA OP! vs usual care regression coefficient: -0.1 (SE=0.19) (95% CI [-0.47, 0.26])
	QOL- Restless tense behavior Higher=better 3 months 6 months	Baseline to 3 months STA OP! vs usual care regression coefficient: 0.95 (SE=0.3) (95% CI [0.36, 1.54]) 3 months to 6 months STA OP! vs usual care regression coefficient: -0.98 (SE=0.32) (95% CI [-1.6, -0.36])
	QOL- Social relations Higher=better 3 months 6 months	Baseline to 3 months STA OP! vs usual care regression coefficient: 0.45 (SE=0.24) (95% CI [-0.02, 0.91])

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
		3 months to 6 months STA OP! vs usual care regression coefficient: 0.23 (SE=0.25) (95% CI [-0.26, 0.72])
	QOL- Social isolation Higher=better 3 months 6 months	Baseline to 3 months STA OP! vs usual care regression coefficient: 0.01 (SE=0.26) (95% CI [-0.49, 0.51])
		3 months to 6 months STA OP! vs usual care regression coefficient: 0.64 (SE=0.27) (95% CI [0.12, 1.17])
Moniz-Cook, 2017 ⁶² 63 care homes 832 patients randomized Primary outcome: NPI	EQ-5D index Higher=better 4 months 7 months	Staff e-learning vs usual care mean difference in score: 0.08 (95% CI [0.00, 0.16])
	EQ-5D VAS Higher=better 4 months 7 months	Staff e-learning vs usual care mean difference in score: 0.35 (95% CI [-1.58, 1.98])
	QOL-AD Higher=better 4 months 7 months	Staff e-learning vs usual care mean difference in score: 0.2 (95% CI [-1.17, 2.43])
Chenoweth, 2014 ⁸² 38 clusters 601 patients randomized Primary outcome: NR	DEMQOL Higher=better 6 months 8 months	Baseline Person centered care mean: 99 (95% CI [96, 101]) Usual care and usual environment mean: 101 (95% CI [98, 104]) 6 month follow-up Person centered care mean: 103 (95% CI [100, 106]) Usual care and usual environment mean: 100 (95% CI [97, 104]) 8-month follow-up Person centered care mean: 106 (95% CI [103, 110]) Usual care and usual environment mean: 103 (95% CI [99, 106]) Person-centered care vs usual care and usual environment p value: 0.17
Chenoweth, 2009 ⁸⁴	QUALID Lower=better	Baseline Person-centered care: 22.7 (SD=2.2)

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
15 care sites 289 patients randomized Primary outcome: CMAI	4 months 8 months	Dementia-care mapping: 23.5 (SD=1.6) Usual care: 23.2 (SD=1.7)
		4-month follow-up Person-centered care: 21.5 (SD=2.2) Dementia-care mapping: 23.4 (SD=1.6) Usual care: 23.7 (SD=1.7)
		8-month follow-up Person-centered care: 20.8 (SD=2.2) Dementia-care mapping: 24.5 (SD=1.6) Usual care: 24.4 (SD=1.7)
		Arm x time interaction p value: 0.33
van de Ven, 2013 ⁴⁸ 14 care homes 268 patients randomized Primary outcome: CMAI	QOL-Qualidem Higher=better 4 months 8 months	Baseline Dementia care mapping: 64.52 (SD=2.06) Usual care: 66.31 (SD=1.71)
		4 month follow up Dementia care mapping: 61.88 (SD=2.1) Usual care 63.72 (SD=1.81)
		8 month follow up Dementia care mapping: 64.11 (SD=1.88) Usual care 62.45 (SD=2.19)
		Arm x time interaction p value 0.995
	QOL-EuroQOL Higher=better 4 months 8 months	Baseline Dementia care mapping: 0.39 (SD=0.03) Usual care: 0.44 (SD=0.02)
		4 month follow up Dementia care mapping: 0.34 (SD=0.03) Usual care: 0.41 (SD=0.02)
		8 month follow up Dementia care mapping: 0.35 (SD=0.03)

Study	Outcome	Results
N clusters N patients Primary outcome	Direction Follow-Up	
		Usual care: 0.36 (SD=0.02)
		Arm x time interaction p value 0.087
Ballard, 2018 ⁴⁰ 69 clusters 832 patients randomized Primary outcome: QOL	DEMQOL-Proxy Higher=better 9 months	WHELD (staff training in person-centered care) vs treatment as usual mean difference: 2.54 (SE=0.88) (95% CI [0.81, 4.28]) (p value 0.0042)
Rokstad, 2013 ⁶⁰ 15 nursing homes 624 patients randomized Primary outcome: BARS	QUALID Lower=better 11 months	Baseline Dementia care mapping mean: 20.4 (SD=6.8) VPM mean: 21.5 (SD=7) Control mean: 20 (SD=6.6) 11 months Dementia care mapping mean: 21.4 (SD=7.2) VPM mean: 23.1 (SD=7.5) Control mean: 22.8 (SD=7.4) Dementia care mapping vs control regression coefficient: -3 (95% CI [-5.5, -0.6]) (p value 0.02) VPM vs control regression coefficient: -1.3 (95% CI [-3.4, 0.9]) (p value 0.02)
Fossey, 2006 ⁵⁵ 12 nursing homes 346 patients randomized Primary outcome: neuroleptic use	Wellbeing Higher=better 12 months	Training and staff support vs usual care weighted mean difference: -0.2 (95% CI [-0.5, 0.2]) (p value 0.29)

PEER REVIEW COMMENTS AND RESPONSES

Comment #	Reviewer #	Comment	Author Response
<i>Are the objectives, scope, and methods for this review clearly described?</i>			
1	1	Yes	
2	2	Yes	
3	3	Yes	
4	4	No - Objectives and scope are not clear, but methods are. See additional comments	We have addressed relevant comments below.
5	5	Yes	
6	6	Yes	
7	7	Yes	
8	8	Yes	
9	9	Yes	
<i>Is there any indication of bias in our synthesis of the evidence?</i>			
10	1	No	
11	2	No	
12	3	No	
13	4	No	
14	5	No	
15	6	No	
16	7	No	
17	8	No	
18	9	No	
<i>Are there any published or unpublished studies that we may have overlooked?</i>			
19	1	No	
20	2	No	
21	3	Yes - Although patient distress may solely be a manifestation of dementia or a psychiatric	We recognize the significance of trauma as associated with patient distress and acknowledge that past adverse

Comment #	Reviewer #	Comment	Author Response
		condition, it is likely that previous trauma plays a role in distress in many of these patients. Indeed, it is likely that there is a strong interaction between trauma, both military and non-military, and dementia or other psychiatric conditions (besides PTSD) in driving patient distress. There is an extensive body of literature on trauma-informed care and its efficacy. This should be considered in such a review.	life experiences and trauma may interact or exacerbate distress. Based on our review, we did not identify any studies that explored the issue of the role of trauma in distress behaviors as we defined it for purposes of the review. While trauma-informed care literature could be informative, it is beyond the scope of this review. This area could be valuable for future research in improving distress behavior management, which we've noted in our limitations. We have added mention of this in the limitations including acknowledging that in the military population trauma likely interacts with patient distress among older Veterans (Limitations section, third paragraph). In addition, we noted in the future research section (first paragraph) the need to explore interventions incorporating trauma-informed care principles.
22	4	No	
23	5	No	
24	6	Yes - - What was your definition for staff-focused person centered interventions? Many person-centered/focused interventions need staff facilitation. I was wondering how you identified that the staff/team was the primary point of deployment as stated in the review criteria. This would help understand how many interventions were not included (sensory stim, reminiscence). - Also, did you think about including environment centered interventions only in the review? Or no because this is not typically within staff-action? or because this cannot be randomized? - A study regarding STAR-VA impact on psychotropic medications could be mentioned - McConeghy KW, Curyto K, Jedele J, Intrator O, Karel M, Wiechers I. (2021). Impact of the STAR-VA interdisciplinary behavioral intervention program on psychotropic drug utilization in VA community living centers. Journal of	We used the following overarching definition for eligible interventions: "Intervention must be primarily targeted at the health care providers or unit (eg, team, clinical service) as the primary point of deployment that involves a change in the way care is delivered." We acknowledge that some patient focused interventions likely required staff facilitation, but if it was not articulated in the article or was a minor component in the description of the intervention then we did not include it. We identified studies with "patient-centered" interventions based on the labeling used by the study authors. We did not include interventions that focused solely on changes to the environment because they did not meet our eligibility criteria for being "primarily targeted at the health care providers or unit as the primary point of deployment." We have added references to the McConeghy study in the VA studies section.

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		Gerontological Nursing, 42(6), 1522-1540. https://doi.org/10.1016/j.gerinurse.2021.10.009	
25	7	No	
26	8	No	
27	9	No	
<i>Additional suggestions or comments can be provided below.</i>			
28	1	Thank you for this evidence synthesis. The conclusions validated what I suspected would be found - interventions are required at multiple levels, training/implementation must be consistent and interventions must be customized to the patient. I appreciate how difficult this must have been because of the wide variety of measures, outcomes and interventions. We have a start but a long way to go with this research.	You are welcome.
29	2	Please correct my credentials Maureen Haske-Palomino DNP, MSN, GNP-BC	Apologies – we have made this correction.
30	2	Very complicated topic with so many variables. I initially was worried that it would be hard to capture the importance of the environment, interprofessional and person-centered approaches. I think the panel did a great job pulling the evidence together and hitting on those points. I agree so much more work needs to be done to better understand the impact of distressing behaviors on burnout, utilization, and safety.	Thank you.
31	3	Within the document I am listed as “Chief Strategy Officer” in the section titled “Technical Expert Panel”. That is not correct. I am the Chief of the Division of Hospital Medicine.	Apologies – we have made this correction.
32	4	1. In Key Findings, many terms do not stand alone. They are not clear until full report is read. The intervention categories of health care team-	We agree that we need to make clear definitions of the category labels we have used and be consistent throughout. We have added definitions for these categories in the Executive Summary (Current Review

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		only, patient-only component, both health care worker and patient focused components are not clear. Most readers will not what these mean and that all of these are under the umbrella of models of health care. The term “patient-only component” is very confusing given all of the interventions are health care deliver models. In addition, need consistency and more definition of this term. Later in report referred to as “patient care patterns” Need to define “health care delivery models” in Key Findings Need to better define setting of interventions in Key Findings. First bullet in Key Findings includes a phrase/term that needs more definition, “..along side structured patient care activities”	section, 4th paragraph) . We have also revised the identified language throughout in need of clarification.
33	4	2. Is there a difference between “health care delivery models” and “staff-focused” interventions ((line 37, pg ix)? In not, “staff-focused” interventions is a much clearer, self-evident term. It they are different, then they each need to be defined and differences highlighted. I like on how page ix, line 31, the interventions are summarized as “interventions centered on staff action (eg, optimal staffing, staffing education/training, staff approaches to improved patient care management). I suggest using this definition and nomenclature rather than “health care deliver models”.	For clarity, we have dropped the phrase “health care delivery models” from the report and stick to using “health care team-focused interventions.” We elected to use the term “health care team” instead of staff to draw a distinction from terms used when discussing the outcomes (<i>eg</i>, “staff level”).

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34	4	3. The outcome of interest needs to be better defined and referred to more consistently. Is the outcome of interest? Behavioral and psychological symptoms (line 55, pg viii) Patient distress and associated behaviors ((line 7, pg ix) Distress, or disruptive, behaviors (line 10, pg ix) Distress behaviors (line30, pg ix) Persistent or recurrent distress and/or disrupted behaviors (line 38, pg ix)	We appreciate the need for clarity on the label and definition of the primary outcome of interest. We have now identified “distress behaviors” as the primary outcome and defined it as well as acknowledge that many of the included studies use a variety of labels and language to mean the same behavioral construct (Introduction section, paragraph 5).
35	4	4. None of the terms listed in #3 are clear. It would be more useful to list out specific behaviors that are included and not included. For example, would patients with depressive symptoms along be included? Psychotic symptoms alone? Wandering alone?	As noted above, we have clarified our definition of distress behaviors including naming specific relevant behaviors and then use this term with all identified by our search. Individual studies had a variety of definitions and examples for such behaviors so it would be unwieldy to describe every potential behavior included by each included study. We have also noted this in the limitations.
36	4	5. Need to better define and perhaps list out all of settings that meet criteria for “post acute”. Becomes much clearer on page 6, but should be clear before reader reaches this point (if they ever do).	We have clarified the criteria for “post-acute” as recommended to be: “long-term residential or inpatient health care settings”
37	4	6. Would be much clearer to limit sample to older adults with dementia. The inclusion of persons with serious mental illness and other psychiatric disorders (line 27, pg ix) makes interpreting findings difficult. How many studies were included that did not predominately include persons with dementia? Most persons understand what distressing and disruptive behaviors are when referring to persons with dementia, but this term is much less familiar and clear when use in reference to persons with serious mental illness and other psychiatric disorders. In addition, it is	We purposefully did not limit the sample to studies focused on older adults with dementia on the recommendation of the nominating partners so that we could identify potentially effective interventions from other patient populations. In the end, all the studies for post-acute settings focused primarily on patients with dementia. The definition of older adult was defined as 50 years based on recommendations from our nominating partners and technical expert panel. However, we agree that the diversity across patient populations make conclusions more challenging. We have noted this in the

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		not clear why older adult was defined as 50 years or older. Interpretations are challenging given wide range in age, diagnosis/sx eligibility criteria, intervention components, setting and outcomes.	limitations. We have also included the mean age range of the participants in the evidence profile table.
38	4	7. I do not care for or understand the term "complex older adult" (line 9, pgxiii).	We have dropped the term "complex."
39	4	8. "just targeting patterns of patient care" (line 41, pg xii) is not a clear term.	This phrase has been rewritten to read: "focused on delivering individual patient care treatments."
40	4	9. Need to remove term, "dementia patient" across report. Replace with persons or individuals with dementia.	We have replacement this term as recommended.
41	5	Question about title of the report, which we discussed and tweaked several times. Per last communication, the title was "Care for Older Adults with Distress Behaviors: Health Care Team Focused Interventions" which seems to capture a bit better the essence of the review than the current title, "Health Care Delivery Models for the Management of Patient Distress." The current title doesn't get at the key issue of "behaviors" (i.e., distress can include anxiety, depression, fear, grief, etc, that doesn't manifest in distressed/disruptive behaviors that interfere with care, etc. Perhaps "Care for Older Adults with Distress Behaviors: Health Care Delivery Models"?	We have changed the title to "Care for Older Adults with Distress Behaviors: Health Care Team Focused Interventions" as originally discussed. We are avoiding the phrase "health care delivery models" on reviewer recommendations as noted above.
42	5	Perhaps address in methods why we chose not to include Inpatient Medicine setting of care, as many readers may be interested in that context	We did not exclude studies that were conducted in inpatient medicine setting; however, we did not identify any studies otherwise meeting our inclusion criteria that were conducted in the inpatient medicine setting. It is possible that our search terms did not identify relevant studies in that setting. We have adjusted the language throughout to make this clarification and noted this in the limitations.

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43	5	Perhaps a bit more about challenges (and insufficiency...) of research in this area? Limitations section is excellent, including acknowledgement of staff turnover as a real challenge for implementing/studying these interventions. I also wonder about looking only at average scores between groups and/or pre-post. Is there missing information to look at variability of impact, by looking at individual trajectories? How do we understand for which patients interventions appeared to have more positive impact vs for those who did not benefit?	We agree that intervention effects are likely not consistent for all patients and more work is needed to understand how patients with different types of distress behaviors and health histories (<i>ie</i> , PTSD) might respond differently to such interventions once effectiveness is established. We have added this consideration to the Future Research Section.
44	5	Did we miss important literature by not including workplace violence or Prevention and Management of Disruptive Behavior (PMDb) studies, targeted at this population? (maybe we did include, or maybe they just don't exist...)	We did not include search terms for workplace violence after discussion with the technical expert panel and with consideration for scope of this review. We agree that there is potentially relevant literature in that area. We have noted this in the limitations. We believe that we would have picked up articles on prevention and management of disruptive behavior if they were in the published literature as we included search terms for “disruptive behavior.”
45	5	Note that I have some minor editing suggestions that I will send directly to Dr. Goldstein via pdf document, rather than try to outline here, which would be cumbersome and not fit within the character count.	Thank you for sharing these suggestions. We have address them directly in the final draft.
46	6	I liked how the review grouped interventions by intervention focus components and multi component interventions. Recommendations: 1) In the objectives behaviors described as challenging or disruptive were the focus - disruptive/challenging to who? How is this different than how distress/distressed behavior is	Thank you. We are glad that this resonated with the reviewer. We appreciate this observation and have changed the language throughout to distress behaviors as noted above in comment # 34.

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		defined? I would recommend defining these terms and using distress behaviors which is more person-centered language, unless a study was making a specific point about level of challenge/disruption and to whom.	
47	6	2) Use person-centered language when possible, such as use person or resident in place of patient, distress behaviors instead of disruptive behaviors, etc.	We have adjusted the language in the report to be patient-centered as recommended.
48	6	3) Clearer language about interventions which all focus on staff-action, and also have multiple labels such as a) person-centered and patient-facing interventions, b) staff-facing, staff-focused, HCW interventions, and c) clinic-facing, unit level, unit focused interventions. It was hard as reader to try to keep track of which we were talking about. - Maybe: a) person centered interventions, b) staff centered interventions, c) person and staff centered interventions, d) person, staff, and environment centered interventions.	We have clarified the intervention language as noted above in response to comment #32.
49	6	4) Be sure you define acronyms the first time they are used (KQ, ROB)	We have reviewed the report to make sure that acronyms were defined with first time use.
50	6	5) I would have also liked to see a table listing the results for person centered/focused interventions and staff/person/environment centered/focused interventions, similar to table 2 for staff centered/focused interventions and table 3 for staff and person centered interventions. Thanks for putting together this important resource.	These tables have been added as requested.
51	7	well done-very thorough	Thank you.

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52	8	• Document page ix, Line 14 (overall page 13): recommend further defining short stay	We have defined short stay as requested.
53	8	• Document page ix, Line 31 (overall page 13): recommend changing “staff action” to “staffing characteristics”	This change has been made as suggested.
54	8	• Document page x, Line 18 (overall page 14): recommend identifying what was used to measure quality of life	We have clarified that the measures used to assess quality of life varied. We prioritized EuroQOL when possible.
55	8	• Document page x, Line 21 (overall page 14): spell out ROB abbreviation	ROB has been spelled out as risk of bias.
56	8	• Document page x, Line 55 (overall page 14): spell out CI abbreviation	We ended up removing this reference due to other edits.
57	8	• Document page xii, Line 58 (overall page 16): After “higher system-level targets (e.g., supervisory involvement, facility culture) could be explored.” Add: “In addition, discipline specific interventions such as the use of Social Workers for intervention and patient-centered care approaches could be explored.”	We have made this addition as recommended.
58	8	• Document page 6, Line 16 (overall page 23): Exclusion “Patients with delirium” - consider adding additional details such as “primary diagnosis of delirium” or “patients with co-occurring delirium” - how was delirium itself controlled for and excluded from this review/study?	We have clarified this exclusion criteria to be “patients with primary diagnosis of delirium.” It is possible that patients included in eligible studies also had delirium, but this was not reported. We only excluded those studies that specifically targeted patients primarily identified to have delirium as the source of their distress behavior.
59	9		