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# Systematic Review: Risk Factors and Interventions to Prevent or Delay Long-term Nursing Home Placement for Adults with Impairments

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**Prepared by:**

Evidence Synthesis Program (ESP) Center  
Minneapolis VA Health Care System  
Minneapolis, MN  
Timothy J. Wilt, MD, MPH, MS, Director

**Authors:**

Principal Investigator:  
Wei Duan-Porter, MD, PhD

Co-Investigators:

Edward Ratner, MD  
Kristine E. Ensrud, MD, MPH  
Joseph E. Gaugler, PhD  
Tetyana Shippee, PhD

Research Associates:

Kristen Ullman, MPH  
Nancy Greer, PhD  
Lauren McKenzie, MPH  
Christina Rosebush, MPH



**U.S. Department of Veterans Affairs**

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## PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted healthcare topics of importance to clinicians, managers, and policymakers as they work to improve the health and healthcare of Veterans. These reports help:

Develop clinical policies informed by evidence;

Implement effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and

- Set the direction for future research to address gaps in clinical knowledge.

The program is comprised of four ESP Centers across the US and a Coordinating Center located in Portland, Oregon. Center Directors are VA clinicians and recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Center Program and Cochrane Collaboration. The Coordinating Center was created to manage program operations, ensure methodological consistency and quality of products, and interface with stakeholders. To ensure responsiveness to the needs of decision-makers, the program is governed by a Steering Committee comprised of health system leadership and researchers. The program solicits nominations for review topics several times a year via the [program website](#).

Comments on this evidence report are welcome and can be sent to Nicole Floyd, Deputy Director, ESP Coordinating Center at [Nicole.Floyd@va.gov](mailto:Nicole.Floyd@va.gov).

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In designing the study questions and methodology at the outset of this report, the ESP consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

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### Operational Partners

Operational partners are system-level stakeholders who have requested the report to inform decision-making. They recommend TEP participants; assure VA relevance; help develop and approve final project scope and timeframe for completion; provide feedback on draft report; and provide consultation on strategies for dissemination of the report to field and relevant groups.

#### **Thomas O’Toole, MD**

*Senior Medical Advisor*

Office of the Assistant Deputy Undersecretary for Health – Clinical Operations (10NC)  
Veterans Health Administration, Washington D.C.

#### **Lynda C. Davis, PhD, MPA**

*Chief Veterans Experience Officer*

Veterans Health Administration, Washington D.C.

#### **Margaret Kabat, LCSW-C, CCM**

*Director, National Caregiver Support Program*

Veterans Health Administration, Washington D.C.

#### **Dayna Cooper, MSN, RN**

*Director, Home and Community Based Care*

Office of Geriatrics and Extended Care (10NC4)

Veterans Health Administration, Washington D.C.

### Technical Expert Panel (TEP)

To ensure robust, scientifically relevant work, the TEP guides topic refinement; provides input on key questions and eligibility criteria, advising on substantive issues or possibly overlooked areas of research; assures VA relevance; and provides feedback on work in progress. TEP members are listed below:

**Courtney Harold Van Houtven, PhD**

Durham VA HSR&D Center of Innovation  
Duke University School of Medicine  
Durham, NC

**James Rudolph, MD**

Director, Providence VA HSR&D Center of Innovation  
Warren Alpert Medical School of Brown University  
Providence, RI

**Lori Gerhard**

Office of Consumer Access & Self Determination  
Administration for Community Living, HHS  
Washington D.C.

**Michele Spoont, PhD**

Minneapolis VA HSR&D Center of Innovation and National Center for PTSD  
University of Minnesota Medical School  
Minneapolis, MN

**David Grabowski, PhD**

Harvard Medical School  
Boston, MA

**Peer Reviewers**

The Coordinating Center sought input from external peer reviewers to review the draft report and provide feedback on the objectives, scope, methods used, perception of bias, and omitted evidence. Peer reviewers must disclose any relevant financial or non-financial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center and the ESP Center work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

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## EXECUTIVE SUMMARY

### INTRODUCTION

In fiscal year 2020, the Department of Veterans Affairs (VA) is projected to spend \$9.8 billion on long-term care services for eligible Veterans. Recent legislation have created and expanded VA programs to support informal caregivers (*ie*, family or friends who provide unpaid care for Veterans with substantial impairments). A substantial proportion of Veterans with impairments served after September 11, 2001; there is a higher prevalence of mental health conditions for this younger group, and their caregivers are more likely to lack social support networks.

In 2017, the VA Secretary launched the Choose Home Initiative to enhance VA policies and practices for supporting Veterans and their informal caregivers, and to improve collaboration with non-VA community groups. To help VA policymakers understand the effects of VA-provided or -funded home and community-based services (HCBS), particularly with regard to avoiding long-term nursing home placement (NHP), the VA Evidence Synthesis Program (VA ESP) was asked to examine evidence on modifiable risk factors for long-term NHP and interventions that aimed to delay long-term NHP for community-dwelling adults with physical and/or cognitive impairments.

We sought evidence for both adults with existing disabilities (or at high risk for developing impairments) and individuals with posttraumatic stress disorder (PTSD) and/or traumatic brain injury (TBI). To address the broad scope of questions for these diverse populations and to provide specific recommendations for VA policies, we undertook an umbrella review of systematic reviews. We present qualitative summaries of results from the highest quality and most recent reviews covering the largest range of risk factors and interventions. We also describe policy implications and evidence gaps.

### METHODS

We developed a conceptual framework for factors contributing to long-term NHP, broadly organized into 3 categories: 1) needs for care; 2) personal and social factors; and 3) larger systems and environmental factors. Interventions may seek to change modifiable risk factors and/or substitute services (to address needs) in settings other than nursing homes. We were particularly interested in HCBS, but included a broad range of interventions.

We searched for systematic reviews in multiple databases (MEDLINE, Sociological Abstracts, PsycINFO, CINAHL, Embase, Cochrane Database of Systematic Reviews, Joanna Briggs Institute Database, Agency for Healthcare Research and Quality Evidence-based Practice Center and VA ESP reports) and sought references from our expert advisory panel. Due to lack of eligible reviews for individuals with PTSD and/or TBI, we undertook additional searches of published primary research studies and ongoing studies for these 2 populations.

At abstract screening, articles were excluded by consensus of 2 reviewers. Two reviewers independently conducted full-text review, and for eligible reviews, quality rating (using modified AMSTAR2 criteria). Eligible populations of interest included community-dwelling adults with existing physical or cognitive impairments, or those with high risk of developing impairments due to advanced age or existing medical conditions; no specific conditions were required or

excluded. Eligible reviews addressing risk factors could include any number or type of factors. Eligible interventions included case management, caregiver support, respite care, preventive home visits, and home-based primary care, among others. We created a preliminary list of interventions to guide searches, but we allowed for new interventions to emerge during screening and selection; such articles were included if review authors clearly intended to examine long-term NHP as an outcome of interest. We required that eligible reviews reported intent to focus on long-term NHP (or used similar terms such as “institutionalization”) as outcomes of interest in review objectives and/or included results on long-term NHP. If a review examined “nursing home admissions” as the outcome and explicitly counted short-term stays for rehabilitation within its definition, then the review was excluded. Although we hoped that reviews would clearly state their definition of long-term NHP (or “institutionalization”) and how authors had determined that included studies had measured the relevant outcome, we found that reviews rarely provided this information.

For all eligible reviews, we abstracted: target population(s); dates of search queries; number and characteristic of included primary studies (location, setting, and study design); if and how reviews determined long-term NHP; and risk factor or intervention addressed. For results on specific associations between risk factors and long-term NHP and the effects of particular interventions on long-term NHP, we prioritized the highest quality and most recent eligible systematic reviews. From these prioritized reviews, we abstracted data including: pooled effects (or qualitative summaries); moderation of intervention effects by participant characteristics; authors’ ratings of quality of included studies and overall strength of evidence; and total number of unique primary studies addressing long-term NHP for that risk factor or intervention.

Given heterogeneity in populations, risk factors, and interventions, we undertook a qualitative synthesis of results. We noted which risk factors or interventions were addressed by eligible reviews, and determined the total available evidence for different risk factors or interventions. Then we summarized results on associations with specific risk factors or effects of interventions from the prioritized subset of higher quality, more recent, eligible reviews.

## RESULTS

We screened 7014 unique citations for systematic reviews and reviewed the full text of 336 articles. We identified 67 eligible systematic reviews, which mainly addressed older adults and/or those with dementia.

We found no eligible reviews for individuals with PTSD and/or TBI. We also searched for primary research studies, ongoing clinical trials, and VA-funded research studies, but found no eligible studies addressing long-term NHP for these populations.

### **For older adults and/or those with dementia, what are potentially modifiable risk factors that contribute to long-term nursing home placement?**

Of 20 eligible reviews addressing risk factors for long-term NHP, 4 focused on frailty status and the remaining reviews included a wide variety of potentially modifiable risk factors within each review. Approximately half of reviews were conducted within the past 5 years, and 15% were high quality. We prioritized all 3 high-quality reviews and 3 of the medium-quality reviews (to more broadly cover populations and risk factors) for evaluating associations with long-term

NHP. In abstracting results, we grouped factors into the 3 categories from our conceptual model, except for frailty status which we describe separately below. We focus on factors which may be addressed by healthcare providers, health systems, and/or public policies, although some of these factors may not be truly amenable to improvement or change (*eg*, degree of cognitive impairment). Demographic characteristics were not considered modifiable

### *Frailty Status*

Frailty has been mainly conceptualized as either a phenotype of decreased physiologic reserve (with concomitant vulnerability to health stressors) or an accumulation of age-related deficits in health and function (*ie*, medical conditions and impairments). Within our conceptual framework, frailty status is most analogous to a combination of risk factors within the needs category, although some features of the frailty phenotype (*eg*, slow gait speed) do not correspond directly to impairments or symptoms. Among prioritized reviews, 2 high-quality and one medium-quality review examined associations between frailty status and long-term NHP. All 3 reviews addressed both frailty phenotype and deficit-accumulation frailty scores, and included studies that used different scoring systems to operationalize definitions of frailty. Overall, using a variety of measures, presence of frailty (or higher frailty scores) was associated with higher risk for long-term NHP.

### *Needs for Care*

Three prioritized reviews (one high-quality and 2 medium-quality) examined a wide range of potentially modifiable risk factors, including those indicating needs for care. The most consistent and substantial associations were found for physical and/or cognitive impairments, with some studies showing more than 3-fold increased risk (*eg*, with impairments in activities of daily living) but most demonstrating modest elevations in risk (1.5 to 2-fold) for long-term NHP. For older adults in general, poor self-reported health status and higher number of prescribed medications were associated with higher long-term NHP, but for those with dementia, general health status was not associated with long-term NHP. One review also reported that among adults with dementia, more behavioral and psychological symptoms were associated with long-term NHP.

### *Personal & Social Factors*

Three prioritized reviews identified studies evaluating personal and social risk factors. While caregiver depression was not associated with long-term NHP, higher caregiver burden or distress was found to predict higher risk for long-term NHP. Other factors associated with long-term NHP included lower physical activity, poor social networks, and poor general health status of caregivers.

### *Systems & Environmental Factors*

Among studies included by all prioritized reviews, only one evaluated systems or environmental factors. This study was conducted more than 20 years ago, addressed long-term NHP for adults with dementia, and showed inconsistent associations for a number of factors. Overall, there was a large gap in evidence on systems and environmental factors.

## **What is the effectiveness of interventions for preventing or delaying long-term nursing home placement?**

Of 47 eligible reviews addressing interventions, more evaluated case management (8 reviews), caregiver support (10 reviews), respite care and adult day clinics (9 reviews), or preventive home visits (6 reviews). Fewer examined home-based primary care (2 reviews) or physical activity interventions (2 reviews). The remaining 10 reviews were either very broad in scope (*eg*, all nonpharmacologic interventions for dementia) or were the only review specifically addressing that intervention (*eg*, occupational therapy). A third of eligible reviews were high quality, and 40% were conducted within the past 5 years. We prioritized all 15 high-quality reviews, 4 medium-quality reviews, and one low-quality review (due to this being the only one for that intervention) for abstraction of results on specific intervention effects. Most prioritized reviews (60%) only included randomized controlled trials (RCTs).

### *Case Management*

Four prioritized high-quality reviews included 29 unique studies that evaluated the effects of case management on long-term NHP. Two of these reviews included only RCTs and collectively identified 22 unique trials. Two reviews focused on adults with dementia, while the other 2 addressed older adults with a variety of different chronic health conditions and/or needs for care. Case management interventions differed on the number and type of components. Case managers were most commonly nurses, and many interventions included components of caregiver support or education. Some interventions described inclusion of comprehensive geriatric assessments among their components, while other interventions did not (though they may have included components with similar goals). There were different frequencies and modalities of patient contact, and varying follow-up periods (one to 10 or more years).

The 2 reviews including only RCTs found no overall effect and inconsistent effects across studies with different follow-up intervals, respectively. One review that included observational studies in addition to RCTs found that case management did not delay long-term NHP for frail elderly (low strength of evidence) but for adults with dementia, programs lasting more than 2 years and involving spouse caregivers delayed long-term NHP (low strength of evidence). The fourth review addressed case management that focused on “reablement,” and only identified one study that evaluated intervention effects on long-term NHP.

### *Caregiver Support*

Two high-quality reviews focused on caregiver support interventions, and both included only RCTs. One review included diverse interventions for caregivers of adults with dementia or cancer, and included 7 studies that evaluated long-term NHP. Review authors concluded that overall strength of evidence was low or inadequate for outcomes such as long-term NHP, but highlighted results from 2 studies that showed delay in long-term NHP. The other review evaluated cognitive reframing interventions for caregivers of adults with dementia, but did not identify any study reporting long-term NHP.

### *Respite Care and Adult Day Clinics*

Three high-quality reviews examined respite care and/or adult day clinics. Two reviews limited inclusion to RCTs and collectively identified 14 trials. One of these reviews focused on adult day clinics for participants with a variety of conditions and found no overall effect of this

intervention on long-term NHP. The other review evaluated respite care in a variety of settings for adults with dementia, and identified one trial showing increased average days in the community (*ie*, alive and not institutionalized). The third review included observational studies and RCTs on a wide range of respite care interventions for adults with a variety of conditions. This review reported participants using respite care had increased likelihood of long-term NHP, and concluded this was likely due to unmeasured confounding in observational studies.

### *Preventive Home Visits*

Two prioritized reviews (one high-quality, one medium-quality) examined preventive home visits; the medium-quality review included only RCTs. Together, these reviews identified 32 unique studies, and nearly all employed health professionals (most often nurses) as visitors. In contrast to case management, preventive home visits generally included older adults (*eg*, from population registries or general practitioner panels) who did not have known impairments or high-risk diagnoses at the outset. Both reviews found no overall effect of preventive visits on long-term NHP across studies, but 1 review reported that the subset of studies with interventions having more than 9 visits showed some decrease in long-term NHP.

### *Other Interventions*

One prioritized high-quality review evaluated home-based primary care but did not identify any study that addressed long-term NHP. One included study examined admissions to skilled nursing facilities before and after initiation of the intervention but did not distinguish between nursing home admission for the purpose of short-term rehabilitation versus long-term NHP for custodial care.

One high-quality review examined any intervention to reduce falls in older adults and included 9 RCTs that evaluated intervention effects on long-term NHP. Three of these trials were also included by the 2 reviews on preventive home visits, described above. Review authors reported evidence of heterogeneity and described inconsistent effects of multifactorial fall prevention interventions.

One medium-quality review addressed occupational therapy interventions and found one study evaluating long-term NHP. This study reported no significant differences in institutionalization at one year.

One high-quality review focused on different models of delivering personal assistance for older adults. This review identified one study that reported average number of days that the participant was not hospitalized or in a nursing home; no separate data for long-term NHP was provided.

Two medium-quality reviews addressed physical activity interventions, one high-quality review evaluated light therapy, and one high-quality review examined assistive technologies. None of these reviews were able to identify any study reporting effects of these interventions on long-term NHP.

Finally, one low-quality review evaluated demonstration projects that aimed to change policy and financing of acute and long-term care services. Among 7 projects described, 2 of these showed decreased rates of institutionalization. Both demonstrations occurred in Europe and involved case managers who assessed participants, coordinated care, and promoted utilization of

HCBS; in one program, case managers also managed the budget for HCBS and institutional care for their panels.

## DISCUSSION

### Summary of Key Findings

To inform the VA Secretary's Choose Home Initiative, we conducted a review of reviews that examined a wide range of risk factors and interventions to delay or prevent long-term NHP. We found 67 eligible reviews addressing these questions mainly for older adults with impairments or at high risk of developing impairments. We did not find any eligible review or research studies for individuals with PTSD and/or TBI.

Key findings include:

- Frailty status and higher frailty scores were associated with higher risk for long-term NHP
- Functional impairments, including difficulty with activities of daily living, demonstrated the most consistent and substantial associations with higher risk for long-term NHP
- Caregiver distress and/or burden was associated with higher risk for long-term NHP
- Case management, caregiver support, and preventive home visits demonstrated no overall benefit for delaying or reducing long-term NHP across studies, but there were a few studies in each category which showed delays
- For a variety of other interventions, such as physical activity, home-based primary care, and assistive technologies, very limited to no evidence was available for effects on long-term NHP

The lack of effectiveness for multiple interventions reflects the complexity of factors contributing to long-term NHP and the challenges of conducting and evaluating multicomponent programs to address these factors. Review authors highlighted multiple difficulties with summarizing effects for these complex interventions. This included lack of clarity on the exact components for various interventions, which made it difficult to understand the critical nature of any single component or the potential requirement for a specific combination of components. Moreover, review authors noted that different groups of participants with variable underlying risk for long-term NHP were enrolled in different studies. Overall, effects of complex interventions are particularly challenging to evaluate and synthesize due to differences in components and variation in context for the interventions (including characteristics of both participants and the healthcare or community setting).

Our results also suggest critical questions about the potential impact of interventions to delay or prevent long-term NHP. First, which participants should be selected for interventions? At earlier or less severe stages of a chronic condition, interventions may have a better chance of preventing development of impairments and disease progression. However, challenges for such a public health approach include that many participants (in this lower risk group) must engage with the intervention in order to see any appreciable benefit, and effects may not be evident for many

years. In the current US healthcare environment, the entity or organization that makes an upfront investment in such early interventions is unlikely to see the potential savings in resources from decreased future utilization of services. In contrast, interventions that target participants with many (or more intensive) existing care needs may have very limited ability to alter trajectories of decline for those at later stages of disability who have higher risk for long-term NHP. Current interventions aimed at these higher-risk groups have largely sought to enhance coordination of services and caregiver resources, often with the hope that such efforts will enable existing informal support networks to continue meeting needs for adults with impairments. Our results suggest that many existing interventions would not sufficiently meet the needs of adults with impairments who have no informal caregiver support.

Furthermore, the financial and regulatory environment for healthcare and long-term care services in the US have shaped local availability (or lack thereof) to care and services. Thus, these factors limit the potential impact of individual interventions, such as case management, which must work within existing resources. While a change in state or national policy may incentivize improved access and/or higher quality of HCBS, it may take many years to truly change the landscape of local resources.

### **Implications for Policy**

In contrast to most other healthcare organizations in the US, the VA is an integrated national system that provides and/or funds services across the whole continuum of healthcare and community settings; thus, the VA may be better situated to ensure integration of services across settings to meet the entire range of needs for eligible Veterans with impairments. However, although VA provides many services through its own facilities and staff, VA also purchases substantial amounts of care provided by non-VA community agencies and organizations. This is especially true for long-term care services, where the vast majority of Veterans receiving VA-paid HCBS and nursing home care are served by non-VA providers. It seems unlikely that VA can change the landscape of local resources (and availability of new models of care), unless it strategically partners with organizations that determine the majority of financial incentives (and regulations) for long-term care service providers in the US.

Additionally, and likely in part due to variation in local resources, VA facilities differ in the number and types of long-term care programs and services that are provided and/or funded. Understanding what is available at a particular facility, and coordinating services across multiple programs within the same facility, remain key challenges for Veterans, their caregivers, and VA clinical staff. Therefore, in VA (as in non-VA settings), case management for adults with impairments may offer substantial benefits, despite the lack of effectiveness in general as suggested by our results. To impact NHP, it is likely that case management (and other similar interventions) should have relatively high-frequency longitudinal contacts with participants, be initiated early in the course of chronic conditions (*eg*, dementia), and extend for at least several years. As noted by other groups, there are also opportunities for VA to streamline its programs, and focus on consistently implementing a core set of evidence-based interventions across all facilities. This may improve the ability of Veterans, their caregivers, and VA staff to identify and engage in appropriate care, potentially without high-intensity case management. In the absence of robust, longitudinal, and coordinated services to address needs for Veterans with impairments, we think it unlikely that improved assessment for impairments (or other risk factors for long-term NHP) will be sufficient to improve outcomes.

Finally, to better serve Veterans with impairments, the VA should be at the forefront of advancing our understanding of the value of HCBS versus institutional nursing home care. There are questions about the current national shift of funding to HCBS (and away from nursing homes) and whether this will lead to worse outcomes for those with substantial needs, especially if numeric goals (*eg*, proportion of spending on HCBS) do not adequately account for the specific mix of needs for different populations. Our results support concerns that increased utilization of HCBS may not lead to appreciable changes in long-term NHP, and point to the importance of understanding the impact of HCBS on other outcomes for adults with impairments and their caregivers. We agree with others who have encouraged policymakers to evaluate existing programs (and future interventions) in terms of cost-effectiveness due to improved patient and family-centered outcomes, and not solely in terms of avoiding costs of long-term NHP.

Therefore, we suggest the following:

- Organize and streamline VA programs and services according to their key goals, which may include delaying long-term NHP or other important outcomes, such as caregiver support and wellbeing
- Compare VA programs that aim to prevent or delay long-term NHP with models of high-intensity interventions (*eg*, case management, caregiver support, and/or home visits) that have some evidence for effects on long-term NHP, and consider that lower-intensity programs may have low likelihood of changing long-term NHP
- Combine implementation of improved assessment for physical and cognitive impairments and social resources with programs to provide dedicated, longitudinal care coordination over years, in order to impact long-term NHP
- Evaluate programs (including alternative residential settings that provide a high level of care) for cost-effectiveness from improved patient and family-centered outcomes, rather than cost-savings (from avoidance of long-term NHP)
- Leverage past VA experience with implementation of complex programs that have addressed both healthcare and social needs for vulnerable Veterans, and develop new models of support for Veterans with substantial impairments

### **Evidence Gaps and Future Research Needs**

We found no review or studies that addressed risk factors or interventions to delay long-term NHP for individuals with PTSD and/or TBI. Eligible reviews also found little evidence examining systems or environmental factors, such as local availability of HCBS, or appropriate and affordable housing. As noted above, systems and environmental factors may be very important and limit the ability of individual interventions to address long-term NHP. Additionally, reviews did not identify evidence regarding certain personal and social factors, such as attitudes and preferences for setting of care.

We examined different complex interventions that often varied along multiple dimensions, and were evaluated for different groups (and in different settings). This complexity and variability

created substantial challenges in understanding effects on long-term NHP. As complex interventions may be the most plausible way to enhance healthcare delivery and improve outcomes for various groups with complex needs, it is imperative that we consider methodologies to improve design and evaluation of such interventions. For example, the multiphase optimization strategy (MOST) can be employed to guide selection of intervention components; frameworks for pragmatic trials and evaluation of implementation outcomes (*eg*, stepped wedge and hybrid designs) may also improve interpretation of results and enable future implementation.

Therefore, we recommend the following for future research:

- Longitudinal observational studies examining whether individuals with PTSD and/or TBI are at substantial risk of long-term NHP
- Longitudinal studies on effect of factors such as attitudes and preferences for setting of care, and systems and environmental factors (*eg*, local availability of HCBS), on long-term NHP
- Randomized evaluations of complex interventions that compare models of care which differ in only 1-2 key components or characteristics (*eg*, similar types of services at home vs in clinic)
- Randomized evaluations of interventions with longer follow-up (likely > 2 years) and larger sample size, particularly if targeting individuals at lower overall risk of long-term NHP
- Consider using strategies to optimize selection of intervention components and evaluation designs that explicitly consider implementation outcomes in future studies of complex interventions to address long-term NHP

## Limitations

Our work focused on long-term NHP and we excluded reviews that did not address this outcome (*eg*, those examining only caregiver outcomes). Thus, our findings do not indicate that interventions are not effective for other important outcomes for adults with impairments or their caregivers. We prioritized highest quality and more recent reviews to provide associations and effects of specific risk factors and interventions. We relied on review authors' descriptions of interventions, quality ratings for included studies, and determination of overall strength of evidence. Most eligible reviews did not specify how they determined whether included studies addressed long-term NHP. To further evaluate this, we examined primary studies included in prioritized reviews, and found that most used participant or family reports of long-term NHP. Few studies confirmed these outcomes with additional data sources, such as state or federal administrative data on utilization of long-term care services. Examination of the primary studies also showed that few were conducted in the VA or among Veterans; however, evidence for the general population may be applicable to Veterans, given the likelihood of some shared risk factors that contribute to long-term NHP, as well as VA's use of non-VA service providers for many Veterans with impairments. It may be that interventions in countries other than the US is

less relevant for Veterans and the VA, but we elected to include this evidence, as it may help inform future policy changes.

## Conclusions

Existing evidence on a wide range of risk factors and interventions for older adults demonstrated the complexity of contributors to long-term NHP and the difficulty of preventing or delaying this outcome. There was a lack of evidence evaluating certain risk factors, especially at the level of systems and environment. Very limited evidence suggested that high-intensity models of case management, caregiver support, and home visits may delay long-term NHP. Although there are a variety of VA programs and services that seek to help Veterans with impairments, many likely do not involve similar levels of participant contact and dedicated coordination of care and services over years, compared with those interventions that delayed long-term NHP.

Policymakers should consider evaluating cost-effectiveness of current and future VA programs in terms of improved patient and family-centered outcomes, and not solely as seeking to avoid costs of long-term NHP.

## ABBREVIATIONS TABLE

<b>Abbreviation</b>	<b>Definition</b>
AHRQ	Agency for Healthcare Research and Quality
EPC	Evidence-based Practice Center
ESP	Evidence Synthesis Program
HBPC	Home-based primary care
MeSH	Medical subject heading
NHP	Nursing home placement
PTSD	Posttraumatic stress disorder
RCTs	Randomized controlled trials
SR	Systematic review
TBI	Traumatic brain injury
TEP	Technical expert panel
VA	Department of Veterans Affairs
VHA	Veterans Health Administration

# EVIDENCE REPORT

## INTRODUCTION

In fiscal year 2015, the Department of Veterans Affairs (VA) spent \$5.3 billion on institutional care, and \$2.1 billion for non-institutional home and community-based services (HCBS), with total costs for long-term care services making up 13% of its overall budget.<sup>1</sup> In fiscal year 2020, VA is projected to spend \$9.8 billion overall on long-term care services for eligible Veterans.<sup>2</sup> This growth in VA costs for long-term care services is expected to continue, due to increased numbers of Veteran enrollees who have a high degree of service-connected disabilities.<sup>1</sup> At the same time, recent legislation (Caregivers and Veterans Omnibus Health Services Act of 2010<sup>3</sup> and VA Maintaining Systems and Strengthening Integrated Outside Networks [MISSION] Act of 2018<sup>4</sup>) have established and expanded financial support and services for informal caregivers—that is, family or friends who provide unpaid care for Veterans with substantial impairments. While the initial program of caregiver benefits and services was limited to Veterans who served after September 11, 2001, the VA MISSION Act expanded eligibility to those from earlier eras of service. Among Veterans requiring assistance from informal caregivers, approximately one-fifth served after 9/11 and there are substantial differences between these individuals and Veterans who served before 9/11—more post-9/11 Veterans have mental health conditions and their caregivers are twice as likely to lack support networks.<sup>5</sup>

In 2017, the VA Secretary launched the Choose Home Initiative to enhance VA policies and practices for supporting Veterans and their informal caregivers, and to improve collaboration with non-VA community groups.<sup>6,7</sup> The overall objective of this initiative is to increase support for Veterans with substantial impairments and help these individuals remain in community settings, if that is their preference. The Choose Home Initiative is led by the VA Veterans Experience Office and works with stakeholders and experts within and outside of VA, including the VA Office of Geriatrics and Extended Care, VA Caregiver Support Program, Administration for Community Living in the US Department of Health and Human Services, and the Elizabeth Dole Foundation. To help VA policymakers understand the effects of HCBS, particularly with respect to avoiding long-term nursing home placement (NHP), the VA ESP was asked to provide a review of the evidence on modifiable risk factors for and interventions that aimed to delay long-term NHP for community-dwelling adults with physical and/or cognitive impairments.

In collaboration with representatives from the Choose Home Initiative, VA Veterans Experience Office, Geriatrics and Extended Care, and Caregiver Support Program (hereafter referred to as “VA partners”), we developed the conceptual and analytic frameworks, and refined the scope for this evidence report. In addition to individuals who have existing disabilities, or are at high risk for developing impairments (due to older age and/or chronic medical conditions), our VA partners also requested evidence on risk factors and interventions for adults with posttraumatic stress disorder (PTSD) and/or traumatic brain injury (TBI), due to the higher prevalence of these conditions among Veterans with service-connected disabilities.<sup>8</sup> To adequately address the broad scope of risk factors and interventions for these diverse populations, and to fulfill the goal of providing specific recommendations for VA policies, we undertook an umbrella review of systematic reviews. We present qualitative summaries of results from the highest quality and most recent reviews covering the broadest range of risk factors and interventions. We also describe implications for policy and gaps in evidence.

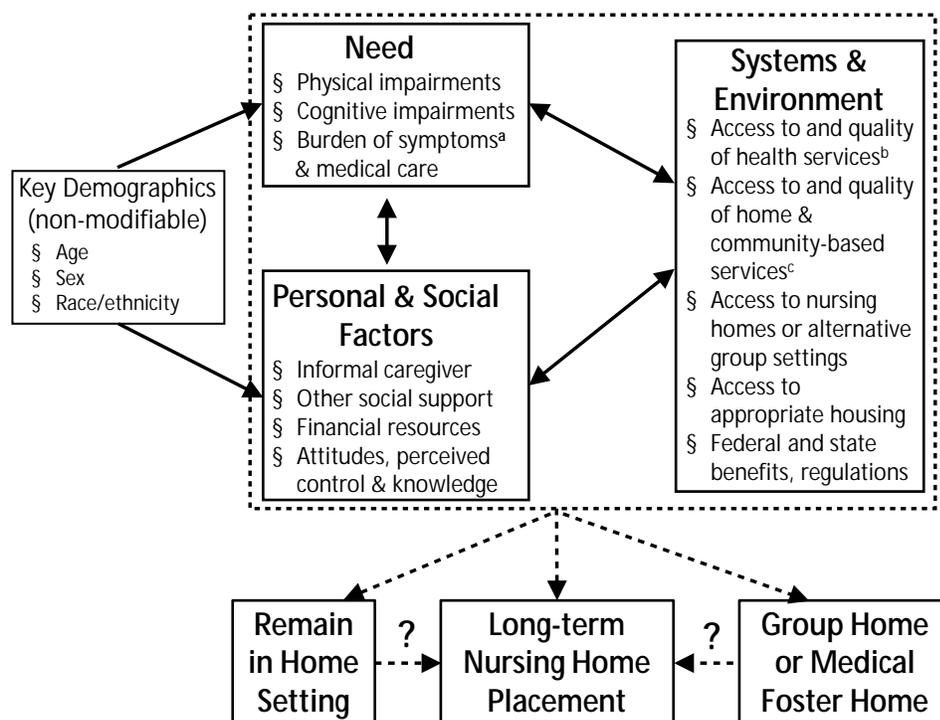
## METHODS

### TOPIC DEVELOPMENT

#### Conceptual Model and Analytic Framework

To guide scope refinement and protocol development, we first established our conceptual model of factors contributing to long-term NHP. We reviewed existing frameworks, including Andersen's Behavioral Model of Health Services Use,<sup>9,10,11</sup> Lawton's Person-Environment Model,<sup>12,13</sup> and the Vulnerable Populations Model,<sup>14</sup> that have been applied and adapted in past research addressing long-term NHP for adults with substantial physical and cognitive impairments. We sought to integrate and adapt key components, with the ultimate goal of generating an organizing framework to help address questions posed by our VA partners. Our conceptual model (Figure 1) included 3 categories of factors that interact: 1) needs for care due to physical or cognitive impairment and consequences of medical illness; 2) personal and social factors that may be resources or barriers to meeting needs; and 3) systems and environmental factors including access and quality of healthcare and social services. Collectively, factors in these 3 categories determine whether adults may remain at home or seek a higher level of care in nursing homes or alternative settings with substantial supports (eg, group homes).

**Figure 1. Conceptual Model for Long-term Nursing Home Placement**



<sup>a</sup> Due to mental health and physical health conditions

<sup>b</sup> Includes outpatient and inpatient care

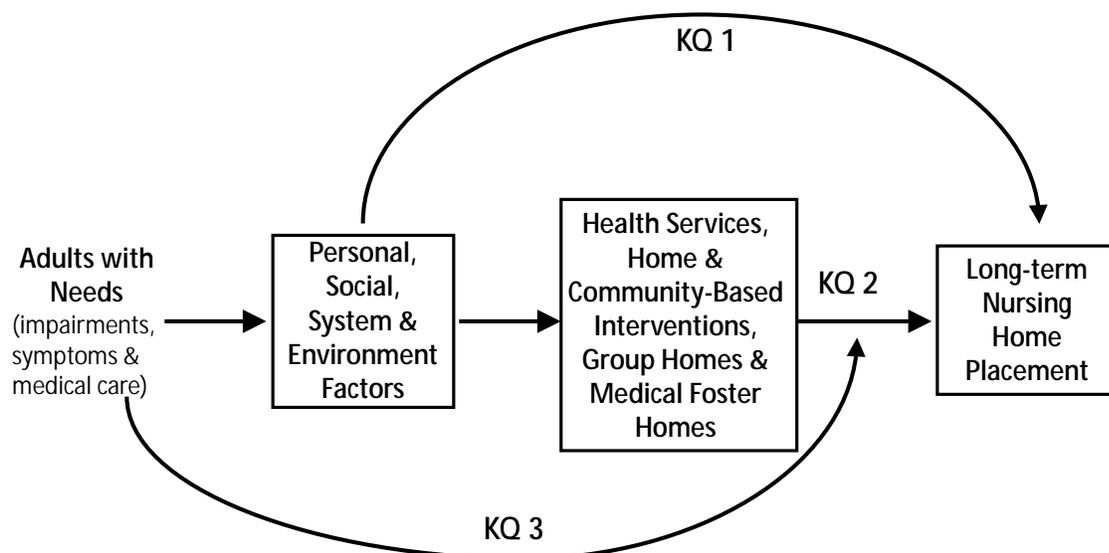
<sup>c</sup> Includes skilled healthcare at home (eg, nursing, physical therapy) and non-health services (eg, home aides)

Our conceptual model highlighted some of the complexities in the study of factors leading to long-term NHP and interventions to avoid or delay this outcome. Multiple factors across several categories likely change over time and may interact dynamically. Complex interventions

involving several components addressing multiple factors may be needed to delay or avoid long-term NHP; such interventions present substantial challenges in analysis and interpretation of effects, particularly regarding the importance of individual components. Finally, factors in the systems and environment category may have substantial effects on long-term NHP, but addressing these factors may well be beyond the scope of individual healthcare facilities or systems.

We applied our conceptual model to develop the analytic framework and guide formulation of key questions regarding risk factors and interventions seeking to delay or prevent long-term NHP (Figure 2). Our analytic framework shows that a number of factors outside of immediate needs for care may contribute to long-term NHP. Interventions may seek to change modifiable risk factors or substitute services (to address needs) in settings other than nursing homes. We were particularly interested in HCBS, but we included a broad range of interventions and alternative community settings for higher level of care. Finally, different characteristics of participants may affect the ability of interventions to delay long-term NHP.

**Figure 2. Analytic Framework for Evidence Review of Risk Factors and Interventions to Prevent or Delay Long-term Nursing Home Placement**



### Key Questions (KQ)

For adults with physical and/or cognitive impairments:

**KQ1**—What are the modifiable risk factors that lead to long-term NHP?

**KQ2**—What is the effectiveness of home and community-based interventions, and group homes or medical foster homes, for preventing or delaying long-term NHP?

**KQ3**—Which characteristics of adults with impairments moderate the effectiveness of home and community-based interventions, group homes or medical foster homes, in preventing or delaying long-term NHP?

## SEARCH STRATEGY

We searched for systematic reviews in the following databases, from inception until September 2018: MEDLINE, Sociological Abstracts, PsycINFO, CINAHL, and Embase. The search terms included MeSH and free text for: nursing homes and long-term care placement, populations more likely to have impairments (*eg*, older adults) or of special interest to VA (*ie*, PTSD or TBI), eligible interventions, and systematic reviews (Appendix 1). We supplemented these results with additional searches of the Cochrane Database of Systematic Reviews, Joanna Briggs Institute Database, Agency for Healthcare Research and Quality Evidence-based Practice Center (AHRQ EPC) reports, and VA ESP reports through November 2018. We also sought references from our expert advisory panel.

We anticipated that there might be areas without eligible reviews and discussed preliminary results with our VA partners and expert advisory panel. Due to the lack of eligible reviews on long-term NHP for individuals with PTSD and/or TBI, we undertook additional searches of published primary research, and ongoing observational studies and clinical trials. We queried MEDLINE from inception until November 2018 using MeSH and free-text terms for outcomes and interventions, as noted above; we removed terms for systematic reviews and older adults. For ongoing studies, we searched VA Health Services Research & Development-funded studies ([www.hsrd.research.va.gov/research](http://www.hsrd.research.va.gov/research)) and [www.clinicaltrials.gov](http://www.clinicaltrials.gov) using text terms for PTSD, TBI, and interventions of interest.

## STUDY SELECTION

After duplicates were removed, search results were uploaded into DistillerSR (DistillerSR, Evidence Partners, Ottawa, Canada). We screened titles and abstracts using prespecified inclusion/exclusion criteria (Appendix 2). Articles underwent full-text review if at least one reviewer deemed it eligible during abstract screening. Exclusion of articles at screening required agreement of 2 reviewers. At full-text review, 2 individuals separately determined inclusion/exclusion and then resolved any conflicts through discussion. When consensus could not be reached, disagreements were discussed with a third reviewer.

Eligible populations of interest included community-dwelling adults with existing physical or cognitive impairments, or those with high risk of developing impairments due to advanced age or existing medical conditions; no specific conditions were required or excluded. Eligible reviews addressing KQ1 could include any number or type of risk factors. Eligible reviews addressing KQ2-3 examined many different interventions, including case management and geriatric assessment, caregiver support, respite care, preventive home visits, home-based primary care, and alternative group settings for high-level care (Appendix 2). We created a preliminary list of interventions to guide searches but we allowed for new interventions to emerge during screening and selection.

Articles were included if review authors clearly intended to examine long-term NHP as an outcome of interest. We anticipated that certain reviews may not distinguish between short-term post-acute care rehabilitation in nursing homes and long-term NHP; thus, we required that eligible reviews reported intent to focus on long-term NHP (or used similar terms such as “institutionalization”) as outcomes of interest in review objectives and/or included results on long-term NHP. If a review examined “nursing home admissions” as the outcome and explicitly

counted short-term stays for rehabilitation within its definition, then the review was excluded. Although we hoped that reviews would clearly state their definition of long-term NHP (or “institutionalization”) and how authors determined that included studies had measured the relevant outcome, we found that reviews rarely provided this information.

## DATA ABSTRACTION & QUALITY ASSESSMENT

We assessed the quality of all eligible reviews using criteria adapted from AMSTAR 2<sup>15</sup> and rated overall quality as high, medium, or low (Appendix 3). In general, a high-quality review met all applicable criteria (*ie*, at least “partial Yes” for all questions). Two reviewers independently rated each eligible review, and consensus was reached through discussion.

All eligible reviews underwent data abstraction by 2 reviewers for: target population(s) of review; dates of search queries; number and characteristic of included primary studies (location, setting and study design); if and how reviews determined long-term NHP; and risk factor or intervention. For results on specific associations with or effects on long-term NHP, we focused on the highest quality and most recent eligible systematic reviews that covered the broadest range of risk factors and interventions. For example, out of all eligible reviews on case management, 4 were high quality and among these, 2 were conducted within the past 5 years (the other 2 were published in 2013); we prioritized all 4 high-quality reviews on case management for further data abstraction. Additional data abstraction included: pooled effects (or qualitative summaries) for risk factors or interventions; moderation of intervention effects by participant characteristics; datasets used and method of ascertainment for long-term NHP; quality ratings and strength of evidence (as determined by review authors); conceptual frameworks used by reviews; and total number of unique primary studies evaluating long-term NHP that were identified by all prioritized reviews for each intervention. Data abstraction was done by one reviewer and overread by a second reviewer.

## DATA SYNTHESIS

Given the heterogeneity in populations, risk factors and interventions, we undertook a qualitative synthesis of results. First we noted which risk factors or interventions were addressed by eligible reviews, and determined the available evidence for different risk factors and interventions. Then we summarized the specific results on associations with risk factors or effects of intervention from the prioritized subset of higher quality, more recent, eligible reviews.

## PEER REVIEW

A draft version of this report was reviewed by 6 technical experts, as well as VA operational partners. Their comments and our responses are presented in Appendix 4.

## RESULTS

### OVERVIEW

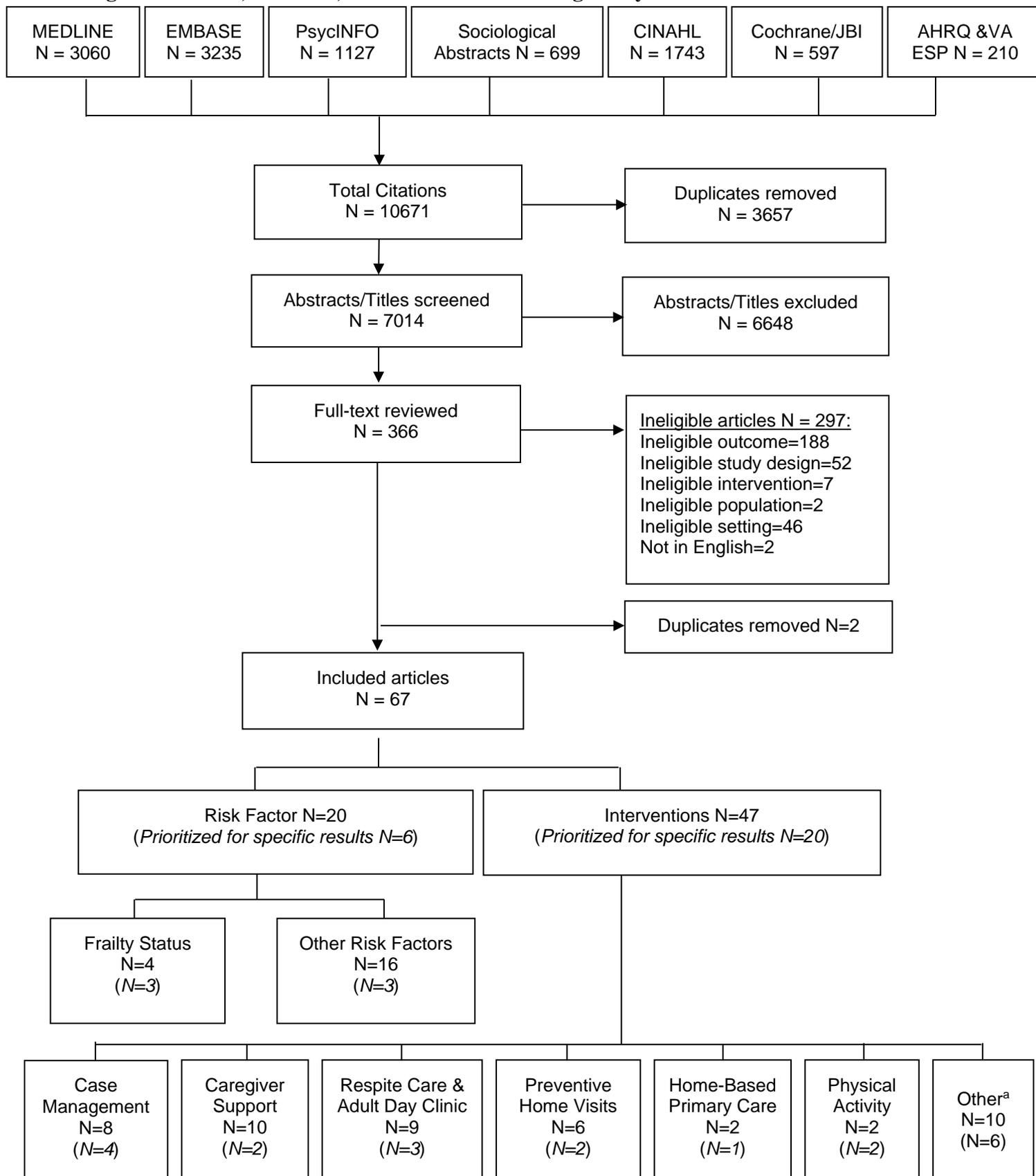
Of 7014 unique citations, 336 underwent full-text review (Figure 3). We identified 67 eligible systematic reviews, which mainly addressed older adults and/or those with dementia. We found no eligible reviews for individuals with PTSD and/or TBI. We also searched for primary research studies for individuals with PTSD or TBI; after screening 126 citations and reviewing the full text of 7 articles, we identified no eligible primary studies on long-term NHP. We did not find any ongoing clinical trials or VA funded research studies that addressed long-term NHP for these populations. Therefore, we were unable to address any of the KQ for these groups.

There were 20 eligible reviews addressing risk factors for long-term NHP, and all focused on older adults and/or those with dementia. Four reviews examined frailty status<sup>16-19</sup> and the remaining reviews included a wide variety of factors within each review.<sup>20-35</sup> Approximately half of reviews were conducted within the past 5 years, and 15% were high quality (Appendix 5.1). We prioritized all high-quality reviews<sup>16,18,22</sup> and 3 of the medium-quality reviews<sup>19,27,29</sup> (to more broadly cover populations and risk factors) for evaluating associations between specific risk factors and long-term NHP.

Of 47 eligible reviews addressing interventions to prevent or delay long-term NHP, more evaluated case management (8 reviews),<sup>36-43</sup> caregiver support (10 reviews),<sup>44-53</sup> respite care and adult day clinics (9 reviews),<sup>54-62</sup> or preventive home visits (6 reviews).<sup>63-68</sup> Fewer examined home-based primary care (2 reviews),<sup>69,70</sup> or physical activity interventions (2 reviews).<sup>71,72</sup> The remaining 10 reviews<sup>73-82</sup> were either very broad in scope (*eg*, all nonpharmacologic interventions for dementia) or the single review addressing that topic (*eg*, occupational therapy). A third of eligible reviews on interventions were high quality, and 40% were conducted within the past 5 years. We prioritized all 15 high-quality reviews,<sup>38,40,41,45,51,54,59,61,65,70,73,75,77,80,83</sup> 4 medium-quality reviews,<sup>67,71,72,74</sup> and one low-quality review (due to this being the only review on that topic)<sup>82</sup> for abstraction of results on specific intervention effects. Most prioritized reviews (60%) limited eligible studies to randomized controlled trials (RCTs).

We abstracted results for specific risk factors and interventions from a total of 26 prioritized eligible reviews (6 for risk factors<sup>16,18,19,22,27,29</sup> and 20 for interventions<sup>38,40,41,43,45,51,54,59,61,65,67,70-75,77,80,82</sup>). Characteristics of these reviews are provided in Table 1. Descriptions of these results are provided below.

**Figure 3. Search, Selection, and Prioritization of Eligible Systematic Reviews**



<sup>a</sup>2 reviews—any nonpharmacologic intervention for adults with dementia; 1—any intervention for falls prevention; 1—any intervention for patient or caregiver stress; 1—different settings for personal assistance; 1—in-home healthcare or personal assistance; 1—assistive technologies; 1—demonstration projects to integrate acute and long-term care in US and Europe; 1—occupational therapy; and 1—light therapy

**Table 1. Characteristics of 26 Prioritized Systematic Reviews (SR)**

	Total # SR <sup>a</sup>	Recent <sup>b</sup>	Quality of SR:		SR including:			# Unique Studies Evaluating NHP <sup>d</sup>
			High	Medium	Only RCTs	Multiple Study Designs <sup>c</sup>	US Studies	
<i>Risk Factors:</i>								
Frailty Status	3	2	2	1	—	2	2	8
Other Risk Factors	3	2	1	2	—	3	3	98
<i>Interventions:</i>								
Case Management	4	2	4	—	2	1	3	28
Caregiver Support	2	1	2	—	2	—	1	7
Respite Care & Day Clinics	3	1	3	—	2	1	3	22
Preventive Home Visits	2	—	1	1	1	1	2	32
Home-Based Primary Care	1	1	1	—	—	1	1	—
Physical Activity	2	2	—	2	2	—	1	—
Others <sup>e</sup>	6	3	4	1	3	3	4	11

NHP=long-term nursing home placement; RCTs=randomized controlled trials; US=United States

<sup>a</sup> Number of SR prioritized per category, based on better quality and most recent searches.

<sup>b</sup> Search conducted 2013 or later.

<sup>c</sup> Included RCTs and various observational study designs (eg, cohort with or without comparator).

<sup>d</sup> Within each category, total unique primary studies identified as reporting long-term NHP

<sup>e</sup> 1—interventions for falls prevention; 1—different settings for personal assistance; 1—assistive technologies; 1—demonstration projects to integrate acute and long-term care in US and Europe; 1—occupational therapy; and 1—light therapy. 1 SR (on demonstration projects) was low quality.

## For older adults and/or those with dementia, what are potentially modifiable risk factors that lead to long-term nursing home placement? (KQ 1)

Of 6 prioritized reviews on risk factors, 3 focused on frailty status<sup>16,18,19</sup> and 3 examined a variety of other risk factors.<sup>22,26,29</sup> In abstracting results, we grouped factors into categories from our conceptual model (see Figure 1 and Methods), except for frailty status which we describe separately below. In these results, we focus on factors which may be addressed by healthcare providers, health systems, and/or public policies, although some of these factors may not be truly amenable to improvement or change (eg, degree of cognitive impairment). Demographic characteristics were not considered modifiable. Results on associations between specific risk factors and long-term NHP are summarized in Table 2. Detailed characteristics and results from prioritized reviews are found in Appendix 5.2.

**Table 2. Summary of Results from 6 Prioritized Reviews<sup>a</sup> on Potentially Modifiable Risk Factors of Long-term Nursing Home Placement for Older Adults**

Category of Risk Factor	Description	Risk for NHP	Comments on Associations
<b>Frailty status</b>	Frailty phenotype or frailty scores	#	2 reviews reported qualitative summaries <sup>16,18</sup> and 1 review reported meta-analysis (OR/RR 1.67 [95% CI 1.47, 1.89]) <sup>19</sup>
<b>Needs for Care</b>	Physical and/or cognitive impairments	#	2 reviews reported qualitative summaries—1 review focused on adults with dementia, <sup>22</sup> 1 on older adults in general <sup>26</sup>
	Poor health status	1 /#	2 reviews reported qualitative summaries—1 review on adults with dementia found no association, <sup>22</sup> but 1 review on older adults reported greater NHP with lower self-rated health status <sup>26</sup>
	More behavioral & psychological symptoms (of dementia)	#	1 review reported qualitative summary, stating more symptoms “ <i>significantly increased the risk of [NHP] in most but not all studies...</i> ” <sup>22</sup>
	More prescriptions	#	1 review reported qualitative summary, stating that “ <i>a high number of prescriptions...[were] strong predictors of NHP</i> ” <sup>26</sup>
<b>Personal &amp; Social</b>	Low level of physical activity	#	1 review reported qualitative summary, stating that “ <i>low activity level ...had a moderate predictive effect on NHP.</i> ” <sup>26</sup>
	Poor social network	#	1 review reported qualitative summary, stating moderate evidence showed greater risk for “ <i>those with a poor social network...</i> ” <sup>26</sup>
	More caregiver burden & distress	#	1 review reported qualitative summary, stating that “[i]ncreased caregiver burden...were significant predictors of [NHP] in most studies...” <sup>22</sup>
	Poor caregiver health	1 /#	1 review <sup>22</sup> reported meta-analysis for caregiver depression (HR 1.00 [95% CI 0.97-1.03]) and qualitative summary of health status (“ <i>markers of worse caregiver health...were significant predictors...</i> ”)
<b>Systems &amp; Environment</b>		?	1 review <sup>22</sup> found 1 study that “ <i>examined the effect of several characteristics of the American continuing care system...</i> ”

#=increased risk; 1 =no meaningful difference or effect; \$=lowered risk; ?=reviews identified none or only 1 study; ADL=activities of daily living; CI=confidence interval; HR=hazards ratio; NHP=long-term nursing home placement; OR= odds ratio; RR=relative risk ratio

<sup>a</sup> Prioritized based on highest quality and most recent search.

## Frailty Status

Frailty has been mainly conceptualized as either a phenotype of decreased physiologic reserve (with concomitant vulnerability to health stressors)<sup>76,77</sup> or an accumulation of age-related deficits in health and function (*ie*, medical conditions and impairments).<sup>84</sup> Within our conceptual framework, frailty status is most analogous to a combination of risk factors within the needs category, although some features of the frailty phenotype (*eg*, slow gait speed) do not correspond directly to impairments or symptoms. We prioritized 2 high-quality<sup>16,18</sup> reviews and 1 medium-quality review<sup>19</sup> that examined associations between a variety of frailty measures and long-term NHP. All 3 reviews included studies that used a variety of scoring systems to operationalize and measure frailty, some of which applied the frailty phenotype, while others used the deficit-accumulation model. Overall, these reviews identified 8 unique studies evaluating the relationship between frailty and long-term NHP (Table 1).<sup>84-91</sup>

One high-quality umbrella review focused on validity of frailty assessment instruments for adults 60 years and older living in any setting, and examined predictive accuracy of frailty for adverse health outcomes, including institutionalization.<sup>16</sup> This umbrella review identified 1 systematic review<sup>86</sup> that evaluated diverse older adult populations, and found frailty indices (based on the deficit-accumulation model) to be “*sufficiently accurate to predict increased risk of...hospitalization and institutionalization at 12 months...*” The systematic review based its conclusions about long-term NHP on 3 observational cohort studies—1 from the Netherlands<sup>86</sup> and 2 from Canada.<sup>85,88</sup> All 3 primary studies used administrative data, sometimes in combination with interview or survey data.

One high-quality review<sup>18</sup> and 1 medium-quality review<sup>19</sup> examined frailty in community-dwelling adults 65 years and older; these reviews together included 6 studies that evaluated long-term NHP,<sup>84,87-91</sup> one of which was also identified by the review discussed above.<sup>88</sup> Of the 5 additional unique studies, 1 used US data,<sup>90</sup> 3 used Canadian cohorts,<sup>84,89,91</sup> and 1 used Italian data.<sup>87</sup> Long-term NHP was reported by participants or family in 4 studies,<sup>84,87,89,90</sup> and assessment was unclear in 1 study.<sup>91</sup> Three studies used frailty indices that applied the deficit-accumulation model,<sup>84,89,91</sup> 1 study used the frailty phenotype,<sup>90</sup> and one study used 2 measures that applied deficit-accumulation and phenotype models, respectively.<sup>87</sup> One review<sup>18</sup> conducted a qualitative synthesis, stating that institutionalization was one of the “*most common outcomes [associated with] frailty...*” The other review<sup>19</sup> performed a quantitative meta-analysis, showing that frailty was associated with an overall pooled hazard ratio (HR) or risk ratio (RR) of 1.65 (95% CI 1.48, 1.84) for institutionalization.

In summary, all 3 reviews addressed both frailty phenotype and deficit-accumulation frailty scores and included studies that used many different scoring systems to operationalize definitions of frailty. Overall, using a variety of measures, presence of frailty (or higher frailty scores) was associated with higher risk for long-term NHP.

## Needs for Care

Three prioritized reviews (1 high-quality<sup>22</sup> and 2 medium-quality<sup>20,22</sup>) examined a wide range of risk factors. The high-quality review examined factors contributing to long-term NHP for adults with dementia,<sup>22</sup> while the other 2 reviews included studies on older adults in general.<sup>27,29</sup> Together, these 3 reviews included 98 unique primary research studies (Table 1). Two reviews

provided qualitative summaries of results for associations with specific measures of impairments, symptoms, and/or complexity of medical care,<sup>22,27</sup> but the third review evaluated summary risk assessment tools (excluding frailty indices) that predicted risk for institutionalization.<sup>29</sup> While these risk tools often included a range of factors in the needs category,<sup>92-95</sup> there were no results on associations with individual risk factors.<sup>29</sup>

Both reviews that provided results on specific risk factors applied Andersen's Behavioral Model of Health Services Use<sup>9</sup> to identify and describe factors. The review on risk factors in dementia<sup>22</sup> reported 14 studies showing increased long-term NHP associated with greater impairment in basic or instrumental activities of daily living (ADL/IADL).<sup>96-109</sup> Additionally, this review included 2 studies which showed no association with general health status or medical comorbidities.<sup>96,110</sup> Some included studies also showed that more behavioral and psychological symptoms were associated with more long-term NHP,<sup>98,108,109,111-126</sup> but 3 studies did not find an association.<sup>127-129</sup>

The other review included studies on older adults and also reported consistent associations between more ADL/IADL and/or cognitive impairment and higher risk of long-term NHP.<sup>27</sup> This review categorized overall results for individual factors into strong, moderate, weak, or inconclusive evidence, and highlighted the minimum and maximum associations for each factor from studies that authors rated as high quality. For example, review authors stated there was strong evidence for higher long-term NHP associated with greater IADL impairment and noted the range of hazards ratios (HR) as 1.05-2.50.<sup>27</sup> Similarly, there was strong evidence for associations of long-term NHP with greater ADL (HR range 1.32-3.70, odds ratio [OR] range 1.30-1.78)<sup>130-133</sup> and cognitive impairment (OR range 1.44-1.55, HR 1.67).<sup>131,134,135</sup> Additional factors with strong evidence were lower general health status (OR range 1.48-1.67, HR 3.40)<sup>130,134,136</sup> and higher number of prescriptions (HR range 1.04-1.67, OR 1.15).<sup>131,136,137</sup> Association of long-term NHP with specific health conditions such as arthritis and respiratory diseases were rated by review authors as inconclusive.

In summary, the most consistent and substantial associations were reported for functional and/or cognitive impairments, for both those with dementia and the general population of older adults. For older adults in general, poor self-reported health status and higher number of prescribed medications were associated with higher long-term NHP, but for those with dementia, general health status was not associated with long-term NHP. For those with dementia, most studies also found that behavioral and psychological symptoms were associated with long-term NHP.

## Personal & Social Factors

Two prioritized reviews<sup>22,27</sup> provided results on specific personal and social factors, while the third review<sup>29</sup> examined summary risk assessment instruments and did not report associations for individual factors. The high-quality review on adults with dementia<sup>22</sup> reported a quantitative meta-analysis that showed no overall association between caregiver depression and long-term NHP (HR 1.00 [95% CI 0.97, 1.03], reportedly using data from 9 studies, but exact studies were not identified in review). In qualitative synthesis, this review also reported increased long-term NHP was associated with higher caregiver distress or burden (8 studies),<sup>98,100,108,113,129,138-140</sup> lower life satisfaction (2 studies),<sup>112,116</sup> or poor caregiver health (2 studies).<sup>100,141</sup>

The medium-quality review<sup>27</sup> examined risk factors for older adults in general and provided qualitative summaries. The following factors were rated as having moderate evidence for association with increased long-term NHP: poor social network (HR range 1.18-1.27, OR range 1.11-1.18)<sup>131,133,135,142</sup> and low physical activity (OR 1.97)<sup>132</sup>.

### **Systems & Environmental Factors**

Prioritized reviews on risk factors collectively found only one study that examined association of long-term NHP with specific systems or environmental factors. This study evaluated adults with dementia, was conducted more than 20 years ago, and found inconsistent results for a variety of factors.<sup>104</sup> Overall, there was a large gap in evidence on systems and environmental factors.

### **What is the effectiveness of interventions for preventing or delaying long-term nursing home placement? (KQ 2 & 3)**

Results from 20 prioritized reviews on interventions are summarized in Table 3 (for 13 reviews that included only RCTs<sup>38,40,41,45,51,54,59,65,67,72,73,75,80</sup>) and Table 4 (for remaining 7 reviews that included multiple study designs<sup>43,61,70,71,74,77,82</sup>). In general, interventions were evaluated for older adults and/or those with serious chronic medical conditions (*eg*, dementia); no interventions clearly demonstrated overall benefit across studies for delaying or preventing long-term NHP. Reviews reported some interventions had positive effects in a subset of included studies (*ie*, for case management, caregiver support, and preventive home visits). Reviews on several other interventions, including home-based primary care and physical activity programs, did not identify studies that examined effects on long-term NHP. Detailed results from prioritized reviews on interventions are described below and found in Appendix 5.3 (for long-term NHP) and Appendix 5.4 (for secondary outcomes, such as mortality and hospitalizations).

**Table 3. Interventions to Delay or Prevent Long-term Nursing Home Placement (NHP)—Summary of Results from 13 Prioritized Reviews that Limited Inclusion to RCTs<sup>a</sup>**

Interventions (# prioritized SR, # unique RCTs <sup>b</sup> )	Effect on NHP	Comments
Case Management (2, 22)	1	2 reviews reported quantitative meta-analyses for adults with dementia—1 review found inconsistent results across different follow-up intervals (reduction in NHP at 6 and 18 months, but not at 10-12 and 24 months) <sup>40</sup> ; 1 review found no overall decrease in NHP (RR 0.94 [95% CI 0.85, 1.03]) or delay in timing (WMD 77.8 days [95% CI -70.5, 226.1]) <sup>41</sup>
Caregiver Support (2, 7)	1 / \$	1 review <sup>45,143</sup> reported qualitative summaries, stating interventions for caregivers of adults with dementia “ <i>did not consistently improve...institutionalization for patients with memory-related disorders</i> ” but also highlighted results from 2 studies that demonstrated delay in NHP
	?	1 review <sup>51</sup> on cognitive reframing for caregivers of adults with dementia found no RCTs reporting NHP
Respite Care & Day Clinics (2, 14)	1	1 review <sup>54</sup> reported quantitative meta-analysis for adult day clinics and found no overall decrease in NHP (OR 0.84, 95% CI 0.58, 1.21) or when separated by type of comparator
	?	1 review <sup>59</sup> on all types of respite care identified 1 RCT which showed delay to combined outcome of NHP and death
Preventive Home Visits (1, 13)	1 / \$	1 review <sup>67</sup> reported quantitative meta-analysis and found no effect overall (RR 0.91 [95% CI 0.76, 1.09]) but suggested more intensive interventions (>9 visits) may decrease NHP
Physical Activity (2, 0)	?	2 reviews <sup>71,72</sup> on frail or pre-frail older adults found no RCTs reporting NHP
Other (3, 9)	1	1 review <sup>73</sup> on a variety of interventions for falls prevention, reported qualitative summaries that multifactorial programs and exercise-focused interventions showed inconsistent effects
	?	1 review <sup>75</sup> on light therapy for adults with dementia found no RCTs reporting NHP
	?	1 review <sup>80</sup> on assistive technologies for adults with dementia found no RCTs reporting NHP

#=increased or accelerated NHP; 1=no meaningful difference or effect; \$=delayed or prevented NHP; ? = reviews identified none or only 1 study; CI=confidence interval; HR=hazards ratio; NHP=long-term nursing home placement; OR= odds ratio; RR=relative risk ratio; RCTs=randomized controlled trial; SR=systematic review

<sup>a</sup> Prioritized reviews based on highest quality and most recent search; these reviews explicitly allowed only RCTs as study design of included articles.

<sup>b</sup> Included RCTs that reported results on NHP

**Table 4. Interventions to Delay or Prevent Long-term Nursing Home Placement (NHP)—Summary Results from 7 Prioritized Reviews Including Multiple Study Designs<sup>a</sup>**

Interventions (# prioritized SR)	Effect on NHP	Comments
Case Management (2)	1 /\$	1 review <sup>83</sup> reported qualitative summary for adults with dementia, stating that programs ≤ 2 years did not “confer clinically important delays in time to [NHP]” (moderate strength of evidence) but interventions for those with “in-home spouse caregivers and continue services for longer than 2 years” may be effective (low strength of evidence)
	1	1 review <sup>83</sup> reported qualitative summary for adults with frailty or multimorbidity, stating no effect on NHP (low strength of evidence)
	?	1 review <sup>38</sup> on “reablement” interventions for older adults found only 1 study reporting NHP
Respite Care & Day Clinics (1)	#	1 review <sup>61</sup> reported quantitative meta-analysis of “quasi-experimental” <sup>b</sup> studies and found increased NHP (OR 1.79 [95% CI 1.02, 3.12])
	\$	1 review <sup>61</sup> reported qualitative summary of observational cohort studies, stating that these “found some support for the benefits of respite care...” <sup>144-146</sup>
Preventive Home Visits (1)	1	1 review <sup>65</sup> reported quantitative meta-analysis and found no effect overall (RR 1.02 [95% CI 0.88, 1.18]) or by different follow-up intervals
Home-Based Primary Care (1)	?	1 review <sup>70</sup> found no study reporting NHP
Other (3)	?	1 review <sup>74</sup> on occupational therapy found only 1 study reporting NHP
	?	1 review <sup>77</sup> on different settings or models of personal assistance found no studies reporting NHP
	\$	1 review <sup>82</sup> reported qualitative summary of demonstration projects to better integrate acute and long-term care, stating decreased NHP occurred in 2 projects

# = increased or accelerated NHP; 1 = no meaningful difference or effect; \$ = delayed or prevented NHP; ? = reviews identified none or only 1 study; CI = confidence interval; NHP = long-term nursing home placement; OR = odds ratio; RCTs = randomized controlled trial; SR = systematic review

<sup>a</sup> Prioritized based on highest quality and most recent search, these reviews included randomized trials and observational studies

<sup>b</sup> Review authors defined these as observational studies with a comparison group as control

## Case Management

Four prioritized high-quality reviews<sup>38,40,41,43</sup> included 29 unique studies that evaluated the effects of case management on long-term NHP. Two reviews<sup>40,41</sup> focused on adults with dementia, while the other 2 reviews<sup>38,83</sup> addressed older adults with different characteristics, including multiple chronic health conditions. Reviews included a variety of case management interventions that differed on the number and types of components. Case managers had variable professional backgrounds (most commonly nursing), and employed different modalities and frequencies of patient contact. Some interventions described inclusion of comprehensive geriatric assessments among their components, while other interventions did not (though they may have included components with similar goals). Often, interventions had some element of caregiver counseling and support. Included studies had follow-up periods from 1 to more than 10 years.

The 2 reviews focusing on adults with dementia<sup>40,41</sup> included only RCTs and collectively identified 22 unique trials that reported effects on long-term NHP. One review<sup>40</sup> conducted meta-analyses using data from 9 trials,<sup>147-155</sup> stratifying by follow-up interval. There were decreased odds of long-term NHP at 6 months (OR 0.82 [95% CI 0.69, 0.98]) and 18 months (OR 0.25 [95% CI 0.10, 0.60]), but not at 10-12 months (OR 0.95 [95% CI 0.83, 1.08]) or 24 months (OR 1.03 [95% CI 0.52, 2.03]). The other review<sup>41</sup> pooled data from 16 studies,<sup>96,147,151,152,156-167</sup> and reported “*no statistically significant effect of dementia [case management] compared to usual care*” (risk ratio [RR] 0.94 [95% CI 0.85, 1.03]). Additionally, this review evaluated time to long-term NHP by meta-analysis using data from 5 studies<sup>96,156,161,162,167</sup> and also found no difference (weighted mean difference 77.98 days [95% CI -70.5, 226.1]).

One prioritized review on case management included observational studies in addition to RCTs.<sup>43</sup> This review evaluated case management for older adults with different characteristics, finding 10 studies on adults with dementia<sup>147,149-152,155,168-171</sup> and 2 focused on frailty or multimorbidity<sup>172,173</sup> that reported effects on long-term NHP. For dementia, review authors concluded that there was moderate strength of evidence that programs lasting 2 years or less did not “*confer clinically important delays in time to nursing home placement...*” However, the review also stated that interventions for adults with dementia “*who have in-home spouse caregivers and continue services for longer than 2 years*” may be effective for delaying long-term NHP (low strength of evidence). For adults with frailty or multiple chronic health conditions, review authors reported low strength of evidence that case management did not decrease long-term NHP.

One review addressed reablement or restorative care for older adults, and included RCTs and observational studies.<sup>38</sup> Review authors stated that reablement may not be distinct from other types of services delivered at home, and defined it as a high-intensity, time-limited intervention oriented towards optimizing function and reducing care in the future. Description of intervention elements showed substantial overlap with goals and components of case management. This review identified only one trial evaluating long-term NHP, which showed no differences.<sup>174</sup>

In summary, most evidence indicated that case management did not delay or reduce long-term NHP, with the possible exception of dementia programs lasting longer than 2 years and involving in-home spouses as caregivers.

## Caregiver Support

Two high-quality prioritized reviews<sup>45,51</sup> focused on caregiver support interventions, and both included only RCTs. One review<sup>45</sup> was based on a VA ESP report<sup>143</sup> that evaluated diverse interventions for caregivers of adults with dementia or cancer. Review authors reported qualitative summary of 7 studies that evaluated long-term NHP, all of which were for caregivers of those with dementia.<sup>96,164,166,167,171,175,176</sup> Authors stated that caregiver involved interventions “*did not consistently improve...institutionalization for patients with memory-related disorders,*”<sup>143</sup> but highlighted results from 2 studies that demonstrated delay in long-term NHP (228-557 days).<sup>171,176</sup> Both of these studies evaluated the same model of caregiver support, which included tailored in-person counseling (6 sessions over the first 4 months), information and encouragement to attend local support groups, and ad hoc follow-up by counselors via different modalities.<sup>171,176</sup>

The other review<sup>51</sup> addressed only cognitive reframing interventions for caregivers of adults with dementia. Although review authors intended to examine long-term NHP, they did not identify any studies that reported effects on this outcome.

In summary, evidence indicated that caregiver support interventions were generally not effective for preventing or delaying long-term NHP, although a few studies have reported benefits of a particular model of high-intensity caregiver counseling.

## Respite Care & Adult Day Clinics

Three high-quality reviews examined respite care and/or adult day clinics, and collectively identified 22 unique studies. Two reviews limited inclusion to RCTs; one of these reviews focused on adult day clinics for a variety of populations,<sup>54</sup> while the other examined respite care in any setting (eg, residential, at home, or at day clinics) for those with dementia.<sup>59</sup> The first review<sup>54</sup> included studies of adults with different medical conditions, and conducted quantitative meta-analysis using data from 13 RCTs.<sup>177-189</sup> There was no overall benefit for decreasing institutionalization (pooled OR 0.84 [95% CI 0.58, 1.21]), or in subgroup analyses by different categories of comparators (eg, OR 0.91 for day clinic versus comprehensive geriatric care [95% CI 0.70, 1.19]). The other review (examining respite care for adults with dementia)<sup>59</sup> included one RCT, but this trial used a combined outcome of days in the community, defined as not experiencing institutionalization or death.<sup>190</sup> This trial showed more days in the community for the intervention group (22 days on average).<sup>190</sup>

The third review included both RCTs and observational studies of respite care in any setting for adults with a variety of conditions.<sup>61</sup> This review included 8 studies on long-term NHP—1 RCT,<sup>156</sup> 4 “quasi-experimental” studies (non-randomized prospective studies with any comparative control),<sup>191-194</sup> and 3 observational cohort studies.<sup>144-146</sup> The 1 trial compared caregiver training program with 10 days of respite care as the control; this showed shorter time to long-term NHP for the respite care group.<sup>156</sup> Review authors conducted meta-analysis using data from 3 of the quasi-experimental studies,<sup>191-193</sup> and found increased long-term NHP in the respite care groups (OR 1.79 [95% CI 1.02, 3.12] for long-term NHP, and OR 1.54 [95% CI 1.01-2.33] for combined long-term NHP or death). One quasi-experimental study<sup>194</sup> was not included in the meta-analysis but review authors described that this showed “*respite users tended to keep the care recipient in the community for significantly longer than matched control subjects.*”

Qualitative summary was provided for remaining 3 cohort studies<sup>144-146</sup>—“*observational studies found some support for the benefits of respite care...*” This review also included qualitative studies on how caregivers perceived use of respite care, and authors concluded “*it is likely... that many samples recruited to studies of respite care are at a relatively late stage in the caregiving career and respite is unlikely to have a substantial impact on institutionalization rate.*”

In summary, adult day clinics do not decrease long-term NHP but the evidence for respite care (in a variety of settings) is inconclusive, due to few RCTs and concerns about confounding factors in observational study designs.

### Preventive Home Visits

Two prioritized reviews<sup>65,67</sup> examined preventive home visits and, together, identified 32 unique studies which evaluated long-term NHP. In contrast to case management interventions, preventive home visits generally included older adults (*eg*, from population registries or general practitioner panels) who did not have known impairments, recent adverse health events, or high-risk diagnoses at the outset. Nearly all included studies employed health professionals (nurses, physicians, and/or social workers) as visitors; only 1 study used non-professional volunteers.<sup>195</sup> The medium-quality review<sup>67</sup> included only RCTs and conducted quantitative meta-analysis using data from 13 trials.<sup>136,138,140-142,144,145,152,202,279,282-284</sup> This review found that overall “*reduction in the risk of [long-term NHP] was modest and nonsignificant*” (RR 0.91 [95% CI 0.76, 1.09]), but there was evidence of substantial heterogeneity. In subgroup analysis using data from 4 studies with more than 9 visits,<sup>196-199</sup> authors reported “*the estimated reduction [of long-term NHP]... was 34% (RR, 0.66; 95% CI, 0.48-0.92) and the typical risk difference was 2.3%.*” Review authors excluded “*short-term and residential or board and care-unit admissions*” in abstracting results on long-term NHP.<sup>67</sup>

The other review<sup>65</sup> was high quality and included both RCTs and studies using “*quasi-random methods that approximated the characteristics of randomization*” to allocate participants. The quantitative meta-analysis for institutionalization used data from 26 studies<sup>108,136-143,146,149,151,201,266,268-279</sup> and showed no overall effect of home visits (RR 1.02 [95% CI 0.88, 1.18]). Review authors concluded there was “*moderate quality evidence of no clinically important difference*” between intervention and control groups in overall effect; there were also no effects in analyses by different follow-up intervals (*eg*, RR 0.96 [95% CI 0.69, 1.33] for 8 studies with at least 3 years of follow-up<sup>197-204</sup>).

In summary, most evidence indicated no decrease in long-term NHP, but a few studies with greater intensity of home visits showed some reduction.

### Other Interventions

One prioritized high-quality review<sup>70</sup> evaluated home-based primary care and sought to examine long-term NHP. This review included 19 studies but none of these reported long-term NHP. One observational study evaluated the proportion of participants with admissions to a skilled nursing facility before and after initiation of home-based primary care, but this study did not distinguish between short-term stays for rehabilitation and long-term NHP.<sup>205</sup>

Two prioritized reviews<sup>71,72</sup> examined physical activity interventions that involved mostly or exclusively exercise programs. Both were medium quality and included only RCTs with

community-dwelling older adults who were frail or pre-frail. Neither review identified any trials that reported long-term NHP.

One high-quality review<sup>73</sup> examined any type of intervention to reduce falls in older adults and included 9 RCTs that evaluated long-term NHP. Review authors reported evidence of heterogeneity and provided qualitative summaries of results. Seven trials<sup>206-212</sup> used multifactorial interventions, which varied in type of components and intensity of participant contacts, and showed inconsistent results for long-term NHP (RR range 0.43-3.07). Review authors cautioned “*prevalence of institutionalization in the control groups varied substantially, from 0.6 to 20.1 percent*” and wide confidence intervals reflected that long-term NHP were rare events. Two trials<sup>213,214</sup> used exercise only and showed “*no statistically significant effect on participants transitioning to institutionalized care...*” Other included studies on vitamin D, environmental modification, medication management, and psychological interventions did not report effects on long-term NHP.

One medium-quality review<sup>74</sup> addressed occupational therapy interventions for older adults and found only 1 RCT<sup>215</sup> that reported effects on long-term NHP. Review authors did not provide results from this trial. We examined this study and found that it evaluated occupational therapy at home for older adults who were recently hospitalized for falls; there were no significant differences in self-reported long-term NHP at 1 year.<sup>215</sup>

One high-quality review<sup>77</sup> focused on different models of delivering personal assistance to address ADL impairment for older adults. This review found 1 study that reported average number of days in the community (*ie*, not hospitalized or in a nursing home); no separate data for long-term NHP was provided.<sup>216</sup>

One high-quality review on light therapy<sup>75</sup> and 1 high-quality review on assistive technologies<sup>80</sup> both addressed adults with dementia and failed to identify any study reporting long-term NHP.

One low-quality review<sup>82</sup> evaluated demonstration projects that aimed to change current policies and practice towards “*comprehensive integration of acute and long-term care services, including financial mechanisms...*” Included projects occurred after the US National Long-term Care Demonstration (Channeling).<sup>187</sup> The review provided qualitative summaries of 7 demonstrations in US, Canada, UK, and Italy, and reported 2 of these projects evaluated rates of institutionalization.<sup>172,217</sup> Both programs occurred in Europe and involved case managers who assessed participants, coordinated care, and promoted utilization of HCBS; in one program, case managers directly managed the budget for HCBS and institutional long-term care services for their panels.<sup>217</sup> Both studies reported decreased institutionalization.<sup>172,217</sup>

In summary, evidence on long-term NHP was mostly not available for a wide range of interventions, and studies on interventions for falls prevention may have lacked sufficient follow-up and/or sample size to detect differences in long-term NHP.

## DISCUSSION

### SUMMARY OF KEY FINDINGS

To inform the VA Secretary's Choose Home Initiative, we conducted a review of reviews to examine a wide range of risk factors and interventions to delay or prevent long-term NHP. We found 67 eligible reviews addressing these questions mainly for older adults with impairments or at high risk of developing impairments. We did not find any eligible review or research studies for individuals with PTSD and/or TBI. Key findings include:

- Frailty status and higher frailty scores were associated with higher risk for long-term NHP
- Functional impairments, including difficulty with ADL/IADL, demonstrated the most consistent and substantial associations with higher risk for long-term NHP
- Caregiver distress and/or burden was associated with higher risk for long-term NHP
- Case management, caregiver support, and preventive home visit interventions demonstrated no overall benefit for delaying or reducing long-term NHP across studies, but there were a few studies in each category which showed delays
- For a variety of other interventions, such as physical activity, home-based primary care, and assistive technologies, very limited to no evidence were available for effects on long-term NHP

The lack of effectiveness in general for interventions like case management reflects the complexity of factors contributing to long-term NHP and the challenges of conducting and evaluating multicomponent programs to address these factors. Review authors highlighted multiple difficulties with summarizing effects for such complex interventions. This included lack of clarity on the exact components for various interventions, which made it difficult to understand the critical nature of any single component or the potential requirement for a specific combination of components. Moreover, review authors noted that different groups of participants with variable underlying risk for long-term NHP were enrolled in different studies. In addition to potentially different mechanisms of action (*eg*, due to heterogeneity of risk factors for long-term NHP), this variability led to difficulty with determining whether individual studies were adequately powered to detect true intervention effects. Also, because of the high degree of variability across many dimensions, reviews were limited in ability to examine intervention and participant characteristics through subgroup analyses. Overall, effects of complex interventions are particularly challenging to evaluate and synthesize due to differences in components and variation in context for the interventions (including characteristics of both participants and the healthcare or community setting).

Our results also suggest critical questions about the potential impact of interventions to delay or prevent long-term NHP. First, which participants should be selected for interventions, or alternatively, when in the course of aging or a chronic illness should someone be considered for more intensive services or programs? At earlier or less severe stages of a chronic condition, interventions have a better chance of preventing the development of impairments and disease

progression. However, challenges for such a public health approach include that many participants (in this lower risk group) must engage with the intervention, in order to see any appreciable benefit, and impacts may not be evident for many years. In the current US healthcare environment, the entity or organization that makes an upfront investment in such early interventions is unlikely to see the potential savings in resources from decreased future utilization of services. In contrast, interventions that target participants with many (or more intensive) existing care needs may have very limited ability to alter trajectories of decline for those at later stages of disability who have higher risk for long-term NHP. Current interventions aimed at these higher risk groups have largely sought to enhance coordination of services and caregiver resources, often with the hope that such efforts will enable existing informal support networks to continue meeting needs for adults with impairments. But some individuals with substantial needs will lack any support network, and social support can change quickly and dramatically (*eg*, death of a spouse). Our results suggest that many existing interventions would not sufficiently meet the needs of adults with impairments who have no informal caregiver support.

As noted above, addressing long-term NHP in the US is made more difficult by the fragmentation and complexity of the financial and regulatory environment for healthcare and long-term care services. These larger environmental factors make early investment (to reap long-term benefits) not financially feasible for many healthcare entities and community organizations. These factors also shape local availability (or lack thereof) to care and services, and thus limit the potential impact of individual interventions, such as case management, which must work with existing resources. Even limited demonstration projects of new financial benefits or incentives<sup>218</sup> must operate within existing local barriers to care and services, including availability and quality of service providers. While a change in state or national policy may incentivize improved access and/or higher quality of HCBS (*eg*, current Medicaid rebalancing initiatives<sup>219,220</sup>), it may take many years to truly change the landscape of local resources.

## IMPLICATIONS FOR POLICY

As an integrated national healthcare system that provides and/or funds services across the whole continuum of healthcare and community settings (including outpatient and inpatient services, HCBS and long-term nursing home care), VA may be better situated to ensure integration of services across settings to meet the entire range of needs for eligible Veterans with impairments. However, although VA provides many services through its own facilities and staff, VA also purchases substantial amounts of care provided by non-VA community agencies and organizations. This is especially true for long-term care services, where the vast majority of Veterans receiving VA-paid HCBS and nursing home care are served by non-VA providers.<sup>1</sup> Thus, although VA has greater flexibility in provision and funding of services across settings, and greater ability to invest in early interventions, VA is also limited in delivery of care and services by the same local barriers to access and quality that apply to the general population of US adults with impairments. While VA spends a substantial proportion of its budget on long-term care services for eligible Veterans, this amounts to less than 10% of the annual Medicaid budget for long-term care services for elderly enrollees.<sup>221</sup> Therefore, it seems unlikely that VA can change the landscape of local resources (and availability of new models of care), unless it strategically partners with organizations that determine the majority of financial incentives (and regulations) for long-term care service providers in the US.

Additionally, and likely in part due to variation in local resources, VA facilities differ in the number and types of long-term care programs and services that are provided and/or funded.<sup>222</sup> Understanding what is available at a particular facility, and coordinating services across multiple programs within the same facility, remain key challenges for Veterans, their caregivers, and VA clinical staff.<sup>223</sup> While there are a range of risk factors which may contribute to long-term NHP, no single factor, or small set of factors, reliably indicate which individuals will need long-term NHP. Moreover, most factors, including the degree of functional impairment, are dynamic over time.<sup>224,225</sup> Thus, the salience of any particular program or service will also vary over time for individual Veterans at risk for long-term NHP. Therefore, in VA (as in non-VA settings), case management for adults with impairments may offer substantial benefits, despite the lack of effectiveness in general, as suggested by our results.

To impact long-term NHP, it is likely that case management (and other similar interventions that focus on caregiver support) should have relatively high-frequency longitudinal contacts with participants, be initiated early in the course of chronic conditions (eg, dementia), and extend for at least several years. Current VA programs likely do not provide comparable levels of support and care coordination over years, and implementing such high-intensity interventions may require substantial resources. As others have noted, there are also opportunities for VA to streamline its programs, and focus on consistently implementing a core set of evidence-based interventions across all facilities.<sup>223</sup> This may improve the ability of Veterans, their caregivers, and VA staff to identify and engage in appropriate care, potentially without high-intensity case management. While more consistent assessment of impairments and social resources, including caregiver support, may help clinicians and the healthcare system predict which Veterans are at higher risk for long-term NHP, we think it unlikely that improved assessment will be sufficient to improve outcomes. Thus, we recommend implementation of robust, longitudinal, and coordinated services to address needs that are identified through better assessment.

Finally, to better serve Veterans with impairments, VA should be at the forefront of advancing our understanding of the value of HCBS versus institutional nursing home care. Past work has highlighted that we lack high-quality evidence on whether (and which) outcomes are improved with HCBS.<sup>226</sup> Some have questioned whether the national push to shift funding to HCBS (and away from nursing homes) is wise, or if this will lead to worse outcomes for those with substantial needs,<sup>227</sup> especially if numeric goals (eg, proportion of spending on HCBS) do not adequately account for the specific mix of needs for different populations.<sup>228</sup> Our results support concerns that increased utilization of HCBS may not lead to appreciable changes in long-term NHP, and point to the importance of understanding the impact of HCBS on other outcomes. We agree with others who have encouraged policymakers to instead consider evaluating existing programs (and future interventions) in terms of cost-effectiveness due to improved patient and family-centered outcomes,<sup>226,229</sup> and not solely in terms of avoiding costs of long-term NHP. The VA should implement rigorous evaluations of patient and family-centered outcomes for VA-provided and -funded services, to help establish the value and cost-effectiveness for different types of long-term care services.

Therefore, we suggest the following:

- Organize and streamline VA programs and services according to their key goals, which may include delaying long-term NHP or other important outcomes, such as caregiver support and wellbeing

- Compare VA programs that aim to prevent or delay long-term NHP with models of high-intensity interventions (*eg*, case management, caregiver support, and/or home visits) that have some evidence for effects on long-term NHP, and consider that lower-intensity programs may have low likelihood of changing long-term NHP
- Combine implementation of improved assessment for physical and cognitive impairments and social resources with programs to provide dedicated, longitudinal care coordination over years, in order to impact long-term NHP
- Evaluate programs (including alternative residential settings that provide a high level of care) for cost-effectiveness from improved patient and family-centered outcomes, rather than cost-savings (from avoidance of long-term NHP)
- Leverage past VA experience with implementation of complex programs that have addressed both healthcare and social needs for vulnerable Veterans, and develop new models of support for Veterans with substantial impairments

## EVIDENCE GAPS & FUTURE RESEARCH NEEDS

We found no review or studies that addressed risk factors or interventions to delay long-term NHP for individuals with PTSD and/or TBI. Perhaps this is because few individuals are at substantial risk of long-term NHP, although many require family support for mental health symptoms and mild cognitive impairment. However, questions regarding risk for long-term NHP should be examined in future studies.

Eligible reviews also found little evidence examining systems or environmental factors, such as local availability of HCBS, or appropriate and affordable housing. In part, this may be due to the selection criteria of eligible reviews examining risk factors, which often required longitudinal follow-up and excluded cross-sectional studies. As noted above, systems and environmental factors may be very important and limit the ability of individual interventions to address long-term NHP. Additionally, reviews did not identify evidence regarding certain personal and social factors, such as attitudes and preferences for setting of care. Some adults with impairments (and their caregivers) may have more positive attitudes toward institutional care and some preferences may change over time.<sup>11,230</sup>

As noted above, eligible reviews on interventions to prevent or delay long-term NHP reported difficulties with evaluation of complex interventions that often differed along multiple dimensions, including in type and number of components, settings, and frequency and modality of participant contacts. Combined with heterogeneity in participant characteristics and settings for studies, this intervention complexity and variability created substantial challenges in understanding effects on long-term NHP. As complex interventions may be the most plausible way to enhance healthcare delivery and improve outcomes for various groups with complex needs, it is imperative that we consider methodologies to improve design and evaluation of such interventions. For example, the multiphase optimization strategy (MOST) can be employed to guide selection of intervention components that may work better for certain groups or in certain settings.<sup>231</sup> Frameworks also exist for pragmatic trials and explicit consideration of implementation outcomes, along with effects on participant health and functioning (*eg*, stepped wedge and hybrid designs).<sup>232,233</sup> One important benefit of applying an implementation science

framework is the clarification between the “core” set of important components and an “adaptable periphery” of elements that can be adjusted to accommodate the local context for implementation<sup>234</sup>; this acknowledgment is key for considering intervention fidelity, interpreting effectiveness results, and enabling future implementation.

Therefore, we recommend the following for future research:

- Longitudinal observational studies examining whether individuals with PTSD and/or TBI are at substantial risk of long-term NHP
- Longitudinal studies on effect of factors such as attitudes and preferences for setting of care, and systems and environmental factors, including local availability of HCBS, on long-term NHP
- Randomized evaluations of complex interventions that compare models of care which differ in only 1-2 key components or characteristics (*eg*, similar types of services at home vs in clinic)
- Randomized evaluations of interventions with longer follow-up (likely > 2 years) and larger sample size, particularly if targeting individuals at lower overall risk of long-term NHP
- Consider using strategies to optimize selection of intervention components and evaluation designs that explicitly consider implementation outcomes in future studies of complex interventions to address long-term NHP

## LIMITATIONS

To address the priorities of our VA partners, this work focused on long-term NHP, and reviews that did not address long-term NHP were excluded. Although we also abstracted results for other outcomes (*eg*, mortality and hospitalizations for adults with impairments), we only examined prioritized reviews that evaluated long-term NHP. We excluded reviews that only addressed caregiver outcomes. Therefore, our findings do not indicate that interventions are not effective for other important outcomes for adults with impairments or their caregivers. We prioritized highest quality and more recent reviews to provide associations and effects for specific risk factors and interventions. We relied on review authors’ descriptions of interventions, quality ratings for included studies, and determination of overall strength of evidence. We examined included primary studies from only prioritized reviews, and our focus was primarily to provide an indication of the size of the underlying evidence base (*ie*, by counting the number of unique studies addressing different interventions and confirming ascertainment of long-term NHP in these studies). Most eligible reviews did not specify how they determined whether included studies addressed long-term NHP. In our examination of primary studies included in prioritized reviews, we found that most studies used participant or family reports of long-term NHP and few confirmed long-term NHP with additional data sources, such as state or federal administrative data on utilization of long-term care services. Examination of the primary studies also showed that few were conducted in the VA (a notable exception being research on HBPC, although these studies did not examine long-term NHP); however, evidence for the general population may be applicable to Veterans, given the likelihood of some shared risk factors that contribute to long-

term NHP, as well as VA's use of non-VA service providers for many Veterans with impairments. It may be that interventions in countries other than the US may be less relevant for Veterans and the VA, but we elected to include this evidence, as it may help inform future policy changes. Despite these limitations, our review provides important information about a wide range of risk factors and interventions to delay long-term NHP.

## CONCLUSION

Existing evidence on a wide range of risk factors and interventions for older adults demonstrated the complexity of contributors to long-term NHP and the difficulty of preventing or delaying this outcome. There was a lack of evidence evaluating certain risk factors, especially at the level of systems and environment. Very limited evidence suggested that high-intensity models of case management, caregiver support, and home visits may delay long-term NHP. Although there are a variety of VA programs and services that seek to help Veterans with impairments, many likely do not involve similar levels of participant contact and dedicated coordination of care and services over years, compared with those interventions that were able to change long-term NHP. Policymakers should consider evaluating cost-effectiveness of current and future VA programs in terms of improved patient and family-centered outcomes, and not solely as seeking to avoid costs of long-term NHP.

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## APPENDIX 1. SEARCH STRATEGIES

### OID MEDLINE SEARCH FOR SYSTEMATIC REVIEWS

1	(meta-analy\$ or metaanaly\$ or meta analy\$).tw. or exp Meta-Analysis/ or (systematic adj (review\$ or overview\$)).tw. or (systematic review or literature review or rapid review or umbrella review or meta synthesis or metasyntesis or meta-analysis or meta-synthesis or integrative review or data synthesis or comparative effectiveness review).mp.
2	(case report or case series).tw.
3	1 not 2
4	((nursing home\$ or care home\$ or long-term care or institution\$ or facility) adj5 (place\$ or entry or admit\$ or admission\$)) or institutionalization).tw. or exp Homes for the Aged/ or Nursing Homes/ or Long-Term Care/
5	3 and 4
6	aged.mp. or exp AGED/ or (elder\$ or old age or ag?ing or advanced age or aged-related or late\$ life or senior\$ or geriatr\$ or retired or frail elder\$).tw. or ((old or older) adj (adult\$ or people or person\$ or male\$ or female\$ or m?n or wom?n or population\$ or citizen\$)).tw. or exp dementia/ or (dementia or Alzheimer\$ or lewy body or pick\$ disease or (frontotemporal adj2 degeneration) or (vascular adj2 dementia)).tw. or ((memory adj2 (problem\$ or disorder\$)) or cognition or cognitive disorders).tw.
7	(TBI or mTBI or traumatic brain injur\$).tw. or exp Brain Injuries, Traumatic/ or exp Stress Disorders, Traumatic/ or ((post-traumatic or posttraumatic or post traumatic) adj2 stress) or PTSD).tw.
8	(Disabled or disabilit\$ or impair\$ or function\$).tw.
9	(6 or 7) and 8
10	exp Health Services for the Aged/ or exp Community Health Services/ or exp Community Health Workers/ or exp Home Care Services/ or Home Health Aides/
11	exp Geriatric Assessment/ or (geriatric\$ adj5 assess\$).tw.
12	exp House Calls/ or (house adj5 call\$).tw. or (home adj5 (intervention\$ or visit\$ or assessment\$ or service\$ or therapy or healthcare or health care or primary care or aides or nurs\$ or visit\$)).tw. or home-based.tw. or health visitor\$.tw.
13	exp Occupational Therapy/ or (occupation\$ adj5 therap\$).tw.
14	exp Physical Therapy Specialty/ or (phys\$ adj5 therap\$).tw.
15	exp Social Support/ or (social adj5 (support or intervention)).tw. or (psychosocial adj5 care).tw. or exp Social Isolation/ or exp Social Facilitation/
16	exp Social Work/ or (social adj5 (program\$ or work\$)).tw.
17	((physical\$ adj5 (exercise or fitness or activit\$)) or (exercise adj5 (program\$ or behavi\$))).tw. or exp Exercise Therapy/ or exp Physical Fitness/ or exp WALKING/ or exp exercise movement techniques/ or tai chi.tw.
18	exp Caregivers/ or exp FAMILY/ or exp FAMILY NURSING/ or (caregiver\$ or carer\$ or care giver\$ or informal care\$ or (family adj2 (care\$ or therapy))).tw.
19	exp Home Nursing/ or exp Night Care/ or (night\$ adj2 care).tw. or exp Respite Care/ or (respite or day care or day clinic\$).tw. or exp Day Care, Medical/
20	exp Food Services/ or ((meals adj2 wheels) or congregant dining or grocery delivery).tw.
21	exp Foster Home Care/ or medical foster home\$.tw.
22	exp Assisted Living Facilities/ or Group Homes/ or assisted living.tw.
23	((cash and counseling) or self-directed or consumer-directed).tw.
24	(transport\$ or mobiliz\$).tw.

25	or/10-24
26	3 and 9 and 25
25	5 or 26
26	Limit to English

## OID EMBASE SEARCH FOR SYSTEMATIC REVIEWS

1	(meta-analy\$ or metaanaly\$ or meta analy\$).tw. or exp Meta-Analysis/ or (systematic adj (review\$ or overview\$)).tw. or (systematic review or literature review or rapid review or umbrella review or meta synthesis or metasynthesis or meta-analysis or meta-synthesis or integrative review or data synthesis or comparative effectiveness review).tw.
2	(case report or case series or case study).mp.
3	1 not 2
4	((nursing home\$ or care home\$ or long-term care or institution\$ or facility) adj5 (place\$ or entry or admit\$ or admission\$)) or institutionalization).tw. or exp Home for the Aged/ or Nursing Home/
5	3 and 4
6	(elder\$ or old age or ag?ing or advanced age or aged-related or late\$ life or senior\$ or geriatr\$ or retired or frail elder\$).tw. or ((old or older) adj (adult\$ or people or person\$ or male\$ or female\$ or m?n or wom?n or population\$ or citizen\$)).tw. or exp dementia/ or (dementia or Alzheimer\$ or lewy body or pick\$ disease or (frontotemporal adj2 degeneration) or (vascular adj2 dementia)).tw. or ((memory adj2 (problem\$ or disorder\$)) or cognition or cognitive disorders).tw.
7	(TBI or mTBI or traumatic brain injur\$).tw. or exp Brain Injuries, Traumatic/ or exp Stress Disorders, Traumatic/ or (((post-traumatic or posttraumatic or post traumatic) adj2 stress) or PTSD).tw.
8	(Disabled or disabilit\$ or impair\$ or function\$).tw.
9	(6 or 7) and 8
10	exp Geriatric Assessment/ or (geriatric\$ adj5 assess\$).tw. or exp Health Services for the Aged/ or exp Community Health Services/ or exp Community Health Workers/
11	exp home visit/ or exp home care/ or (house adj5 call\$).tw. or (home adj5 (intervention\$ or visit\$ or assessment\$ or service\$ or therapy or healthcare or health care or primary care or aides or nurs\$ or visit\$)).tw. or home-based.tw. or health visitor\$.tw.
12	exp Occupational Therapy/ or (occupation\$ adj5 therap\$).tw. or exp Physical Therapy/ or (phys\$ adj5 therap\$).tw.
13	exp Social Support/ or (social adj5 (support or intervention)).tw. or (psychosocial adj5 care).tw. or exp Social Isolation/ or exp Social Work/ or (social adj5 (program\$ or work\$)).tw.
14	((physical\$ adj5 (exercise or fitness or activit\$)) or (exercise adj5 (program\$ or behavi\$))).tw. or exp kinesiotherapy/ or exp Fitness/ or exp WALKING/ or tai chi.tw.
15	exp Caregiver/ or exp FAMILY NURSING/ or (caregiver\$ or carer\$ or care giver\$ or informal care\$ or (family adj2 (care\$ or therapy))).tw. or (night\$ adj2 care).tw.
16	exp Respite Care/ or exp Day Care/ or (respite or day care or day clinic\$).tw.
17	exp catering service/ or ((meals adj2 wheels) or congregant dining or grocery delivery).tw.
18	medical foster home\$.tw. or exp Assisted Living Facilities/ or assisted living.tw. or exp residential home/
19	((cash and counseling) or self-directed or consumer-directed).tw.
20	(transport\$ or mobili\$).tw.
21	or/10-20

22	3 and 9 and 21
23	5 or 22
24	Limit 23 to English language

## PSYCINFO SEARCH FOR SYSTEMATIC REVIEWS

1	(meta-analy\$ or metaanaly\$ or meta analy\$).tw. or exp Meta-Analysis/ or (systematic adj (review\$ or overview\$)).tw. or (literature review or rapid review or umbrella review or meta synthesis or metasynthesis or meta-synthesis or integrative review or data synthesis or comparative effectiveness review).mp.
2	((nursing home\$ or care home\$ or long-term care or institution\$ or facility) adj5 (institutionalization or place\$ or entry or admit\$ or admission\$) or institutionalization).tw. or Nursing Homes/ or Long-Term Care/
3	1 and 2
4	(TBI or mTBI or traumatic brain injur\$).tw. or exp Traumatic Brain Injury/ or exp Posttraumatic Stress Disorder/ or (((post-traumatic or posttraumatic or post traumatic) adj2 stress) or PTSD).tw.
5	(Disabled or disabilit\$ or impair\$ or function\$).tw.
6	1 and 4 and 5
7	2 and 6
8	exp Elder Care/ or exp Community Services/ or exp Home Care/ or exp Home Care Personnel/ or (community health service\$ or community health worker\$ or home care service\$ or home health aide\$).tw.
9	exp Home Visiting Programs/ or (house adj5 call\$).tw. or (home adj5 (intervention\$ or visit\$ or assessment\$ or service\$ or therapy or healthcare or health care or primary care or aides or nurs\$ or visit\$)).tw. or home-based.tw. or health visitor\$.tw.
10	exp Occupational Therapy/ or (occupation\$ adj5 therap\$).tw.
11	exp Social Support/ or (social adj5 (support or intervention)).tw. or (psychosocial adj5 care).tw. or exp Social Isolation/ or exp Social Facilitation/
12	exp Social Casework/ or (social adj5 (program\$ or work\$)).tw.
13	((physical\$ adj5 (exercise or fitness or activit\$) or (exercise adj5 (therap\$ or program\$ or behavi\$))).tw. or exp Physical Activity/ or exp Exercise/ or exp Physical Fitness/ or exp WALKING/ or tai chi.tw.
14	exp Caregivers/ or exp FAMILY/ or (caregiver\$ or carer\$ or care giver\$ or informal care\$ or (family adj2 (nurs\$ or care\$ or therapy))).tw.
15	((home adj2 nursing) or (night\$ adj2 care)).tw. or exp Respite Care/ or (respite or day care or day clinic\$).tw. or exp Adult Day Care/ or exp Day Care Centers/
16	(food service\$ or (meals adj2 wheels) or congregant dining or grocery delivery).tw.
17	exp Assisted Living/ or exp Group Homes/ or exp Independent Living Programs/ or assisted living.tw.
18	((foster adj2 care) or medical foster home).tw.
19	((cash and counseling) or self-directed or consumer-directed).tw.
20	(transport\$ or mobili\$).tw.
21	exp Geriatric Assessment/ or (geriatric\$ adj5 assess\$).tw.
22	exp Physical Therapy/ or (phys\$ adj5 therap\$).tw.
23	or/8-22
24	aged.mp. or exp Aging/ or exp Geriatric Patients/ or (elder\$ or old age or ag?ing or advanced age or aged-related or late\$ life senior\$ or geriatr\$ or retired or frail elder\$).tw. or ((old or

	older) adj (adult\$ or people or person\$ or male\$ or female\$ or m?n or wom?n or population\$ or citizen\$).tw. or exp dementia/ or exp Alzheimer's Disease/ or (dementia or Alzheimer\$ or lewy body or pick\$ disease or (frontotemporal adj2 degeneration) or (vascular adj2 dementia).tw. or exp Memory Disorders/ or exp Cognitive Impairment/ or ((memory adj2 (problem\$ or disorder\$) or cognition or cognitive disorders).tw.
25	6 and 23
26	1 and 5 and 23 and 24
27	2 and 26
28	1 and (2 or ((4 or 24) and 5 and 23))
29	limit 28 to english language

## SOCIOLOGICAL ABSTRACTS SEARCH FOR SYSTEMATIC REVIEWS

S2	noft(meta-analy* OR metaanaly* OR meta analy*) OR MAINSUBJECT.EXACT.EXPLODE("Literature Reviews") OR noft((systematic review* OR systematic overview* OR literature review OR rapid review OR umbrella review OR meta synthesis OR metasynthesis OR meta-synthesis OR integrative review OR data synthesis OR comparative effectiveness review))
S3	MAINSUBJECT.EXACT("Nursing Homes") OR MAINSUBJECT.EXACT("Long Term Care") OR noft(nursing home place* or nursing home entry or nursing home admit* or nursing home admission* or care home place* or care home entry or care home admit* or care home admission* or long?term care place* or long?term care entry or long?term care admit* or long?term care admission* or facility place* or facility entry or facility admit* or facility admission* or institutionalization )
S4	S2 AND S3
S5	noft(TBI or mTBI or traumatic brain injur* or post-traumatic stress or posttraumatic stress or post traumatic stress or PTSD)
S6	noft(disabled or disabilit\$ or impair\$ or function*)
S7	S2 and S5 and S6
S8	S3 and S7
S10	Exact("home health care" OR "health care services") OR noft(community health service* or community health worker* or home health aid*)
S11	noft(house call* or home intervention* or home visit* or home assessment* or home service* or home therapy or home healthcare or home health care or home primary care or home aid* or home nurse* or home visit* or home-based or health visitor*)
S12	noft(occupation* NEAR/5 therap*)
S13	noft(social support or social intervention* or psychosocial care or social isolation or social facilitation) OR Exact("social support" OR "social services" or "social welfare")
S14	Exact("social work") OR noft(social program* or social work*)
S16	Exact("physical fitness") OR noft(physical* exercise OR physical* fit* OR physical* activit* OR exercise program* OR exercise behavi* OR exercise therapy OR walking OR exercise movement OR tai chi)
S17	Exact("caregivers") OR (family or caregiver* or carer* or care giver* or informal care* or family care* or family therapy or family nursing)
S18	Exact("home care" OR "respite care" OR "adult care services") OR noft(home nursing or night* care or respite or day care or day clinic*)

S19	noft(food service* or meals NEAR/2 wheels or congregant dining or grocery delivery)
S20	Exact("foster home care") OR noft(medical foster home*)
S21	Exact("group homes" OR "assisted living" OR "assisted living facilities") OR noft(assisted living)
S22	Exact("group homes" OR "coresidence" OR "assisted living" OR "assisted living facilities") OR noft(assisted living)
S23	noft("cash and counseling" or self-directed or consumer-directed)
S24	noft(transport* or mobili*)
S25	Exact("geriatric assessment") OR noft(geriatric* NEAR/5 assess*)
S26	noft(phys* NEAR/5 therap*)
S28	S10 OR S11 OR S12 OR S13 OR S14 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26
S29	Exact("geriatric/geriatrics (see also aging, aged)" OR "alzheimer's disease" OR "dementia disorders" OR "aged (see also aging, geriatric)" OR "dementia, vascular" OR "alzheimers disease" OR "dementia" OR "aging (see also aged, geriatric)") OR noft(aged or elder* or old age* or ag?ing or advanced age or aged-related or late* life or senior* or geriatr* or retired or frail elder*) OR noft(old* NEAR/2 adult* or people or person* or male* or female* or m?n or wom?n or population* or citizen*) OR noft(dementia or Alzheimer* or lewy body or pick* disease or frontotemporal degeneration or vascular dementia or memory problem* or memory disorder* or cognition or cognitive disorder*)
S30	S7 AND S28
S31	S2 AND S6 AND S28 AND S29
S32	S31 AND S3
S33	S2 AND (S3 OR ((S5 OR S29) AND S6 and S28))

## SEARCHES OF COCHRANE DATABASE OF SYSTEMATIC REVIEWS, JOANNA BRIGGS INSTITUTE (JBI) EVIDENCE-BASED PRACTICE DATABASE, VA EVIDENCE SYNTHESIS PROGRAM (ESP), AND AHRQ EVIDENCE-BASED PRACTICE CENTER (EPC)

Target Interventions	Search Terms (keywords in title/abstract)
Home-based primary care, outpatient geriatric assessment and case management	Home-based primary care Geriatric Assessment Home visits House calls Case management older adults Case management PTSD Case management TBI
Outpatient or home-based rehabilitation, nursing services, or other medical care	Home nursing Home physical therapy Home occupational therapy
Physical activity or exercise (not as part of rehabilitation program)	Physical activity program older adults Physical activity program PTSD Physical activity program TBI Exercise program older adults Exercise program PTSD

	Exercise program TBI
In-home assistance with non-healthcare activities (home aides, home repair, etc.)	Home health aide Home repair
Caregiver interventions	Caregiver (Edited to "caregiver adj3 intervention" in JBI)
Respite care	Respite care (Edited to "respite adj2 care" in JBI)
Community health workers, friendly visits	Friendly visit/visitor
Nutritional programs (Meals on Wheels, congregant dining, grocery delivery, etc.)	Meals on Wheels Congregant dining Grocery delivery
Transportation and mobility services	Transportation Mobility services
Assistive technologies	Assistive technology (“home” and “community” added to search in Cochrane)
Alternative housing with range of services (assisted living or group homes, medical foster homes, etc.)	Assisted living Group home Medical foster home
Financial support and benefits (caregiver stipends, Cash and Counseling, etc.)	Caregiver benefits Caregiver stipends Cash and Counseling

## OID MEDLINE FOR PRIMARY STUDIES ON TBI/PTSD POPULATION

1	((nursing home\$ or care home\$ or long-term care or institution\$ or facility) adj5 (place\$ or entry or admit\$ or admission\$) or institutionalization).tw. or exp Homes for the Aged/ or Nursing Homes/ or Long-Term Care/
2	(TBI or mTBI or traumatic brain injur\$.tw. or exp Brain Injuries, Traumatic/ or exp Stress Disorders, Traumatic/ or (((post-traumatic or posttraumatic or post traumatic) adj2 stress) or PTSD).tw.
3	1 and 2
4	limit 3 to "all child (0 to 18 years)"
5	3 not 4
6	limit 5 to english language

## APPENDIX 2. STUDY SELECTION CRITERIA

	Inclusion	Exclusion
<b>Participants</b>	Adults with physical or cognitive impairment (or at high risk for developing new impairments) due to: older age, frailty, dementia, other chronic conditions, PTSD, and/or TBI	Adults dependent on medical technology (eg, ventilator); adults with no impairments and having little or very remote risk for new impairments
<b>Interventions</b>	Home-based primary care, outpatient geriatric assessment and case management Outpatient or home-based rehabilitation, nursing services, or other medical care Physical activity or exercise (not as part of rehabilitation program) In-home assistance with non-healthcare activities (home aides, home repair, etc) Caregiver interventions Respite care Adult day clinics Community health workers, friendly visits Nutritional programs (Meals on Wheels, congregant dining, grocery delivery, etc) Transportation and mobility services Assistive technologies Alternative housing with range of services (assisted living or group homes, medical foster homes, etc) Financial support and benefits (eg, caregiver stipends, Cash and Counseling)	Hospice and end-of-life care Condition-specific medications (eg, donepezil for dementia)
<b>Comparators</b>	Any (active or inactive)	
<b>Outcomes</b>	Primary: Long-term nursing home placement, (must specify as long-term or otherwise use term that indicates long-term placement eg, institutionalization) Secondary: Function, quality of life Hospitalizations Resource use, costs, spend-down Mortality Harms (falls, medication errors)	Short-term admission to nursing homes for post-acute care Caregiver outcomes without patient outcomes
<b>Timing</b>	Any duration	
<b>Setting</b>	Community	Acute care settings (ie, emergency rooms and inpatient wards) Institutional settings (eg, skilled nursing facilities for rehabilitation)
<b>Design</b>	Systematic review: must have search strategy, eligibility criteria, and analysis/synthesis plan; may include randomized controlled trials, observational studies, and/or qualitative studies	
<b>Other</b>	English Language	

## APPENDIX 3. QUALITY ASSESSMENT

### 3.1 QUALITY ASSESSMENT CRITERIA (MODIFIED AMSTAR 2<sup>15</sup>)

1. Total number of eligible articles included in review:

2. Types of studies included in review (check all that apply):

RCTs  Cross-sectional  Cohort  Systematic Reviews

3. Location (check all that apply):

United States  Canada  Europe  Asia  Australia  
 Other (please specify)  Not Reported

4. Did the research questions and inclusion criteria for the review include the components of PICO?

Must have population, Intervention, comparator group and outcome.

5. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify and signification deviations from the protocol?

Partial Yes=ALL of the following: review questions, search strategy, inclusion/exclusion criteria, risk of bias assessment

Yes=ALL of partial yes plus: protocol registered, a meta-analysis/synthesis plan (if appropriate) and a plan for investigating causes of heterogeneity, justification for any deviations from the protocol

6. Did the review authors explain their selection of the study designs for inclusion in the review?

Example: explanation for including RCTs only

7. Did the review authors use a comprehensive literature search strategy?

Partial Yes: must have searched at least 2 databases (relevant to research question), provided key word and/or search strategy, justified publication restrictions (eg, dates)

Yes=ALL of the above plus searched reference lists/bibliographies, searched trial/study registries, included/consulted content experts in the field, searched for grey literature where relevant, conducted search within 24 months of completion of the review

## 8. Did the review authors perform study selection in duplicate?

(at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include)

## 9. Did the review authors perform data extraction in duplicate?

(at least two reviewers achieved consensus on which data to extract)

## 10. Did the review authors use a satisfactory technique for assessing the quality of individual studies that were included in the review?

Partial Yes: must have described element of quality

Yes: must have also used standard quality or risk of bias tools

## 11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

(the authors justified combining the data in a meta-analysis and considered heterogeneity)


## 12. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?

(performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias)


## 13. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?

(the authors reported no competing interests OR they described their funding sources and how they managed potential conflicts of interest)

Taking into account your previous answers, please rate quality as:

### 3.2 QUALITY ASSESSMENT FOR ALL ELIGIBLE SYSTEMATIC REVIEWS

Author, Year	Research Questions include components of PICO?	Protocol established prior to conduct of review?	Explained selection of included study designs?	Comprehensive search strategy used?	Dual review for inclusion? Dual review for data extraction?	Assessed quality?	Meta analyses: Appropriate statistical methods and investigation of publication bias?	Reported any potential conflicts of interest?	Overall Quality
Apostolo, 2017 <sup>16</sup>	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	High
Beswick, 2010 <sup>36</sup>	Yes	No	Yes	Yes	No Yes	Partial Yes	Yes	Yes	Medium
Black, 2004 <sup>20</sup>	Yes	No	No	Yes	No	No	No	No	Low
Bottcher, 2015 <sup>37</sup>	Yes	No	Yes	Yes	Yes No	Yes	NA	No	Medium
Brown, 2015 <sup>54</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Burridge, 2007 <sup>21</sup>	No	No	No	Yes	No	Yes	NA	No	Medium
Cepoiu-Martin, 2016 <sup>22</sup>	Yes	Partial Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Cochrane, 2016 <sup>38</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Dickinson, 2017 <sup>44</sup>	Yes	No	No	Yes	Yes	Yes	NA	Yes	Medium
Du Preez, 2018 <sup>55</sup>	No	No	No	No	No	Yes	NA	Yes	Low
Elkan, 2001 <sup>63</sup>	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Medium
Ellen, 2017 <sup>56</sup>	Yes	No	No	Partial Yes	No	No	NA	No	Medium
Fields, 2014 <sup>57</sup>	No	No	Yes	Yes	No	No	NA	Yes	Low
Flint, 1995 <sup>58</sup>	Yes	No	No	Yes	No	Yes	NA	No	Low
Forbes, 2014 <sup>75</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Frazier, 2005 <sup>23</sup>	No	No	No	Yes	No	No	NA	No	Low
Frost, 2017 <sup>71</sup>	Yes	Yes	Yes	Yes	Yes No	Yes	Yes	Yes	Medium

Author, Year	Research Questions include components of PICO?	Protocol established prior to conduct of review?	Explained selection of included study designs?	Comprehensive search strategy used?	Dual review for inclusion? Dual review for data extraction?	Assessed quality?	Meta analyses: Appropriate statistical methods and investigation of publication bias?	Reported any potential conflicts of interest?	Overall Quality
Gawel, 2012 <sup>24</sup>	Yes	No	Yes	Yes	Yes No	Yes	NA	No	Medium
Gilhooly, 2016 <sup>81</sup>	Yes	No	Yes	Yes	Yes No	Yes	NA	Yes	Medium
Gine-Garriga, 2018 <sup>72</sup>	Yes	No	Yes	Yes	Yes	Yes	Yes No	Yes	Medium
Goy, 2010 <sup>52</sup>	Yes	Yes	Yes	Yes	No	Yes	NA	Yes	Medium
Griffin, 2015 <sup>45</sup>	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	High
Guirguis-Blake, 2018 <sup>73</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Hedrick, 1989 <sup>76</sup>	Yes	No	No	Yes	No	No	No	No	Low
Hickam, 2013 <sup>83</sup>	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	High
Jensen, 2015 <sup>46</sup>	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Medium
Johri, 2003 <sup>82</sup>	Yes	No	Yes	Yes	No	No	NA	No	Low
Kojima, 2018 <sup>17</sup>	Yes	No	Yes	Partial Yes	No	Yes	No Yes	Yes	Low
Lee, 2014 <sup>59</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Lehmann, 2018 <sup>25</sup>	Yes	No	No	Yes	Yes No	Yes	Yes No	Yes	Medium
Luppa, 2008 <sup>26</sup>	Yes	No	Yes	Yes	No	No	NA	No	Low
Luppa, 2009 <sup>28</sup>	Yes	No	Yes	Yes	No	No	NA	Yes	Low
Luppa, 2010 <sup>27</sup>	Yes	No	Yes	Yes	No	Partial Yes	NA	Yes	Medium
Markle-Reid, 2006 <sup>64</sup>	Yes	No	Yes	Yes	No	Yes	NA	Yes	Low
Mason, 2007 <sup>60</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes No	Yes	High

Author, Year	Research Questions include components of PICO?	Protocol established prior to conduct of review?	Explained selection of included study designs?	Comprehensive search strategy used?	Dual review for inclusion? Dual review for data extraction?	Assessed quality?	Meta analyses: Appropriate statistical methods and investigation of publication bias?	Reported any potential conflicts of interest?	Overall Quality
Mayo-Wilson, 2014 <sup>65</sup>	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	High
Montgomery, 2008 <sup>77</sup>	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	High
O'Caoimh, 2015 <sup>29</sup>	Yes	No	No	Yes	Yes	Yes	NA	Yes	Medium
Olazaran, 2010 <sup>78</sup>	Yes	No	Yes	Yes	Yes No	Partial Yes	Yes No	Yes	Medium
Palmer, 2014 <sup>30</sup>	Yes	No	Yes	Partial Yes	Yes	No	NA	No	Low
Pamoukdjian, 2015 <sup>31</sup>	Yes	No	No	No	No	No	NA	Yes	Low
Parker, 2008 <sup>53</sup>	Yes	No	Yes	Yes	Yes No	Yes	Yes No	No	Low
Pimouguet, 2010 <sup>39</sup>	Yes	No	Yes	Yes	No	Partial Yes	NA	No	Low
Pinquart, 2006 <sup>47</sup>	Yes	No	Yes	Partial Yes	Yes No	Yes	Yes No	Yes	Medium
Ploeg, 2005 <sup>66</sup>	Yes	No	Yes	Yes	Yes	Yes	Yes No	Yes	Medium
Reilly, 2015 <sup>40</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Rydwick, 2012 <sup>32</sup>	Yes	No	No	Partial Yes	No Yes	Partial Yes	NA	Yes	Medium
Shaw, 2009 <sup>61</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Smits, 2007 <sup>48</sup>	No	No	No	Partial Yes	Yes No	Yes	NA	No	Low
Snowden, 2017 <sup>33</sup>	Yes	No	No	Partial Yes	No	Partial Yes	NA	Yes	Medium
Spijker, 2008 <sup>79</sup>	Yes	No	Yes	Yes	Yes No	Yes	Yes No	Yes	Medium

Author, Year	Research Questions include components of PICO?	Protocol established prior to conduct of review?	Explained selection of included study designs?	Comprehensive search strategy used?	Dual review for inclusion? Dual review for data extraction?	Assessed quality?	Meta analyses: Appropriate statistical methods and investigation of publication bias?	Reported any potential conflicts of interest?	Overall Quality
Stall, 2014 <sup>69</sup>	Yes	No	No	Yes	Yes No	Yes	NA	Yes	Medium
Sternberg, 2011 <sup>18</sup>	Yes	Partial Yes	No	Yes	Yes	Partial Yes	NA	Yes	High
Steultjens, 2004 <sup>74</sup>	Yes	No	Yes	Partial Yes	Yes	Partial Yes	NA	No	Medium
Stuck, 2002 <sup>67</sup>	Yes	No	Yes	Yes	Yes	Partial Yes	Yes	Yes	Medium
Suchowersky, 2007 <sup>34</sup>	Yes	No	No	Yes	No	No	NA	Yes	Low
Tam-Tham, 2013 <sup>41</sup>	Yes	Partial Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
Torti, 2004 <sup>35</sup>	No	No	No	No	No	No	NA	No	Low
Totten, 2016 <sup>70</sup>	Yes	Yes	Yes	Yes	Yes	Partial Yes	NA	Yes	High
Van der Roest, 2017 <sup>80</sup>	Yes	Yes	Yes	Yes	Yes No	No	NA	Yes	High
van Haastregt, 2000 <sup>68</sup>	Yes	No	No	Yes	Yes	Yes	NA	Yes	Medium
Vandepitte, 2015 <sup>49</sup>	Yes	No	Yes	Partial Yes	No	Yes	NA	Yes	Low
Vandepitte, 2016 <sup>62</sup>	Yes	No	Yes	Yes	Yes No	Yes	NA	Yes	Medium
Van't Leven, 2013 <sup>50</sup>	Yes	No	No	Yes	Yes No	Yes	NA	Yes	Medium
Vermeiren, 2016 <sup>19</sup>	Yes	Yes	Yes	Partial Yes	Yes	Yes	Yes No	No	Medium
Vernooij-Dassen, 2011 <sup>51</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	High
You, 2013 <sup>42</sup>	Yes	No	Yes	Yes	No	Yes	NA	Yes	Medium

## APPENDIX 4. PEER REVIEW COMMENTS/AUTHOR RESPONSES

Question Text	Reviewer Number	Comment	Author Response
Are the objectives, scope, and methods for this review clearly described?	1	Yes	Thank you.
	3	Yes	
	6	Yes	
	7	Yes	
	9	Yes	
	10	Yes	
Is there any indication of bias in our synthesis of the evidence?	1	No	Thank you. We agree with reviewer’s concerns regarding challenges in evaluating and summarizing interventions that are applied to different populations and/or settings. This is particularly true for complex interventions, which often additionally vary in their components. However, we disagree that this necessarily lead to bias in findings of systematic reviews. We have focused on a set of prioritized, mostly high-quality eligible systematic reviews, in order to provide the findings from reviews which use more rigorous review methods (including careful consideration of bias and the impact of different synthesis approaches).
	3	Yes - Please see comment about heterogeneity of populations, interventions, and environments. Systematic reviews dilute this heterogeneity	
	6	No	
	7	No	
	9	No	
	10	No	
Are there any <u>published</u> or <u>unpublished</u> studies that we may have overlooked?	1	No	Thank you.
	3	No	
	6	No	
	7	No	
	9	No	
	10	Yes - Recent studies on Social Determinants of Health	We focused our search and eligibility criteria on potentially modifiable risk factors and interventions to delay or prevent long-term nursing home placement. Social determinants would have been eligible as risk factors, although some social determinants (eg, educational status) may not be

			<p>alterable at the time that adults develop impairments. Social determinants that were not potentially modifiable were considered as not addressing KQ 1 on modifiable risk factors. Social determinants could also have been included as participant (or caregiver) characteristics that impacted intervention effectiveness (KQ 3), but we did not identify findings about the impact of social determinants on intervention effects.</p>
<p>Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.</p>	<p>1</p>	<p>Excellent recommendations.</p> <p>Minor edits: Pg 14. AMSTAR2 ratings in appendix 5 (not appendix 3) pg. 31 - 2nd policy recommendation has an extra word</p>	<p>Thank you.</p> <p>We have re-organized Appendices 3 and 5 and grouped together the AMSTAR 2 criteria and ratings for individual eligible reviews. We have also examined and revised the policy recommendations for clarity and wording.</p>
	<p>3</p>	<p>The ESP systematic review of systematic reviews of home and community based services has strong rigor including a comprehensive search, evaluation of the underlying systematic reviews, grading of the strength of evidence, and identifying the number of RCTs and studies within the systematic review. From this limited evidence base, there are strong conclusions drawn which could be misinterpreted.</p> <p>Major concerns:</p> <p>1. The conclusions of the report are often broad and cutting. However, the evidence is under developed in most cases, making such broad statements as harmful as describing benefit. Examples include: Page 6 paragraph 2: "It is unclear that any existing intervention can change NHP for adults with impairments who have no informal care support" Page 7 Point 4: "As most interventions fail to prevent or delay NHP..."</p> <p>2. These comments are particularly distressing in the context of the ESP reviews findings that the complexity of factors in both the environments, functional needs, and nuances of the interventions. As a result, the authors should tone down the definitiveness of the</p>	<p>Thank you.</p> <p>1. We appreciate reviewer's concerns about the conclusions, and have reworded these statements in the Discussion</p> <p>2. We have removed the phrase "As most interventions fail..."</p>

	<p>statements</p> <p>3. Page 15: Why was the focus on dementia, TBI and PTSD when other VA conditions that could be associated with NHP are not included (Stroke, SCI, or ALS)?</p> <p>4. At times, the authors seem to appreciate the complexity of the risk factors, interventions, and social environment (Page 5 last line), but this appreciation seems reduced when this complexity is discounted in the analysis. If the reviews are comparing diverse populations, programs, and a environments, how effective are the reviews?</p>	<p>3. We undertook additional searches to identify evidence for adults with TBI and PTSD because of particular interest expressed by VA operations partners in risk factors and interventions for these groups. This is likely due to the higher prevalence of these conditions among Veterans (from more recent eras of service) who need substantial help from informal caregivers. We have further clarified the rationale for focusing on TBI and PTSD for additional searches, and our selection criteria, in Methods. While we did not undertake specific searches for the other conditions noted by the reviewer, eligible systematic reviews could have included or focused on these groups. Indeed, some of the eligible reviews included studies on interventions for adults who had suffered strokes, among other serious medical conditions.</p> <p>4. We appreciate and agree with reviewer’s comments about the challenges of conducting and evaluating complex interventions. Despite these challenges, synthesis of evidence for complex interventions is often high priority for healthcare systems, as such interventions may be the only plausible solution to enhance healthcare delivery and improve outcomes for populations with high needs. We note that the VA ESP, along with other evidence review groups such as the AHRQ Evidence-based Practice Centers, are frequently called upon to review and synthesize evidence for complex interventions. We hope that advances in evaluation of complex interventions will continue to enhance our ability to understand their value and applicability to different groups.</p> <p>5. Symbols are defined in the footnotes of the tables. We have not found the “two plus signs” and have carefully reviewed the tables for</p>
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	<p>5. For the tables of results, the choice of symbols for directionality is confusing and not well labeled. For example, two plus signs and a down arrow represent? (i.e. interpretation could range from really significant - except when it wasn't – to strong numerator and low denominator). As these figures are critical to dissemination efforts, clarity is critical</p> <p>6. Can the authors explain why the findings suggest that social and caregiver support is critical to delay of NHP, but there is no recommendation for standardized assessment? One could make the same argument for frailty status</p> <p>7. A major limitation of a systematic review of systematic reviews is that the science of systematic reviews has increased substantially in the past couple years. The authors do note which systematic reviews are within 5 years. However, in complex population with complex interventions, there is significant variability. Some systematic reviews, particularly earlier ones, used 'evidence' which is more marketing of programs than science.</p> <p>Minor Page 16 Figure 3: What do the numbers in parentheses mean?</p> <p>Page 17 Table 1 – please center the columns consistently</p>	<p>formatting errors. Most reviewers have found these summary tables helpful.</p> <p>6. In the Discussion, we have expanded upon the rationale for our recommendation to link assessment for needs and social resources, including caregiver support, with a longitudinal program of services and care coordination. Without a robust longitudinal program to address identified needs (and lack of social resources) we think it unlikely that improved assessment will be sufficient to impact Veteran outcomes.</p> <p>7. We agree with reviewer's comments that there have been advances and improvements in systematic review methods, with have also included efforts to evaluate the quality of systematic reviews themselves. That is why we selected high quality and more recent eligible reviews, whenever possible, to focus on in describing results of specific risk factors and interventions. However, we have noted in the Limitations that we relied on systematic review authors to rate the quality of included studies, as well as the overall strength of evidence. We also agree that it is challenging to evaluate and synthesize evidence for complex interventions, which we have highlighted in the Discussion.</p> <p>These are the numbers of prioritized reviews for detailed data extraction (also noted in column heading).</p> <p>We have corrected the formatting.</p>
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6	<p>Pg. 11, Line 37: I find it interesting that only 2 reviews with HBPC met eligibility. Just today I listened to a research call with our GEC Data Analysis Center that showed evidence of HBPC delaying nursing home by 1 year (using 2016 data - although report is probably unpublished at this point). I realize much HBPC research is on hospitalization and cost vs nursing home, but find it interesting that only 2 met criteria.</p>	<p>Thank you for this update about emerging evidence on HBPC effects for nursing home placement. As you have noted, most studies of HBPC have focused on acute care use and costs, and not evaluated nursing home placement. Our findings regarding the risk factors for nursing home placement may be useful to researchers in future observational studies of the impact of HBPC vs usual care on this outcome.</p>
7	<p>Are the objectives, scope, and methods for this review clearly described?</p> <ul style="list-style-type: none"> <li>• The report is highly responsive to its general objectives: (1) to examine evidence on modifiable risk factors for NHP and interventions that aimed to delay nursing home placement (NHP) for community-dwelling adults with physical and/or cognitive impairments. Community-dwelling adults included both older adults with existing disabilities (or at high risk for developing impairments) and individuals with posttraumatic stress disorder (PTSD) and/or traumatic brain injury (TBI); and (2) to address the broad scope of questions for these diverse populations and provide specific recommendations for VA policies.</li> <li>• A systematic review of systematic reviews is an efficient method for covering a wide range of individual studies. Employing a second level of review on top of the initial systematic review is an efficient check on the quality of the study findings.</li> <li>• The scope of the review was initially very broad and comprehensive, beginning initially with 10,671 citation meeting inclusion criteria. The inclusion criteria were designed to arrive at the very best systematic reviews. In the end, 20 risk factor reviews were considered and 6 were prioritized for specific results. A total of 47 intervention reviews were considered and 20 were prioritized for specific results (figure 3, page 16).</li> <li>• Unfortunately, none of the studies meeting inclusion criteria pertained to adults with PTSD or TBI. This gap appears to have been unavoidable because the research in these areas is not well developed.</li> <li>• The review was guided by a well-conceived, comprehensive conceptual model for risk of long-term NHP (Figure 1, page 11)</li> </ul>	<p>Thank you.</p>

	<p>including demographics, need for care, personal and social factors, and system and environmental factors. Special consideration was given to frailty status as a risk factor. In addition, the systematic review addressed the role of health services, community-based and other interventions in preventing NHP. The framework for the systematic review centered on: (1) direct contribution of modifiable and non-modifiable risk factors to NHP; (2) effect of interventions in preventing NHP; and (3) indirect effect of risk factors in modifying the effect of interventions (Figure 2, page 12).</p> <ul style="list-style-type: none"> <li>• The conclusions from the study, although disappointing, appeared to be well-founded. Three general risk factors were consistently related to NHP – frailty, functional impairments, and caregiver stress/burden. Frailty and functional impairments are difficult to modify, particularly among individuals of advanced age with multiple chronic conditions. Caregiver distress or burden should be modifiable. However, in reviewing evidence about the effectiveness of interventions to prevent NHP, the authors discovered that caregiver support, case management, and preventive home health visits demonstrated no overall benefit for delaying or avoiding NHP. There was insufficient evidence to draw conclusions about effects of other interventions such as physical activity, home-based primary care, and assistive technologies. One relevant finding, that carries over into the Implications for Policy, was the apparent benefit of some high-intensity interventions.</li> </ul> <p>2. Is there any indication of bias in our synthesis of the evidence? None.</p> <p>3. Are there any published or unpublished studies that we may have overlooked? None.</p> <p>4. Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.</p> <ul style="list-style-type: none"> <li>• The patient and caregiver's preferences for care setting are arguably the most important factor in NHP. Yet, there appears to have been no systematic reviews addressing preferences or the LTC</li> </ul>	
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	<p>decision making process. This is not the fault of the review; it represents a substantial gap in LTC research.</p> <ul style="list-style-type: none"> <li>• The vast majority of reviewed studies took place outside the VA system. This limitation should be noted. It underscores the recommendation for more intervention development and program evaluation within the VA.</li> <li>• The first Implications for Policy regarding the organization and streamlining of VA programs and services was quite thoughtful. However, it does not seem to follow from the results of the systematic review. Only one systematic review dealt with the category of Systems and Environment as modifiable risk factors and it found questionable evidence. There were no interventions to modify Systems or Environment.</li> <li>• The report points to the difficulty of evaluating the effectiveness of complex, multi-component interventions that are aimed at influencing an outcome, NHP, that is itself highly complex. Thus, the absence of supporting evidence does not necessarily mean that these interventions are ineffective.</li> <li>• Building on this point, the conventional evidence review may be of questionable value for a problem such as NHP and the types of complex interventions reviewed in this report. Conventional summative evaluations run a high risk of a type-2 error because of the vulnerability of these interventions to implementation flaws that can undermine their ability to detect significant effects if they are present. Complex interventions tend to be sensitive to local contexts, which few studies adequately take into account. In addition, fidelity can be a problem because of formidable practical challenges in mounting these complex interventions. Finally, evaluation designs for these interventions tend to focus on effect size (summative evaluation) rather than “what worked or did not work, and for whom”. Therefore, little learning takes place from a “failed” evaluation.</li> </ul>	<p>We appreciate reviewer’s suggestion and have added this to Evidence Gaps and Future Research Needs.</p> <p>We have added this to the Limitations and also expanded on the applicability of non-VA studies, as well as those conducted outside of the US.</p> <p>We have expanded the Implications and clarified the connection between our results and the recommendation to streamline VA programs.</p> <p>We agree with reviewer’s comments about the challenges of conducting and evaluating complex interventions. We have expanded our Discussion to better highlight issues surrounding the context for implementation. We have also expanded our recommendations for future research to reference an evaluation framework that combines standard efficacy or effectiveness (in terms of participant outcomes), with implementation outcomes, to better guide both interpretation of results and future implementation efforts. We address the question of fidelity through reference to concepts of core components and adaptable periphery, per implementation science frameworks. However, as noted above, VA ESP is frequently called upon to review and synthesize evidence for complex interventions. Therefore, advances in methodology (for both primary research studies and evidence synthesis) will be important for advancing this field and improving care.</p> <p>We agree with reviewer’s suggestion that barriers and facilitators will be helpful for future</p>
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	<ul style="list-style-type: none"> <li>• Would it be possible in the framework of ESP Reports to go one step further by reviewing selected individual studies covered by the systematic reviews? An examination of individual studies could shed light on factors contributing to effectiveness for interventions found to be effective, as well as implementation facilitators and challenges overcome. Would it be possible to find successful implementations that could be contrasted with those that were unsuccessful?</li> <li>• The recommendations for further research might give more consideration to evaluation designs. Pragmatic or realistic evaluation designs are often more appropriate for complex health services and HCBS interventions than are conventional RCTs. For larger scale evaluations, the stepped wedge design is a practical approach for achieving scientific rigor while dealing with differences in local context and addressing stakeholder concerns that everyone receive the intervention. Well-designed quasi-experiments, while not as strong in guarding against threats to internal validity, can be a good basis for inference, are less costly and more practical to implement, and can have better external validity.</li> </ul>	<p>implementation of interventions that have shown some benefit. Although VA ESP does review and synthesize evidence of barriers and facilitators for different programs and interventions, this was beyond the scope for the current report. This would be an important next step as VA seeks to improve care and outcomes for Veterans with impairments.</p> <p>We appreciate reviewer’s suggestion and have expanded the Discussion to include additional study designs, including stepped-wedge designs, as well as implementation science frameworks.</p>
9	<p>Overall I find this ESP to be clearly written and well organized and the team has done an excellent job of distilling all the research down into the report. I especially like the first 8 page summary, as you get everything you need in a condensed form. The inclusion of the conceptual model is a great strength. The tables are super clear. A few minor questions/comments for the team's consideration.</p> <p>p. 3 “System and Environmental Factors” – it would be helpful to define what system factors were examined as it is not clear – also not clear why marital status and stratification are included there. This does not seem like either but are you considering it an environmental factor? Page 22 also does not give sufficient detail to know what you mean. Could consider being very emphatic that these factors present true gaps in the literature.</p>	<p>Thank you.</p> <p>We appreciate reviewer’s suggestions to clarify results from the study on system and environmental factors. We have elected to not provide detailed results from this study, as it may give undue weight to these findings, in the absence of other evidence on such factors. Therefore, we removed details of the analyses, leaving a brief summary of this study. We have followed reviewer’s suggestion to emphasize the large gap in this area within Results.</p>

	<p>p. 4 and general comment. With this dyadic type of situation (e.g. there is a caregiver and a care recipient) sometimes it is tough to say who the “participant” is or “participant outcome (line 22 p. 4). So may be useful to give a once-over to see if it is clear throughout.</p> <p>P. 7 second bullet “define success”. Yes, they will have a low likelihood of success but most programs do not move NHP so emphasizing htat other important outcomes should be used to contextualize success. E.g. goal-concordant care, etc.</p> <p>General comment. I do think it is important for a recommendation for future research to consider that future RCTs need to be powered to detect a change in NHP. Most use NHP as a tertiary outcome and any analysis is exploratory or underpowered. So it will take a large trial to be able to test strategies in VA. This goes along with bullet 4 at bottom of page 7.</p> <p>Page 11. For the conceptual model, Bass and Noelker 1999 did a really cool adaptation of Andersen model and it could be useful as a reference if you need anything on informal v. formal care and outcomes.  <a href="https://journals.sagepub.com/doi/abs/10.1177/073346489901800204">https://journals.sagepub.com/doi/abs/10.1177/073346489901800204</a>                  Table 2 and 3 and 4. I gave feedback on already, I think they are really helpful.</p>	<p>Thank you for this suggestion. We have reviewed the report revised usage of “participant,” particularly for interventions that apply to both the care recipient and caregiver.</p> <p>We have clarified that this applies to long-term nursing home placement, and changed “success” to “change long-term NHP.”</p> <p>We have added the need for larger sample size to our recommendations for Future Research.</p> <p>We appreciate reviewer’s suggestion and have located an article by Bass and Noelker (published in 1987) describing an adaptation of Andersen’s model that considered both formal and informal caregivers. We added this article to references cited in the Methods.</p>
10	<p>It is good that you mention that you were unable to find eligible reviews for individuals and PTSD and/or TBI.</p> <p>When referencing NHP throughout the document sometimes the phrase “long-term” is placed before NHP and sometimes the phrase is not noted. Because the systematic review focused on delaying long term nursing home placements and excluded studies that examined nursing home admissions and explicitly counted short term stays for rehabilitation within its definition (page13 lines 46-49), we recommend always using the phrase “long-term” before NHP when describing the focus of the review, the findings, and the recommendations.</p>	<p>Thank you.</p> <p>We appreciate reviewer suggestions to be consistent in terminology and have verified that “long-term NHP” is used throughout.</p>

<p>The term “Long-Term NHP” is used throughout the document. Is there a definition of “Long-Term NHP”? Can it be included in the document?</p>	<p>Reviews were excluded if they evaluated “nursing home admission” and included short-term rehabilitation as part of this outcome. We have clarified the description of selection criteria for this outcome in Methods.</p>
<p>Were studies that avoided nursing home admission excluded? The statement on page 13 lines 46-49 conveys that this is the case. Is this a correct understanding?</p>	<p>Reviews were excluded if they evaluated “nursing home admission” and included short-term rehabilitation as part of this outcome.</p>
<p>Pg 3. Lines 39-41: The sentence that reads “The remaining 10 reviews...that an intervention (in this review, occupational therapy).” Appears to be missing information.</p>	<p>We have revised this sentence for clarity.</p>
<p>Pg 4. What is the definition of “preventive home visits”?</p>	<p>We have clarified the description of preventive home visits in Results. In contrast to case management interventions, preventive home visits generally included older adults who did not have known impairments, recent adverse health events, or high-risk diagnoses at the outset.</p>
<p>Pg 4. The sentence on lines 48 and 49: “Both reviews found no overall effect of preventive visits on NHP, but one review reported decreased NHP with interventions having more than 9 home visits.” The paragraph starts with two prioritized reviews. Are all these sentences accurate and/or worded correctly? Pg 5. Line 50-52 reads “Case management, caregiver support, and preventive home visit interventions demonstrated no overall benefit for delaying or reducing NHP across studies, but some high-intensity models in each category did show benefit.” How can the first part of this sentence and the last part of this sentence be true? If some high-intensity models in each category did show benefit, what benefit did they show? How is “no overall benefit” different from “benefit”? Page 29 lines 25-28 also have this statement.</p>	<p>We have revised these sentences to more clearly indicate that overall effects are summaries of the impact of interventions across all studies (included by reviews), while the evidence for benefit came from a very limited set of studies for each intervention.</p>
<p>Pg 6. Line 29-30: What is the source that supports this statement? “It is unclear that any existing intervention can change NHP for adults with impairments who have no informal supports.” There is a body of evidence that is showing that by investing in social determinants of health that the risk of institutionalization can be reduced.</p>	<p>We have revised this sentence to more clearly state that our results suggest that many existing interventions would not sufficiently meet the needs of adults with impairments who have no informal caregiver support. This statement is supported by the large involvement of informal caregivers in many interventions that were evaluated.</p>

		<p>We undertook extensive searches for risk factors and interventions that may impact long-term nursing home placement, and as noted above, the involvement of social determinants would have been eligible for inclusion to address multiple KQ. However, we did not identify evidence that indicates social determinants are modifiable risk factors or characteristics that impact intervention effectiveness. This may reflect the lack of primary research studies and/or the selection criteria used by eligible systematic reviews (eg, requirement for longitudinal follow-up).</p>
	<p>Pg 7. Lines 19-23: The lead in on this bullet is inconsistent with other information in the report. The same bullet appears on page 31 line 14. The phrase “As most interventions fail to prevent or delay NHP” is not consistent with information on page 22 Lines 15-23 reads: “In general, no interventions clearly demonstrated benefit across studies for delaying or preventing NHP. Reviews reported some interventions had positive effects in a subset of included studies (ie, case management, caregiver support, and preventive home visits). Reviews on several other interventions, including home-based primary care and physical activity programs, were unable to identify studies that examined effects on NHP.” Are the interventions that are referenced in the phrase on page 7 and page 31 only noting the interventions that were part of this systematic review? Is it possible that some interventions did not have studies that examined the effects on NHP? See page 28 lines 42-44: “In summary, evidence on NHP was mostly not available for a wide range of interventions, and studies on interventions for falls prevention may have lacked sufficient follow-up and/or sample size to detect difference in NHP.”</p>	<p>We agree that this phrase did not capture the lack of evidence for certain interventions, and have removed it. As noted above, we have also clarified in multiple places that overall effects reflect summaries of intervention impact across included primary research studies (in eligible reviews), while a subset of studies for some interventions reported benefit.</p>
	<p>Pg 8. Line 8 through 23. Limitations. The statement on page 12 line 6-10 “Complex interventions involving several components addressing multiple factors may be needed to delay or avoid NHP; such interventions present substantial challenges in analysis and interpretation of effects, particularly regarding the importance of individual components.” appears to be a factor in the systematic review. Were the studies that were part of the systematic review</p>	<p>Yes, several complex interventions were examined by eligible systematic reviews, including case management, caregiver support, and home-based primary care. In the Discussion, we describe the challenges in evaluation and synthesis of complex interventions, as noted by authors of eligible reviews. We also provide some</p>

	<p>using complex interventions involving several components addressing multiple factors?</p>	<p>recommendations for design and evaluation of complex interventions in future studies.</p>
	<p>Pg 8. The Limitation paragraph fails to note the limited studies on the systems and environmental factors.</p>	<p>We note the lack of evidence on systems and environmental factors in the section on Evidence Gap and Future Research Needs. We focus on limitations of our review methodology in the Limitations section.</p>
	<p>Pg 8. Were studies that prevent long-term NH placement for people that have already been admitted to a nursing home included in this systematic review? Were programs and evaluations of the Medicaid funded Money Follows the Person program included in this review?</p>	<p>We have clarified in the text that eligible populations were community-dwelling adults, so adults already residing long-term in nursing homes would have been ineligible. More detailed information on eligibility criteria is also provided in Appendix 2. Reviews that included studies on Medicaid programs would have been eligible for our report, but we did not identify such studies included in eligible reviews.</p>
	<p>Is text missing from the bottom of page 16 to top of page 17?</p>	<p>The text on the top of this page is the footnote for Figure 3 (on preceding page). Formatting has been changed to make this clearer.</p>
	<p>Pg 26. Lines 21-24. The sentence that reads “In summary, evidence indicated that caregiver support interventions were generally not effective, although a few studies have reported benefits of a particular model of high-intensity caregiver counseling.” Is the evidence that is being referenced the research in the systematic review? What is it that the caregiver support interventions were not effective at? Can more be said about the benefits of the particular model of high-intensity caregiver counseling?</p>	<p>We have clarified this sentence to indicate effectiveness with regard to delaying or preventing long-term NHP. In the report text, we focus primarily on long-term NHP outcomes, but we also provide secondary outcomes (eg, mortality) in Appendix 5.</p>
	<p>Pg 27. Lines 39-40: the sentence reads: “In summary, most evidence indicated no decrease in NHP, but a few studies with greater intensity of home visits showed reduction in NHP. What was different with these studies? What were the differentiators? Is this an area for greater study?”</p>	<p>We report the main findings from eligible reviews, including a subgroup analysis based on the number of visits provided by included interventions. We agree that there may have been other differences between interventions that were effective and those that were not. As noted above in our response to other reviewers, evaluation of numerous potential differences between interventions was not part of the scope of this report, but it may be helpful as a next step.</p>

<p>Pg 28. Lines 31-40: The study referenced is under other interventions; however the description reads: “The review provided qualitative summaries of 7 demonstrations in US, Canada, UK, and Italy, and reported 2 of these projects evaluated rates of institutionalization. Both programs occurred in Europe and involved case managers who assessed participants, coordinated care, and promoted utilization of home and community-based services. Both studies reported decreased institutionalization.” What was the reason to place this study in the “Other” category rather than the “Case Management” category or the “System and Environment” category?</p>	<p>We grouped eligible systematic reviews by main focus (per reviews’ stated selection criteria). In this case, this review broadly included a number of demonstration projects (including some of adult day health clinics), but the 2 projects that examined long-term NHP both involved case managers. We have also added a clarification that one of these projects involved giving responsibility for budgets directly to case managers. As this review examined programs that intended to change services (and integration of care), we determined that these were active interventions, and not a synthesis of studies on risk factors. However, we agree that there is conceptual overlap between observational studies that examine Systems and Environmental risk factors and those that seek to evaluate changes to those factors (via non-experimental designs).</p>
<p>Pg 30. Line 11-13 reads: “It is unclear that any existing intervention can change NHP for adults with impairments who have no informal care supports.” What is the source for this statement? There are people with disabilities that do not have informal care supports that direct their care and services successfully in the community and have avoided long-term NHP. If the statement will remain in the document it may be good to tie the statement to published research.</p>	<p>As noted in our response above to the same concern (sentence in Executive Summary), we have revised this sentence to indicate that many interventions involve or rely on informal caregivers.</p>
<p>Pg 30. Line 36-46 reads: “While there are a range...This underlying complexity likely explains why most interventions showed no effect on NHP, and only longer term evaluations of high-intensity multicomponent programs showed any promise of benefit. Moreover, interventions that seemed successful often required close involvement of family caregivers, such as spouses and adult children;” is an informative statement.</p>	<p>Thank you. These sentences have been revised, in connection with clarifying the evidence on the involvement of caregivers in many interventions.</p>
<p>Pg 30. Line 46: Is there a research citation to tie to this statement: “there is little evidence to indicate that interventions can help those who lack strong social support networks to avoid long-term NHP?”?</p>	<p>We have removed this sentence.</p>

## APPENDIX 5. EVIDENCE TABLES

### Appendix 5.1 Characteristics of All Eligible Systematic Reviews (SR)

	Total SR	High Quality	Recent <sup>a</sup>	SR included:				Prioritized SR <sup>b</sup>
				Reviews	RCTs	Cohort Studies	US Studies	
<b>Risk Factors:</b>								
Frailty Status	4	2	3	1	—	3	3	3
Other Risk Factors	16	1	8	1	4	16	12	3
<b>Interventions:</b>								
Case Management	8	4	3	—	8	3	6	4
Caregiver Support	10	2	4	3	8	4	4	2
Respite Care & Day Clinics	9	3	4	3	8	7	6	3
Preventive Home Visits	6	1	—	—	6	2	6	2
Home-Based Primary Care	2	1	2	—	2	2	2	1
Physical Activity	2	—	2	—	2	1	1	2
Others <sup>c</sup>	10	4	4	1	8	5	5	6
<b>Totals</b>	<b>67</b>	<b>18</b>	<b>30</b>	<b>9</b>	<b>46</b>	<b>43</b>	<b>45</b>	<b>26</b>

RCTs=randomized controlled trials; US=United States

<sup>a</sup> Search conducted 2013 or later

<sup>b</sup> Selected for highest quality, most recent searches, and broadest coverage of risk factors and interventions.

<sup>c</sup> 2 SR—any nonpharmacologic intervention for adults with dementia; 1 SR—any intervention for falls prevention; 1 SR—any intervention for patient or caregiver stress; 1 SR—different settings for personal assistance; 1 SR—in-home health care or personal assistance; 1 SR—assistive technologies; 1 SR— demonstration projects to integrate acute and long-term care in US and Europe; 1 SR—occupational therapy; and 1 SR—light therapy.

## Appendix 5.2 Detailed Results from Prioritized Eligible Systematic Reviews on Potentially Modifiable Risk Factors for Long-term Nursing Home Placement in Older Adults

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)	# Included Studies on Long-term Nursing Home Placement (data sources)	Definition and Assessment of Long-term Nursing Home Placement  Follow-up Period	Potentially Modifiable Risk Factors (# of studies and effect size, if available)	Quality of Included Studies (tool used)  Review Authors' Concerns
<b>Frailty Status</b>						
Apostolo, 2017 <sup>16</sup> (High, 2015)	Community-dwelling adults ≥60 years	Quantitative systematic reviews	1 (French cohort study) <sup>235,236</sup>  1 (regional Canadian administrative and interview data; Dutch administrative data) <sup>85,86,88,237</sup>	<i>"institutionalization"</i> <sup>235</sup>  <i>"moving to long-term care"</i> or <i>"transition to long-term care"</i> <sup>86</sup>  1 year	<i>"Donini Index of Frailty, Winograd Index of Frailty and Schoevaerdt's Index of Frailty were analyzed for institutionalization or mortality at 12 months after admission to emergency department and were revealed not to be sufficiently accurate to predict increased risk of any of these adverse outcomes."</i> <sup>235</sup>  <i>"The Frailty Index was shown to be sufficiently accurate to predict increased risk of...hospitalization and institutionalization at 12 months after evaluation..."</i> <sup>86</sup>	1 review met 10 of 11 criteria <sup>235</sup> ; 1 review met 6 of 11 criteria <sup>86</sup> (Joanna Briggs Institute Reviewer Manual) <sup>238</sup>  <i>"...the reported data referred to different versions of [Frailty Index], ranging from 13 to 92 items"</i> <sup>86</sup>
Sternberg, 2011 <sup>18</sup> (High, 2009)	Community-dwelling adults ≥65 years	Cross-sectional & cohort studies	1 (PEP) <sup>90</sup>  2 (Canadian cohort) <sup>84,89</sup>	Participant (or family) reported nursing home stays ≥4 months <sup>90</sup> , <i>"institutionalization"</i> <sup>84</sup> , or <i>"entry into institutional care"</i> <sup>89</sup>  5-7.5 years	<i>"The most common outcomes of frailty [studies] were death (13, 76%), disability (7, 41%), and institutionalization (6, 35%)."</i>	2 studies <sup>89,90</sup> rated highest quality (4 out of 4); 1 study <sup>84</sup> rated 3 out of 4 (CIFA quality assessment tool) <sup>239</sup>  Authors reported no concerns
Vermeiren, 2016 <sup>19</sup> (Medium, 2016)	Community-dwelling adults ≥65 years	Cohort studies	1 (PEP) <sup>90</sup>  1 (Canadian cohort) <sup>89</sup>	Participant (or family) reported nursing home stays ≥4 months <sup>90</sup> ,	Frailty pooled HR/RR (1.67 [95% CI 1.47, 1.89])	2 studies <sup>89,90</sup> met 5 out of 5 criteria; 2 studies <sup>87,88</sup> met 3 out of 5 (NICE methodology checklists)

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)	# Included Studies on Long-term Nursing Home Placement (data sources)	Definition and Assessment of Long-term Nursing Home Placement  Follow-up Period	Potentially Modifiable Risk Factors (# of studies and effect size, if available)	Quality of Included Studies (tool used)  Review Authors' Concerns
			1 (regional Canadian administrative and interview data) <sup>88</sup>  1 (Italian cohort) <sup>87</sup>	"entry into institutional care" <sup>89</sup> , or "nursing home placement" <sup>87</sup>  Regional healthcare administrative data showing "admission to long-term care" <sup>88</sup>  1-7.5 years		Authors reported no concerns
<b>Other Risk Factors</b>						
Cepoiu-Martin 2016 <sup>22</sup> (High, 2015)	Adults with dementia residing in community or supportive living facilities	Cohort studies (follow-up ≥ 1 year)	5 (National US datasets—2 [CERAD] <sup>104,160</sup> ; 1 [NLCS, VA cohort] <sup>114</sup> ; 2 [MADDE] <sup>98,108</sup> )  29 (Local or regional US cohorts) <sup>97,102,103,106,108-110,112,116-120,123-126,139,140,158,171,176,240-246</sup>  25 (Cohorts not in US) <sup>96,100,101,105,107,111,113,115,121,122,127,128,138,141,144,247-256</sup>	Participant or caregiver reported (45)  Administrative data (1)  Participant or caregiver report, verified with administrative data (1)  Outcome definition not clear (12)  1-18 years	<u>Meta-analysis:</u> Caregiver depression (per 1 point increase on scale) HR 1.00 (95% CI 0.97-1.03) (9) <sup>a</sup>  <u>Qualitative synthesis:</u> "Greater impairment in basic ADL and/or [instrumental] ADL ... was associated with an increased [risk]..." (14) <sup>96-109</sup>  "self-rated health was not associated with an increased relative risk"(2) <sup>96,110</sup>  "specific health issues such as ... malnutrition, and incontinence was found to predict LTC placement." (2) <sup>111,120</sup>	Quality results NR (Newcastle-Ottawa)  "The most common issue with study quality was how the outcome of interest was determined ... Most studies (n=38, 64.4%) relied on self-reported LTC placement, as opposed to independent assessment or record linkage... Other common quality issues identified included loss to follow-up (outcome data were missing) ... and concerns about the representativeness of the cohort..."

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)	# Included Studies on Long-term Nursing Home Placement (data sources)	Definition and Assessment of Long-term Nursing Home Placement  Follow-up Period	Potentially Modifiable Risk Factors (# of studies and effect size, if available)	Quality of Included Studies (tool used)  Review Authors' Concerns
					<p><i>“Behavioral and psychological symptoms of dementia significantly increased... risk...in most but not all studies...” (22)<sup>98,108,109,111-129</sup></i></p> <p><i>“Increased caregiver burden and markers of worse caregiver health... were significant predictors... in most studies... Caregiver psychological factors such as increased role captivity, lower life satisfaction, and higher levels of distress (especially if due to behavioral challenges) were also predictive...” (11)<sup>97,98,100,108,112-114,116,139-141</sup></i></p> <p><i>“Both family help and a longer duration of caregiving decreased the risk of LTC placement...” (3)<sup>98,112,116</sup></i></p> <p><i>“...[H]igher number of nursing home beds...and occupancy rates increased the risk...for married but not unmarried persons... [H]igher percent of Medicaid LTC spending on homecare-based services decreased the risk...for unmarried but not for married individuals...[H]igher number of home health agencies...decreased the risk for married but not for unmarried individuals ...The percentage of Medicare spending on LTC did not predict LTC placement.” (1)<sup>104</sup></i></p>	

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)	# Included Studies on Long-term Nursing Home Placement (data sources)	Definition and Assessment of Long-term Nursing Home Placement  Follow-up Period	Potentially Modifiable Risk Factors (# of studies and effect size, if available)	Quality of Included Studies (tool used)  Review Authors' Concerns
Luppa 2010 <sup>27</sup> (Medium, 2008)	NR	Cohort studies	2 (NHANES) <sup>257,258</sup> 3 (AHEAD) <sup>259-261</sup> 5 (EPESE) <sup>131,135,136,262,263</sup> 5 (LSOA) <sup>264-268</sup> 1 (MADDE) <sup>110</sup> 3 (Medicare, national data) <sup>137,269,270</sup> 9 (local or regional US cohorts) <sup>132,142,271-277</sup> 8 Cohorts not in US <sup>133,134,278 279 130,280,281 282</sup>	Participant or caregiver reported (24)  Administrative data (12)  1-20 years	Review authors rated overall strength of evidence and provided either range of minimum/maximum associations or single results from highest quality studies.  <u>Strong evidence:</u> <i>"functional impairment (basic... ADL: HR 1.32/3.70, OR .30/1.78)"</i> <sup>130-133</sup> <i>"IADL: HR 1.05/2.50"</i> <sup>110,260</sup> <i>"cognitive impairment (HR 1.67, OR 1.44/1.50)"</i> <sup>131,134,135</sup> <i>"low self-rated health status (HR 3.40, OR 1.48/1.67)"</i> <sup>130,134,136</sup> <i>"a high number of prescriptions (HR 1.04/1.67, OR 1.15)"</i> <sup>135-137</sup>  <u>Moderate evidence:</u> <i>"a poor social network (HR 1.18/1.27, OR 1.11/1.80)"</i> <sup>131,133,135,142</sup> <i>"low activity level (OR 1.97)"</i> <sup>132</sup>	High quality: 13 studies Moderate quality: 8 studies Low quality: 15 studies (modified tools from Gaugler 2009 and Mols 2005)  <i>"Methodical shortcomings were frequently found due to information on non-respondents, lack of specifications of facility types in NHP definition and lack of data about demented persons included in samples."</i>
O'Caomh 2015 <sup>29</sup> (Medium, 2014)	Community-dwelling adults ≥50 years	Cohort studies	1 (VA cohort) <sup>92</sup> 2 (Canadian cohorts) <sup>93,94</sup> 1 (Irish cohort) <sup>93</sup>	Self-reported "admission to nursing home" <sup>92</sup>  Regional healthcare administrative data showing "admission to nursing home" <sup>94</sup>	Risk assessment tools had AUC of 0.81 (95% CI 0.78, 0.84) and 0.70 (95 % CI 0.62, 0.76) <sup>93</sup> for predicting institutionalization	2 studies <sup>93,95</sup> with low risk of bias on 5 out of 6 criteria; 1 study <sup>92</sup> with low risk on 4 criteria; 1 study <sup>94</sup> with low risk on 3 criteria (QUIPS tool) <sup>283</sup>  <i>"Baseline rates of institutionalisation are small ..., so studies are often</i>

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)	# Included Studies on Long- term Nursing Home Placement (data sources)	Definition and Assessment of Long-term Nursing Home Placement  Follow-up Period	Potentially Modifiable Risk Factors (# of studies and effect size, if available)	Quality of Included Studies (tool used)  Review Authors' Concerns
				Proxy report or regional healthcare administrative data showing "nursing home placement" <sup>95</sup>  Regional healthcare administrative data <sup>93</sup> 1-5 years		<i>underpowered to detect this outcome...</i>

ADL=activities of daily living; AHEAD= Survey on Assets and Health Dynamics Among the Oldest Old; AUC=area under the curve; CERAD=Consortium to Establish Registry for Alzheimer's Disease; IADL=instrumental activities of daily living; LSOA=Longitudinal Study of Aging; MADDE=Medicare Alzheimer's Disease Demonstration Evaluation; NHANES=National Health and Nutrition Examination Survey; NLCS=National Longitudinal Caregiver Study; NR=not reported; PEP=Precipitating Events Project; QUIPS=Quality in Prognosis Studies; SR=Systematic Review

<sup>a</sup>Studies included in meta-analysis were not cited in review

### Appendix 5.3 Detailed Results from Prioritized Eligible Systematic Reviews on Interventions to Prevent or Delay Long-term Nursing Home Placement

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s) Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used) Review Authors' Comments
<b>Case Management (CM)</b>					
Reilly, 2015 <sup>40</sup> (High, 2013)	Adults with dementia, living in the community	RCTs 1-3 years	<p>Self-reported data on: "Institutionalization"<sup>148,149</sup></p> <p>"Long-term institutionalization"<sup>150-152</sup></p> <p>"placed in nursing home for long-term care"<sup>147</sup></p> <p>"Admitted to nursing home"<sup>154</sup></p> <p>"permanent nursing home placement"<sup>155</sup></p>	<p>By follow-up interval: 6 months (6)<sup>147-150,152,155</sup> OR 0.82 [0.69, 0.98]</p> <p>10-12 months (9)<sup>147-155</sup> OR 0.95 [0.83, 1.08]</p> <p>18 months (4)<sup>147-150</sup> OR 0.25 [0.10, 0.61]</p> <p>24 months (2)<sup>151,152</sup> OR 1.03 [0.52, 2.03]</p>	<p>4 studies with low risk for ≥5 out of 9 criteria; 3 studies with low risk for 3-4 criteria; 1 study had high or unclear risk for all criteria (Cochrane Handbook)<sup>284</sup></p> <p>"...heterogeneity in the interventions, outcomes and participants may explain these largely equivocal findings... It is important that these interventions are targeted at the right populations... [A]t least two trials indicated that the intervention was not targeted appropriately..."</p>
Tam-Tham, 2013 <sup>41</sup> (High, 2011)	Adults with dementia, living in the community	RCTs 10 months-16 years	<p>Self-reported data on: "nursing home admission"<sup>156,158,159</sup></p> <p>"nursing home entry"<sup>160</sup></p> <p>"nursing home placement"<sup>96,161</sup></p> <p>"institutionalization"<sup>163,164,167</sup></p> <p>"placed in nursing home for long-term care"<sup>147</sup></p> <p>"long-term institutionalization"<sup>150-152,162</sup></p> <p>Administrative data on: "institutionalization"<sup>157</sup></p>	<p>Overall pooled meta-analysis (16): "no statistically significant effect of dementia CM compared to usual care" RR 0.94 (0.85, 1.03) WMD 77.8 days (-70.5, 226.1), data from 5 studies<sup>96,156,161,162,167</sup></p> <p>By follow-up interval: &lt;18 months (5)<sup>158,163,165-167</sup> RR 0.61 (0.41, 0.91)</p> <p>18 months (4)<sup>147,150,157,162</sup> RR 0.95 (0.62, 1.46)</p> <p>&gt;18 months (7)<sup>96,151,152,156,159,160,164</sup> RR 1.01 (0.97, 1.06)</p>	<p>5 studies<sup>147,152,158,164,165</sup> met 3 out of 5 criteria; 8 studies<sup>96,151,159,161-163,166,167</sup> met 2; and 4<sup>150,156,157,160</sup> met only 1 (Jadad score)<sup>285</sup></p> <p>"we noted high variability in the CM interventions and the care available to the control group, which limits the ability to assess the effect of the intervention specifically... Finally, most trials were underpowered to detect statistically significant differences in effect size between the intervention and control groups."</p>

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s) Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used) Review Authors' Comments
			<i>"nursing home admission, bed days, and costs"</i> <sup>166</sup>		
Hickam, 2013 <sup>83</sup> (High, 2011)	Adults with medical illness and complex care needs, in outpatient settings	RCTs, observational studies 1-9.5 years	Self-report data on: <i>"avoidance of nursing home placement"</i>	<p><u>Older adults with frailty or chronic health conditions (2)</u><sup>172,173</sup> <i>"CM does not decrease nursing home admissions in the frail elderly (strength of evidence: low)."</i></p> <p><u>Dementia (10)</u><sup>147,149-152,155,168-171</sup> <i>"CM programs that serve patients with dementia and have a duration of no longer than 2 years do not confer clinically important delays in time to nursing home placement (strength of evidence: moderate)... CM programs that serve patients with dementia who have in-home spouse caregivers and continue services for longer than 2 years are more effective for delaying nursing home placement than programs providing services for 2 years or less (strength of evidence: low)."</i></p>	<p>7 studies rated good, 2 fair, 3 poor (modified criteria from Downs and Black; USPSTF)<sup>286,287</sup></p> <p><i>"...few organizations have the potential scope (in terms of patient base and clinical resources) to conduct evaluations that directly compare different CM approaches... Synthesizing the evidence about CM requires indirect comparisons among different types of clinical programs. Because the published studies have not compared case managers with differing qualifications, there is no evidence about the efficacy of specialized training programs or case manager certification."</i></p>
Cochrane 2016 <sup>38</sup> (High, 2015)	Adults ≥65 years, living at home and needing assistance to perform tasks of daily living and to participate in normal activities	RCTs, <i>"quasi-random studies"</i> 1 year	Administrative data on: <i>"transfer to a residential setting"</i> <sup>174</sup>	<i>"very low-quality evidence that reablement may make little or no difference to the rates of transfer to a residential setting" (1)</i> <sup>174</sup> 3 months—RR 0.76 (0.40, 1.44) 12 months—RR 0.92 (0.62, 1.34)	<p>1 study with high risk of bias on all domains (Cochrane Handbook)<sup>284</sup></p> <p><i>"We are very uncertain of the effectiveness of reablement because the evidence was very low quality for all outcomes..."</i></p>

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)  Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used)  Review Authors' Comments
<b>Caregiver Support</b>					
Griffin 2015 <sup>45,143</sup> (High, 2014)	Adults with dementia and their family or caregivers	RCTs  6 months – 9.5 years	Self-reported data on: "nursing home placement" <sup>96</sup>  "residential care placement" <sup>176</sup>  "institutionalization" <sup>164,167</sup>  "permanent institutionalization" <sup>175</sup>  "permanent nursing home placement" <sup>171</sup>  Administrative data on: "nursing home admission, bed days, and costs" <sup>166</sup>	Compared with usual care (5) <sup>96,164,166,167,171</sup> "...[O]nly one...reported significant differences... [C]ompared with usual care, patients of caregivers who received counseling and support groups were able to avoid nursing home placement for longer periods of time...an equivalent to a delay of 557 days..." <sup>171</sup>  Compared with another active intervention (2) <sup>175,176</sup> "Researchers [of 1 trial] found that the intervention was successful at keeping patients at home significantly longer. The time from baseline to residential placement for care recipients...in the control group was 228 days earlier..." <sup>176</sup>	2 studies rated good; 3 fair; 2 poor (Cochrane Handbook) <sup>284</sup>  "For some interventions, it is likely that the intention was to reduce the burden of care for caregivers... Consequently, their limited impact on patient outcomes is not surprising..."
Vernooj- Dassen, 2011 <sup>51</sup> (High, 2009)	Family carers of community- dwelling adults with dementia	RCTs	NA	NA (0)	NA
<b>Respite Care &amp; Adult Day Clinics</b>					
Brown 2015 <sup>54</sup> (High, 2013)	Older adults (mean or median age >60 years), needing medical care	RCTs  2 months – 1 year	Self-reported data on: "move to institutional care" <sup>177</sup>  "admission to an institution" <sup>179</sup>  "place of residence" <sup>178</sup>	Overall pooled meta-analysis (13): Day clinic vs. all comparators OR 0.84 (0.58, 1.21)  By type of comparator: Day clinic vs. comprehensive geriatric management (4) <sup>179,181,184,185</sup> OR 0.91 (0.70, 1.19)	2 studies <sup>178,183</sup> with low risk of bias in 5 or 6 criteria (out of 7), 4 <sup>177,180,181,189</sup> with low risk in 4 criteria, and 7 <sup>179,182,184-188</sup> with low risk in only 3 or fewer criteria (Cochrane Handbook)  "This review found little evidence that day [clinics] were better than alternative types of comprehensive service. However, the diversity in the content of

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)  Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used)  Review Authors' Comments
			<p>“move to long-term institutional care”<sup>180</sup></p> <p><u>Administrative data on:</u> “institutionalization”<sup>183,187</sup></p> <p>“discharged to an institution”<sup>182</sup></p>	<p>vs. in-home care (5)<sup>177,178,180,186,189</sup> OR 1.49 (0.53, 4.25)</p> <p>vs. no comprehensive geriatric or in-home care (4)<sup>182,183,187,188</sup> OR 0.58 (0.28, 1.20)</p>	<p><i>alternative services and the populations being served... means the external validity of this finding may be compromised. Furthermore, 10 of the studies were at least 20 years old and the types of health service and the populations being served may not reflect current practice or requirements.”</i></p>
Lee, 2014 <sup>59</sup> (High, 2012)	Community-dwelling adults with full-time caregiver	RCTs  1 year	Family reported “permanent institutionalization” <sup>190</sup>	<u>Qualitative Synthesis (1):</u> <sup>190</sup> “22-day increase of days spent in the community by the experimental group...” (combined outcome of days until death or institutionalization)	<p>Low risk of bias in 3 out of 7 criteria (Cochrane Handbook [cite])<sup>284</sup></p> <p>“...[O]nly one of the studies included any outcomes for the person with dementia<sup>190</sup>... [T]his publication was flawed due to the cluster randomisation process. This is one of the few studies to report a positive effect on rates of institutionalisation.”</p>
Shaw, 2009 <sup>61</sup> (High, 2008)	Adults ≥ 65 years, with informal carers	RCTs, observational studies  10 weeks – 8 years	<p><u>Self-reported data on:</u> “institutional care”<sup>145,191</sup></p> <p>“institutionalization”<sup>192</sup></p> <p>“nursing home admission”<sup>156</sup></p> <p>“still living at home”<sup>194</sup></p> <p><u>Administrative data on:</u> “institutionalization”<sup>146</sup></p> <p>“move to residential, nursing or long-term hospital care with no planned or</p>	<p><u>Pooled meta- analysis (3):</u><sup>191-193</sup> “institutionalization... is more likely following a period of respite.” NHP OR 1.79 (95% CI 1.02, 3.13) Combined NHP or death OR 1.54 (95% CI 1.01, 2.33)</p> <p><u>Qualitative Synthesis (6):</u> “intervention group more likely to be institutionalized after a respite programme involving both home and day care.”<sup>193</sup></p> <p>“compared with a carer training programme, carers in receipt of</p>	<p>3 studies high quality, 2 moderate, 2 low, 1 NR (modified criteria from Downs and Black<sup>288</sup>, and Kmet et al.)<sup>289</sup></p> <p>“It is likely... that many samples recruited to studies of respite care are at a relatively late stage in the caregiving career and respite is unlikely to have a substantial impact on institutionalization rate. Many of the attitudes preventing early use of respite are not only a result of cultural values but also result from poor knowledge of the availability and content of respite programmes...”</p>

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)  Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used)  Review Authors' Comments
			<i>provisional date of discharge</i> <sup>144</sup>	<p><i>respite tended to institutionalise care recipients faster.</i><sup>156</sup></p> <p><i>"respite users tended to keep the care recipient in the community for significantly longer than matched control subject."</i><sup>94</sup></p> <p><i>"over a 3-year period, both low use of ADC (1-30 days in a 6-month period) and high use (78+ days) gave a 30% increased likelihood of institutionalization..."</i><sup>146</sup></p> <p><i>"greater use of respite services (a variety of day and nursing home respite) was associated with institutionalization but...was non-significant when adjusted for dementia severity."</i><sup>145</sup></p> <p><i>"those using day care or home care were less likely to be institutionalized at follow-up of around 1 year."</i><sup>144</sup></p>	
<b>Preventive Home Visits</b>					
Stuck, 2002 <sup>290</sup> (Medium 2001)	Community-dwelling adults (mean age >70 years)	RCTs  1-4 years	<p><i>"number of participants admitted to nursing homes (excluding short-term and residential or board care-unit admissions)"</i><sup>290</sup></p> <p>Primary studies used self-reported and administrative data</p>	<p><u>Overall pooled meta-analysis (13):</u><sup>100,195-199,201,203,211,291-294</sup></p> <p><i>"reduction in the risk of [nursing home] admission was modest and nonsignificant"</i></p> <p>RR 0.91 (0.76, 1.09)</p> <p><u>By number of visits:</u></p> <p>0-4 visits (5)<sup>100,211,291,293,294</sup></p> <p>RR 1.05 (0.85, 1.30)</p>	All studies had clear randomization procedures, 8 studies reported masking of those assessing outcomes, all studies had >95% retention or used intention-to-treat analyses for nursing home outcome (3 criteria: method of randomization, blinding in outcomes assessment, and proportion of participants in analyses of final outcomes)

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s) Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used) Review Authors' Comments
				5-9 visits (4) <sup>195,201,203,292</sup> RR 0.90 [0.75, 1.07]  >9 visits (4) <sup>196-199</sup> RR 0.66 [0.48, 0.92]	
Mayo-Wilson, 2014 <sup>65</sup> (High, 2012)	Community-dwelling adults ≥ 65 years, without dementia (excluded if >50% of participants had dementia)	RCTs, "quasi-random studies" 6 weeks – 4 years	Self-reported data on: "admission to nursing home" <sup>295,296</sup>  "relocation to nursing home" <sup>201</sup>  "admission to institution" <sup>209,211,297</sup>  "moved to institutional care" <sup>206</sup>  "institutionalization" <sup>204,298</sup>  "facility placement" <sup>202</sup>  "permanently admitted to nursing home" <sup>200,203</sup>  "permanent institutionalization" <sup>299</sup>  "admission to nursing home or long-term care hospital" <sup>100</sup>  "placement in nursing homes or homes for disabled older persons" <sup>300</sup>  "nursing home stays were deemed permanent if the	Overall pooled meta-analysis (26): <sup>100,172,197-204,206,209,211,291,295,297-307</sup> "moderate quality evidence of no clinically important difference" RR 1.02 (0.88, 1.18)  By follow-up interval: 0-11 months (2) <sup>297,306</sup> RR 1.00 (0.46, 2.18)  12-23 months (15) <sup>100,172,201,202,206,209,211,295,298-302,304,305</sup> RR 0.95 (0.78, 1.17)  24-35 months (6) <sup>201,202,291,303,304,307</sup> RR 1.02 (0.80, 1.30)  36+ months (8) <sup>197-204</sup> RR 0.96 (0.69, 1.33)	7 studies had low risk of bias for 4 out of 5 criteria <sup>199,200,211,297,305-307</sup> , 5 studies had medium risk of bias for 3 out of 5 criteria <sup>198,202-204,304</sup> and 14 were rated high risk of bias <sup>88,100,197,201,206,291,295,298-304</sup> (Cochrane Handbook) <sup>284</sup>  "no specific components appeared to distinguish effective programs from ineffective programs for mortality and institutionalization ... Limited reporting of intervention implementation prevented further investigation into potential mediators and moderators."

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)  Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used)  Review Authors' Comments
			<p><i>participants remained for 100 days or more or if they were admitted for terminal care</i><sup>198</sup></p> <p><i>"institutionalized or deceased"</i><sup>801</sup></p> <p>Pooled nursing home and hospital admissions<sup>172,302</sup></p> <p>Administrative data on: <i>"nursing home admission"</i><sup>803</sup></p> <p><i>"nursing home placement"</i><sup>804</sup></p> <p><i>"moved to nursing home"</i><sup>805</sup></p> <p><i>"care home admissions"</i><sup>806</sup></p> <p><i>"admission to permanent residential care"</i><sup>197</sup></p> <p><i>"institutionalization"</i><sup>291</sup></p> <p><i>"institutional care"</i><sup>199</sup></p>		
<b>Home-based Primary Care (HBPC)</b>					
Totten, 2016 <sup>70</sup> (High, 2015)	Adults with chronic illnesses or disabilities	RCTs, observational studies, program evaluations	NA	<i>"There was insufficient evidence on which to base a conclusion about the impact of HBPC on nursing home admissions and nursing home days"</i> (0)	NA
<b>Physical Activity</b>					
Frost, 2017 <sup>71</sup> (Medium, 2016)	Community-dwelling adults	RCTs	NA	NA (0 studies)	NA

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s) Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used) Review Authors' Comments
	≥ 65 with mild or pre-frailty				
Gine-Garriga, 2014 <sup>72</sup> (Medium, 2013)	Community-dwelling adults ≥ 65 with frailty	RCTs	NA	NA (0 studies)	NA
<b>Falls Prevention</b>					
Guirguis-Blake, 2018 <sup>73</sup> (High, 2018)	Community dwelling adults ≥65 years	RCTs 25 weeks – 1 year	Self-reported data on: “move to institutional care” <sup>206,212</sup>  “Admitted to nursing home” <sup>208,214</sup>  “admission to institution” <sup>211</sup>  “admission to long-term care” <sup>210</sup>  “move to long-term care” <sup>213</sup>  Administrative data on: “institutionalization” <sup>207</sup>	Multifactorial intervention (7) <sup>206-212</sup> “mixed results on institutionalization...RR from individual trials ranged from 0.43 to 3.07 with wide confidence intervals...”  Exercise intervention (2) <sup>213,214</sup> “no statistically significant difference in the number of people transitioning to institutional care between the exercise and control groups at longest followup (6–12 months)”	2 studies good quality; 7 studies fair (USPSTF criteria) <sup>308</sup>  <u>Multifactorial Intervention</u> “prevalence of institutionalization in the control groups varied substantially, from 0.6 to 20.1 percent...”  <u>Exercise intervention</u> “wide confidence intervals reflect the rare event rate; the prevalence of institutionalization in the control groups varied from 2.8 percent over 6 months to 1.5 percent over 12 months...”
<b>Occupational Therapy</b>					
Steultjens 2004 <sup>74</sup> (Medium 2002)	Community-dwelling adults ≥60 years	RCTs, observational studies	Self-reported “institutionalization” <sup>215</sup>  1 yr	NR in review Original study (1) <sup>215</sup> --“During the follow up period, 19 patients were institutionalized. Twelve were from the control group, and seven were from the intervention group. This difference was not significant.”	1 low quality RCTs (modified from Jadad <sup>285</sup> and Verhagen <sup>309</sup> )  NR
<b>Different Residential Setting for Providing Personal Assistance</b>					
Montgomery, 2008 <sup>77</sup>	Community-dwelling adults	RCTs,	NA	NA (0 studies)	NA

Author, Year (quality, last year of search)	Population Inclusion Criteria	Included Study Design(s)  Follow-up Period	Definition of Long-term Nursing Home Placement	Effect (95% CI) on Long-term Nursing Home Placement (# studies)	Quality of Included Studies* (tool used)  Review Authors' Comments
(High, 2005)	≥ 65 who need assistance with ADLs due to permanent impairments (excluded if >50% have dementia)	observational studies			
<b>Light Therapy</b>					
Forbes, 2014 <sup>75</sup> (High, 2014)	Adults with dementia	RCTs	NA	NA (0 studies)	NA
<b>Assistive Technology</b>					
Van der Roest, 2017 <sup>80</sup> (High, 2016)	Adults with dementia	RCTs	NA	NA (0 studies)	NA
<b>Demonstration Projects for Integrating Acute &amp; Long-term Care Services</b>					
Johri, 2003 <sup>82</sup> (Low, 2000)	Elderly	Observational studies	Unclear, may be self-reported "still at home" (1) <sup>217</sup> or admission to nursing home (1) <sup>172</sup>	"After 6 months, two thirds of the experimental group were still living at home, and after 12 months, over 50% were still at home..." (1) <sup>217</sup> "...non-significant trend towards higher rates of admission to nursing home..." (1) <sup>172</sup>	NR

## Appendix 5.4 Detailed Results on Secondary Outcomes from Prioritized Eligible Systematic Reviews on Interventions

Intervention	Author, Year (quality, last year of search)	Mortality (# studies), Effect Size (95% CI)	Hospitalization (# studies), Effect Size (95% CI)	Other Secondary Outcomes (# studies), Effect Size (95% CI)
<b>Case Management</b>	Reilly, 2015 (High, 2013)	Mortality (9) and HQoL (3) "For mortality at 4-6, 12, 18-24 and 36 months, or participants' or carers' quality of life at 4, 6, 12 and 18 months, there were no significant effects."	(5) "There was no difference in the number of people admitted to hospital at six (4 RCTs, 439 participants), 12 (5 RCTs, 585 participants) and 18 months (5 RCTs, 613 participants)."	NR
	Tam-Tham, 2013 (High, 2011)	NR	(3) "no difference in the risk of hospitalization for the dementia CM group compared with usual care..." RR 1.00 (0.76, 1.33)	NR
	Hickam, 2013 (High, 2011)	(35) "Patients who were provided CM did not experience lower mortality in general populations of patients with chronic illness, in the frail elderly, those with AIDS, or in patients with congestive heart failure."	(30) "Although hospitalization rates were often included as an outcome, trials of CM generally did not demonstrate reductions in these rates. "	NR
	Cochrane 2016 (High, 2015)	(2) "very low quality evidence... that reablement may lead to little or no difference in mortality at nine to 12 months" RR 0.97 (0.74, 1.29)	NR	HQoL (2) "very low quality findings indicated that reablement may make little or no difference to QoL" 3 months—SMD -0.18 (-0.43, 0.07) 12 months—SMD -0.23 (-0.48, 0.02)
<b>Caregiver Support</b>	Griffin 2015 (High, 2014)	NR	NR	Function (23), HQoL (7) "The strength of evidence is low regarding the effectiveness of caregiver-involved interventions in improving patient outcomes in adults with dementia compared with usual care... We also did not find that caregiver-involved interventions were superior to ones that are patient focused or provide only health education, support, or psychoeducation."

Intervention	Author, Year (quality, last year of search)	Mortality (# studies), Effect Size (95% CI)	Hospitalization (# studies), Effect Size (95% CI)	Other Secondary Outcomes (# studies), Effect Size (95% CI)
Respite Care	Brown 2015 (High, 2013)	(16) Day clinic vs. all comparators OR 1.05 (0.85, 1.28)	NR	NR
	Lee, 2014 (High, 2012)	NR	NR	<u>Depression &amp; Anxiety (1)</u> MD -0.18 (-3.82, 3.46)
	Shaw, 2009 (High, 2008)	NR	NR	<u>Healthcare Costs (5):</u> "All of the included economic evaluations investigated the provision of day care interventions compared with customary care... Overall, few discernible benefits were found to be associated with the day care interventions..."
Preventive Home Visits	Stuck, 2002 (Medium 2001)	(18) "Preventive home visits appeared to reduce mortality, but results were again heterogeneous...there was strong evidence that the mean age of study participants was negatively associated with effects..." Overall RR 0.91 (0.81, 1.01) Lowest tertile of age (mean 72.7-77.5) RR 0.76 (0.65, 0.88) NS for higher tertiles	NR	<u>Function (16)</u> "...home visits appeared to have little effect on functional status, but results were heterogeneous... In multivariable analysis, the type of intervention ... explained about half of intertrial heterogeneity..." Overall RR 0.94 (0.83, 1.06) Studies with multi-dimensional geriatric assessment (6) RR 0.76 (0.64, 0.91)
	Mayo-Wilson, 2014 (High, 2012)	(53) "high quality evidence of a small relative effect ... but the absolute difference in mortality was close to zero and unlikely to be clinically important" RR 0.93 (0.87, 0.99), RD 0.00 (-0.01, 0.00)	(15) "moderate quality evidence of a small relative effect...that may not be clinically important" RR 0.96 (0.91, 1.01), RD -0.01 (-0.03, 0.00)	<u>HQoL (29)</u> "low quality evidence of no clinically important difference" <u>SMD -0.06 (-0.11, -0.01)</u>  <u>Falls rate (23)</u> "moderate quality evidence of small effect...but it was not statistically significant" OR 0.86 (0.73, 1.01)
Home-based Primary Care	Totten, 2016 (High, 2015)	(2) "Both studies that included mortality reported no significant	(11) "Four [high-quality] studies reported that hospitalization decreased with HBPC, while one	<u>Healthcare Costs (6)</u> "Two high-quality

Intervention	Author, Year (quality, last year of search)	Mortality (# studies), Effect Size (95% CI)	Hospitalization (# studies), Effect Size (95% CI)	Other Secondary Outcomes (# studies), Effect Size (95% CI)
		<i>difference between the HBPC group and a comparison group...</i>	<i>[high-quality] study reported an increase...</i>	<p><i>studies examined costs, and both calculated that HBPC lowered costs significantly...[One study of] all VA HBPC patients nationwide compared projected costs without HBPC to actual costs and reported an average reduction of 28.1 percent in costs for 6 months of HBPC enrollment...</i></p> <p><u>HQoL (2)</u>  <i>“...most caregiver outcomes were better for the HBPC group, and the patients experienced a statistically significant improvement in health-related quality of life”</i></p> <p><u>Function (1)</u>  <i>“...multi-site RCTs of HBPC in several VA medical centers found no significant difference in function between HBPC patients and usual care patients”</i></p>
<b>Physical Activity</b>	Frost, 2017 (Medium, 2016)	NR	NR	<p><u>Performance-based Physical Function (3)</u>  <i>“...group exercise interventions had a significant and beneficial effect on physical functioning...” SMD 0.37 (0.07, 0.68)</i></p>
	Gine-Garriga, 2014 (Medium, 2013)	NR	NR	<p><u>Performance-based Physical Function (4)</u>  <i>“Exercise significantly increased the performance measure SPPB by 1.87 units (95% CI, 1.17-2.57)...”</i></p>
<b>Falls Prevention</b>	Guirguis-Blake, 2018 (High, 2018)	<u>Multifactorial Intervention (23)</u> <i>“no difference in all-cause mortality at 6 to 36 months in the</i>	<u>Multifactorial Intervention (4)</u> <i>“no difference in the prevalence of hospitalization in the multifactorial</i>	<u>Multifactorial Intervention Falls (17)</u> <i>“lower rate of falls at the longest followup (6–12 months) in the</i>

Intervention	Author, Year (quality, last year of search)	Mortality (# studies), Effect Size (95% CI)	Hospitalization (# studies), Effect Size (95% CI)	Other Secondary Outcomes (# studies), Effect Size (95% CI)
		<p><i>multifactorial group compared to the control group...</i> RR 0.96 (0.79, 1.17)</p> <p><u>Exercise Intervention</u> (11) <i>"no significant association with all-cause mortality at longest followup (12–60 months) in the exercise group compared to the control group..."</i> RR 0.93 (0.71, 1.22)</p>	<p><i>versus control group...RR and OR point estimates ranged from 0.57 to 0.98."</i></p>	<p><i>multifactorial group than in the control group with substantial heterogeneity..."</i> IRR 0.79 (0.68, 0.91)</p> <p><u>Exercise Intervention Falls</u> (14)—<i>"significant reduction in the rate of incident falls at the longest followup (6–24 months) in the exercise group compared to the control group, with substantial heterogeneity..."</i> IRR, 0.87 ( 0.75, 1.00)</p>
<b>Occupational Therapy</b>	Steultjens 2004 (Medium 2002)	NR	NR	<p><u>Falls</u> (4) <i>"One high quality RCTs reported a statistically significant decrease in falls in elderly people who are at high risk of falling..."</i> OR 0.39 (0.22, 0.68)</p>
<b>Different Settings for Personal Assistance</b>	Montgomery, 2008 (High, 2005)	(4) <i>"...most studies reported some data about mortality, which suggest that personal assistance had no comparative impact..."</i>	NR	NR
<b>Light Therapy</b>	Forbes, 2014 (High, 2014)	NR	NR	<p><u>Sleep Duration</u> (6) <i>"...no effect of morning, evening, and all day bright light on total night sleep duration..."</i> MD -1.07 minutes (-35.47, 33.33)</p> <p><u>Cognitive Function</u> (3) <i>"pooled data revealed no significant effect...treatment..."</i> MD 1.24 (-0.81, 3.28) 95% CI -0.81 to 3.28, P = 0.24, n = 156)</p>
<b>Demonstration Projects</b>	Johri, 2003 (Low, 2000)	NR	(6) Mixed results	NR