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ORIGINAL ARTICLE

A systematic review of interventions for persons living with dementia: The Geriatric ED Guidelines 2.0

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Abstract

Background: The increasing prevalence of dementia poses significant challenges for emergency department (ED) care, as persons living with dementia (PLWD) more frequently experience adverse outcomes such as delirium, prolonged stays, and higher mortality rates. Despite advancements in care strategies, a critical gap remains in understanding how ED interventions impact outcomes in this vulnerable population. This systematic review aims to identify evidence-based ED care interventions tailored to PLWD to improve outcomes.

Methods: A systematic review was conducted in Ovid MEDLINE, Cochrane Library (Wiley), Scopus (Elsevier), and ProQuest Dissertations & Theses Global through September 2024. The review protocol was registered on PROSPERO (CRD42024586555). Eligible studies included randomized controlled trials, observational studies, and quality improvement initiatives focused on ED interventions for PLWD. Data extraction and quality assessment were performed independently by two reviewers, with disagreements resolved through discussion. Outcomes included patient satisfaction, ED revisits, functional decline, and mortality.

Results: From 3305 screened studies, six met the inclusion criteria. Interventions included nonpharmacologic therapies (e.g., music and light therapy), specialized geriatric ED units, and assessment tools, such as for pain. Tailored interventions including geriatric emergency units and community paramedic care transitions were effective in reducing 30-day ED revisits and hospitalizations. However, heterogeneity in

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study designs and outcomes precluded meta-analysis. Risk of bias ranged from low to moderate.

Conclusion: This review underscores the urgent need for standardized and evidence-based interventions in ED settings for PLWD. Approaches including multidisciplinary care models and nonpharmacologic therapies demonstrated potential for improving outcomes. Future research should prioritize consistent outcome measures, interdisciplinary collaboration, and person-centered care strategies to enhance the quality and equity of ED services for PLWD.

KEYWORDS
Alzheimer's disease and related dementia, dementia, emergency department, intervention, prevention, systematic review

INTRODUCTION

The number of older Americans (>65 years) with dementia is projected to increase from 7 million to 13 million between 2021 and 2050,[1] while the global burden will triple over the same time frame.[2] Emergency departments (EDs) are often the first point of contact for individuals with dementia during acute health crises.[3–5]

People living with dementia (PLWD) are at heightened risk for preventable adverse emergency care outcomes including delirium, prolonged hospital stays, and increased mortality.[6] They are also more likely to revisit the ED within 30 days.[3,7] However, ED clinicians report a lack of training and resources to compassionately and cost-effectively manage PLWD during times of emergency,[8,9] while Emergency Medicine-specific dementia detection strategies, best practices, communication strategies, and care transition approaches remain under-researched.[10–14]

The complexities and heightened risk associated with an ED visit for PLWD raise the need for more tailored approaches in emergency care. Suggested strategies to improve the experience or outcomes of ED care for PLWD include involving dementia care specialists to coordinate their care, engaging and communicating with patients' care partners early in the episode of emergency care, implementing nonpharmacologic interventions to manage agitation, and modifying the clinical environment to reduce stress and confusion.[13,15,16]

There remains a critical gap in measuring and quantitatively synthesizing how specific ED care processes for PLWD are effective from the perspective of patient experience and satisfaction.[14,17] This study aims to fill this gap by systematically synthesizing the evidence linking ED care processes for PLWD with health outcomes. By identifying and analyzing these care practices, we aim to provide evidence-based recommendations to enhance the quality and safety of ED care for dementia patients. This systematic review was conducted as a part of the Geriatric ED Guidelines 2.0 effort.[18]

METHODS

Study overview

This is a systematic review and meta-analysis of studies describing ED interventions for PLWD. The study protocol is being reviewed at the PROSPERO (CRD42024586555). This review followed PRISMA 2020 statement guidelines.[19]

Eligibility criteria

The following criteria for population, intervention, control, type of studies, and outcomes are listed below (Table 1).

Population

Persons aged 65 or older, living with dementia or cognitive impairment, presenting to an ED were the population of interest. We defined dementia (or Major Neurocognitive Disorder) as a neurodegenerative process characterized by problems with memory, judgment, orientation, and executive function,[20,21] and mild cognitive impairment (MCI) as a condition that affects a person's ability to think, learn, remember, judge, and make a decision.[22,23] The age cutoff of 65 was used as it was the common definition in the United States, but we allowed the age cutoff to be 60 to capture studies conducted elsewhere.[24] MCI is considered the preclinical stage of dementia in this systematic review.[23,25] Since our focus is on the dementia population, we included studies with more than 70% of the sample having dementia. Dementia was identified based on the past history, proxy history, risk stratification, or assessment tools.[26] Exclusion criteria included nonhuman, simulation, non-ED outpatient, hospital, or intensive care unit (ICU) as a source of the index encounter. An Emergency Medical Services study may be included if the enrollment occurred in the ED.

TABLE 1 PICO question.

Population	65 years or older persons living with dementia or cognitive impairment presenting to the ED.	Excluded: Nonhuman, Simulation, Index encounter in: non-ED outpatient, hospital, intensive care unit
Intervention	Any intervention in target population in the ED	
Comparator	Usual care	
Outcomes	Primary: Patient or caregiver satisfaction	Secondary: Patient/caregiver burden, ED revisits, ED length of stay, Fall, Functional decline, Delirium superimposed dementia, Mortality, Hospital admission rates, Hospital length of stay, and Sedation for agitation in the ED

Intervention and comparator

Studies were included if they described any intervention (including pharmacologic treatments) in the target population performed by physicians, nursing staff, and pharmacists, pharmacologic interventions performed by physicians, nursing staff, and pharmacists; furthermore, this intervention had to be compared to those receiving usual care. Studies describing screening through various risk scores, without any further intervention thereafter, were excluded.

Type of study

Randomized control trials (RCT), quasi-experimental, observational study, pre- and post-study, and quality improvement studies were eligible for inclusion. Exclusion criteria included case reports, case series (n up to 5), review articles, scoping/systematic reviews, and qualitative studies.[27]

Outcomes

Patient or caregiver satisfaction was the primary outcome. We chose patient or caregiver satisfaction as our primary outcome because it reflects a patient-centered perspective that is increasingly emphasized in geriatric emergency care and aligns with the values of older adults and their families. Furthermore, patient-reported outcome measures (PROMs), (Churruca et al. 2021) including satisfaction, are a key component of the GRADE framework and are particularly relevant for informing future geriatric ED guidelines. Secondary outcomes included patient/caregiver burden, ED revisits, ED length of stay, falls, functional decline, delirium superimposed dementia, mortality, hospital admission rates, hospital length of stay, or sedation for agitation in the ED.

Information sources

We searched the Ovid MEDLINE, Cochrane Library (Wiley), Scopus (Elsevier), and ProQuest Dissertations & Theses Global databases from inception to September 20, 2024. No language or other restrictions were applied.

Search strategy and article selection

The search strategy is detailed in Appendix 1. A medical librarian created the electronic search strategy, which was peer reviewed by another librarian who verified the validity and reproducibility.

Data collection process

Database search results were uploaded to Covidence by the medical librarian. All entries from the searches were first deduplicated in EndNote and again in Covidence. During title/abstract screening and full text screening, each entry was screened by at least two independent reviewers in Covidence; disagreements were resolved by a third independent reviewer or through discussion in the review team meeting. Data were extracted using a standardized data collection form. Each study was extracted by two independent reviewers; discrepancies were resolved by a third reviewer or through discussion in the review team meeting.

Data items

We planned to extract individual study results, including author, year, study design and number of sites, country, study sample characteristics, dementia assessment tool (index or reference test), age (average and SD or IQR), sample size, % male/female, dementia prevalence (%), stage of dementia (if available, descriptive), place of living, comorbidities,

frailty scale, and ED length of stay. Outcome data included days in hospital, admission rate, ED revisit (time interval up to reviewer), mortality, patient/caregiver satisfaction (if they are reported), patient/caregiver burden, fall (in the ED, hospital, and after getting home), functional decline (after ED visit), delirium superimposed dementia after ED visits, sedation (in the ED), and agitation in the ED.

Risk of bias assessment

The Newcastle–Ottawa tool (cohort study version) for observational studies and the Cochrane Risk of Bias 2 tool for RCTs were used.[28,29] The quality of each study was assessed by two independent raters. The rating was provided for selection, comparability, outcome domains, and a total score was used to classify them as low (Scores 0–3), moderate (Scores 4–7), and high risk of bias (8–10) for observational studies (Appendix 4). The Risk of Bias 2.0 (RoB 2) tool (Appendix 5) assessed bias in randomized controlled trials across five domains: the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selection of reported results. Each domain included signaling questions that guide judgments on bias risk, categorized as low risk, some concerns, or high risk based on a structured algorithm. The overall risk of bias was determined by aggregating domain-specific judgments, with a study rated as high risk if at least one domain is high or if multiple domains raise concerns. Otherwise, an online scoring guide was used for Cochrane risk of bias tools for parallel arm RCT and cluster RCT.[30,31] Disagreements were resolved through discussion between the two raters or in the review team meeting until consensus was reached.

Effect measures

We reported Absolute/Relative risk (RR), odds ratio (OR), risk difference, hazard ratio, and number needed to treat (NNT) for binary outcomes. These effects were extracted from the publications except NNT calculated from RR or OR using the online tool.[32]

Synthesis

Meta-analysis was planned but not conducted due to the heterogeneity of identified study designs. Instead, we conducted a qualitative review of the selected studies.

RESULTS

Study selection

A total of 3309 studies were identified in September 2024. Four duplicates were removed. Of 3305 remaining studies undergoing title and abstract screening, 3250 were excluded for ineligibility. Fifty-five studies underwent full-text review, of which six were eligible and included (Figure 1).

Study characteristics

The characteristics of the six studies are listed in Tables 2 and 3. Three studies were RCTs[33–35]—two were prospective observational studies[36,37] and one was a historical cohort study.[38] The study periods extended from 2018 to 2023. Two studies were conducted in the United States (Keene and Shah),[33,34] two in Australia,[35,37] one study from France[38] and one from Canada.[36] Two studies determined dementia via the Six-Item Screener,[35,37] two studies used medical record definitions,[38,39] while Keene used the Short Blessed Test (SBT)[40] and Shah used the Blessed Orientation Memory Concentration Test.[34]

Types of interventions were very heterogeneous, preventing meta-analysis (Tables 2 and 3). These interventions included light and music therapy,[33] community paramedic Care Transition Intervention (CTI),[34] a multidisciplinary team specializing in the care of frail older ED patients,[38] a multicomponent intervention[36] and two investigations that examined the Pain Assessment in Advanced Dementia (PAINAD) tool.[35,37]

Results of individual studies

We summarized each selected study qualitatively below. None of the studies reported patient satisfaction, which was our outcome of interest.

Keene et al.[33] conducted a pilot RCT at an urban academic ED to assess the feasibility of using light and/or music therapy in preventing hospital-associated delirium among adults 65 years and older in the ED. Exclusion criteria included Emergency Severity Index of 1, inability to consent, isolation precautions due to suspected SARS-CoV-2 infection, being legally deaf, intoxication, or presentation with a psychiatric chief complaint. Consented patients were screened for cognitive impairment with the SBT[40]; patients were enrolled in the trial if they tested positive for potential cognitive impairment (SBT score >4). Patients discharged from the ED were ultimately excluded from the study, but expected disposition was not considered an enrollment criterion. The study randomized 133 participants (median age similar across arms) into four parallel groups: music, light, both interventions, and control. The study was not adequately powered for any outcomes as it was a pilot study. Music was available through a bedside wireless speaker with either a classical or non-vocal jazz repeatable 2-h long playlist. Classical was the default option if the patient was not able to choose. Light therapy was provided by a bedside full spectrum lightbox that mimicked natural light at 6500 K color temperature and 5000 lux brightness. The Confusion Assessment Method was performed at enrollment by a research assistant and then repeated by an inpatient bedside nurse upon patient arrival

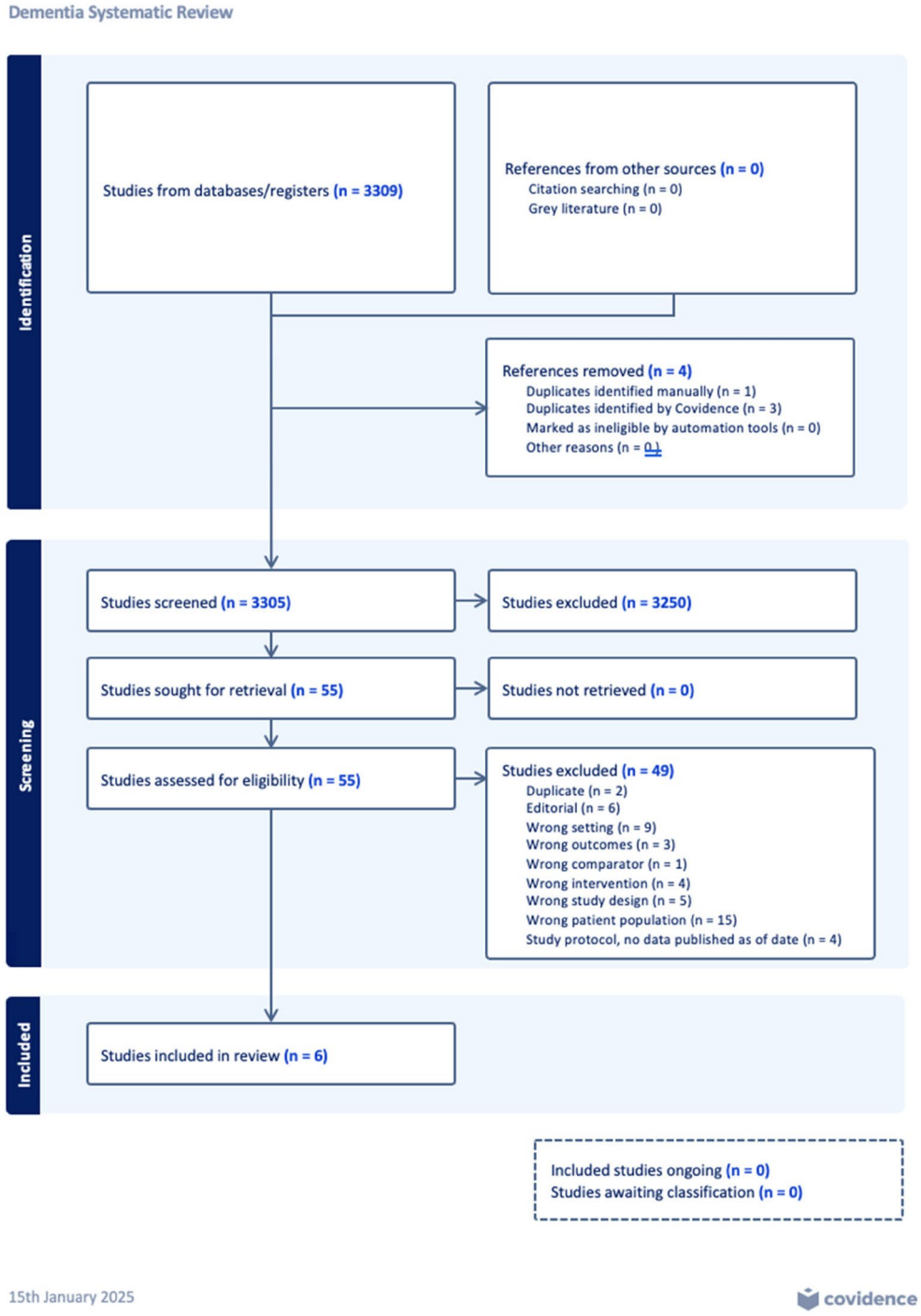

FIGURE 1 Selection of studies (PRISMA).

to the floor. Among the groups, delirium incidence was lowest in the music-only group (2/33, RR: 0.27, 95% CI: 0.06–1.23) and light-only group (3/33, RR: 0.41, 95% CI: 0.12–1.46). The combined music and light group (8/35, RR: 1.04, 95% CI: 0.42–2.55) showed no advantage over control (7/32). While statistical significance was not achieved, results suggest potential benefits of these nonpharmacologic interventions for delirium prevention. The study demonstrated the feasibility of implementing music and light therapy in the ED as well as patient tolerance for these nonpharmacologic approaches as measured by completion of interventions and adherence, setting the stage for larger investigations.

Shah et al.[34] conducted a preplanned subgroup analysis of a RCT to evaluate the effectiveness of an adapted version of Coleman CTI,[41,42] where no transition coaching was provided while the participant was in the ED, in reducing ED revisits (preplanned analysis) among cognitively impaired older adults. The study included 81 participants with cognitive impairment, identified by scoring >10 on the Blessed Orientation Memory Concentration,[40] (mean age: 78,

TABLE 2 Demographic summary of included studies.

Author, year	Design	Site	Country	Dementia assessment	Dementia prevalence	Sample size	Age	Sex, female%
Keene, 2023[33]	RCT	1	USA	SBT	All SBT >4	151	Median/IQR Music 84 (11), 2) Light 83 (8), 3) Music + light 83 (13), 4) Control: 84 (12)	Overall 61.7%, Music 51.5%, Light 60.6%, Music + light 65.7%, and Control 68.8%
Shah, 2022[34]	Subgroup of RCT	3	USA	BOMC	All BOMC >10	81	Mean 78.4 ± SD 10.1 years.	Intervention 64%, Control 47%
Bosetti, 2020[38]	Non-RCT	1	France	DSM-V	100%	801	Exposed group mean 87.0 (SD: 5), Control group 86.0 (SD: 6)	Exposure 73.5%, Non-exposure 71.6%
Fry, 2018[35]	RCT	8	Australia	SIS	100%	602	Intervention group: Median 86 (IQR: 79–90); Control group: Median 83 (IQR: 74–89).	Intervention 70%, Control 72%
Beauchet, 2022[36]	Non-RCT	1	Canada	MCD from record review	100%	365	Intervention mean 86.7 (SD: 5.2), Control mean 86.6 (SD: 5.4)	Exposure 69.8%, Non-exposure 63.1%
Fry, 2018[37]	Non-RCT	4	Australia	SIS	77%	181	Mean 85.5 ± SD 7.5 years	Overall 63.0%

Note: Stage of dementia, Placed of living, and Comorbidities are not listed as more than half of the studies did not report them.

Abbreviations: BOMC, Blessed Orientation Memory Concentration Test; DSM, diagnostic and strategic manual; IQR, interquartile ratio; MCD, major cognitive disorder; SBT, Short Blessed Test, SD, standard deviation; SIS, six-item screening.

TABLE 3 Intervention and outcome table.

Study author, year	Population	Intervention	Intervention type	Comparator	Outcome
Keene, 2023[33]	Admitted older adults	Music, light, and both	Nonpharmacologic Environmental Modification	Usual care	DSD: Music) 2/33 (RR: 0.27, 95% CI: 0.06–1.23, NNT: 6.26), Light) 3/33 (RR: 0.41, 0.06–1.23, NNT: 7.75), Both) 8/33 (RR: 1.04, 0.42–2.55, NNT: NA), None) 7/32 (Reference)
Shah, 2022[34]	Discharged older adults, substudy	Community paramedicine coaches[a]	Care Transition Intervention	Usual care	Intervention group had 75% decreased odds of an ED revisit within 30 days compared to those in the control group (OR: 0.25, 95% CI: 0.07–0.90), absolute numbers were 13/36 (36.1%) controls and 9/44 intervention (20.5%), and NNT 6.39
Bosetti, 2020[38]	Older adults presenting during office hours	Geriatric unit (MUPA unit)@	Multidisciplinary Geriatric ED Unit	ED care	Incidence of 30-day readmissions: The MUPA unit intervention had an OR of 0.68 (95% CI: 0.47–0.98), $p=0.03$. In univariate analysis, $p=0.04$. In the exposed group, 63 (15.8%) were readmitted after discharge. In the control group, 89 (22.2%) were readmitted, NNT 15.71
Fry, 2018[37] (Observational)	Older adults presenting to ED, mostly admitted	PAINAD tool	Validated Clinical Assessment Tool	NRS	Median time to analgesia: 90.0 min (IQR: 54.3–166.5), NRS: Median 5.5 (IQR: 3.0–8.0), moderate pain, PAINAD: Median 1.0 (IQR: 0.0–3.2), mild pain Analgesia Administration: 75% received analgesia, with 53% receiving opioids. Pain Intensity and Analgesia Relationship: Weak correlation (Pearson's $R=-0.019$ and -0.006), NNT: NA
Beauchett, 2022[36]	Older adults with MNCD, on stretcher, assessed with ER2	Multicomponent recommendations by ER2 tool[b]	Screening Tool with Tailored Care Recommendations	Usual care	Intervention period had less incident hospital admissions: Unadjusted model—OR 0.61, 95% CI: 0.40–0.93, $p=0.022$; Adjusted model—OR 0.59, 95% CI: 0.38–0.91, $p=0.018$, NNT: 8.2
Fry, 2018[35] (Cluster RCT)	Older adults, suspected long bone fracture, SIS higher than 4	PAINAD tool	Validated Clinical Assessment Tool	NRS	Time to first analgesic dose (Intervention: median 83 min, IQR: 48–158; Control: median 82 min, IQR: 41–147; $p=0.42$). Analgesia Within 60 min of arrival: Intervention: 28%; Control: 32% ($p=0.19$), NNT: 25. Sensitivity Analysis for Cognitive Impairment Group: Intervention: median 90 min; Control: median 103 min ($p=0.62$)

Abbreviations: CI, confidence interval; DSD, Delirium superimposed dementia; MNCD, major neurocognitive disorder; NA, not applicable; NNT, number needed to treat; NRS, numerical rating scale; OR, odds ratio; PAINAD, pain assessment in advanced dementia; RR, relative risk; SIS, six-item screening.

[a]Community paramedics coaches include home visits, phone calls, coaching focused on self-management: follow up, medications, red flags, and use of personal health records after ED visits.

[b]ER2 includes medications review, discharge planning, mobilizing, and reorientation measures, NRS: Numeric rating scale, @multidisciplinary team specializing in care of elderly patients in the ED.
[@]Develops individual health care plans, recommends additional assessments, and first treatments, also helps with disposition and home care services.

57% female) from three university-affiliated hospitals. Participants receiving CTI had a home visit 24–72 h after ED discharge by a trained community paramedic and follow-up phone calls post-ED discharge. During home visits, paramedics coached participants on CTI's four self-management pillars: patient follow up, medication self-management, knowledge of red flag symptoms, and use of a personal health record. The intervention significantly reduced the odds of 30-day ED revisits (OR: 0.25, 95% CI: 0.07–0.90) compared to usual care. The CTI did not significantly improve outpatient follow up or self-management behaviors but demonstrated promise for enhancing ED-to-home care transitions in this vulnerable population.

Bosetti et al.[38] conducted a historical cohort study to evaluate the effectiveness of a Geriatric Emergency Medicine Unit, known as the MUPA unit, for managing older patients with neurocognitive disorders (NCD) in the ED. Patients were included who had a diagnosis of NCD by DSM V and a medical record containing the terms: Alzheimer's, vascular, mixed, or frontotemporal dementia, dementia with Lewy bodies, or severe NCD. The MUPA unit is composed of an interdisciplinary team of physicians, nurses, and social workers who perform geriatric assessments and individualized care plans for patients. The study included 801 patients aged ≥75 years (mean age: 87, 72.5% female), comparing outcomes between those treated in the MUPA unit ($n=400$) and those receiving standard ED care ($n=401$). Patients treated in the MUPA unit experienced a 35% lower rate of 30-day readmissions (15.8% vs 22.2%, *adjusted* OR: 0.65, 95% CI: 0.46–0.94) after adjusting for confounders (age, living at home, history of falls, the Charlson Comorbidity Index, and diagnosis of fall risk). Although hospitalization rates were higher in the MUPA group (57.8% vs 47.1%), the intervention demonstrated the potential benefits of a multidisciplinary geriatric approach for improving outcomes by reducing 30-day readmissions (primary outcome) in this vulnerable population.

Fry et al.[35] conducted a cluster RCT to evaluate the impact of the Pain Assessment in Advanced Dementia (PAINAD) tool[43] on the time to analgesia for cognitively impaired older adults (≳ 65) in the ED with suspected long bone fractures. PAINAD is a tool developed to assess pain in patients with advanced dementia and is particularly useful in patients with aphasia. The study included 323 patients at intervention sites using PAINAD and 279 at control sites using standard pain assessment methods. Patients at all sites were administered the Six Item Screener (SIS)[44] prior to pain assessment by bedside nurses. Cognitive impairment was defined as a SIS score less than 4. At intervention sites, PAINAD was used on patients with a SIS score less than 4. Time to analgesia was defined as the time from ED arrival to the first dose of parenteral or oral analgesia. The median time to analgesia was 83 min at intervention sites and 82 min at control sites ($p=0.42$). A sensitivity analysis showed a nonsignificant reduction of 13 minutes in time to analgesia for patients at intervention sites (90 vs 103 min, $p=0.62$). While PAINAD did not significantly reduce time to analgesia, it demonstrated potential clinical utility in improving pain recognition in this vulnerable population. The study highlights the challenges of timely pain management for older adults with cognitive impairment.

Fry et al.,[37] conducted a multicenter observational study in four EDs to evaluate the reliability and utility of the PAINAD scale for assessing pain and improving analgesia in older adults (age mean: 85.5, range: 63–100) with cognitive impairment (CI) identified by SIS score of less than 4 at the bedside. The study included 181 patients (mean age: 85, 63% female) with suspected long bone fractures. The PAINAD scale showed good internal consistency (Cronbach's $\alpha=0.80$) and moderate correlation with the Numeric Rating Scale (NRS) for pain ($r=0.39$). Despite lower median pain scores on PAINAD compared to NRS (1.0 vs 5.5), the tool was implemented as a routine pain assessment tool during the study period, suggesting feasibility in this cohort. The study concluded that PAINAD is a possible alternative to NRS for pain assessment in older adults with CI but highlighted the need for broader integration of pain assessment with caregiver input and comprehensive assessment strategies.

Beauchet et al.[36] conducted a pre–post intervention study to assess the impact of the "Emergency Room Evaluation and Recommendations" (ER2) tool,[45] which is a validated clinical tool to screen older patients in the ED to identify those at high risk of hospitalization and longer length of stay (LOS) in the ED than those who are not at high risk. In addition to its assessment part, ER2 has a tailor-made intervention guide based on responses to ER2. These recommendations were: (1) medication review by ED physician and pharmacist; (2) discharge planning team; (3) availability of walking aid, fall risk identification and encouraging mobility; and (4) reorientation to time and place, assistance with basic needs, and toileting. The study included 356 participants aged ≥75 years with major neurocognitive disorder (MNCD) visiting the Jewish General Hospital ED. MNCD was defined by presence of MNCD diagnosis in a patient's medical chart. During the intervention phase, ER2-tool screening and tailored recommendations for ED staff after triage were compared to usual care and resulted in a 39% reduction in hospital admissions (OR 0.61, $p \leq 0.022$, adjusted for baseline covariates). The authors did not evaluate the rate of return ED visits. However, the LOS in the ED increased significantly, by approximately 4.28–5.56 h ($p \leq 0.008$). The study highlights ER2's potential to prevent hospitalizations through focused geriatric screening linked with immediately actionable emergency care responsiveness for persons with MNCD while acknowledging the trade-off of this additional screen-intervene approach in terms of extended ED LOS.

Risk of bias in studies

The risk of bias assessment for the three observational studies with the Newcastle–Ottawa scale showed that one study was rated as low risk of bias,[38] while two others[36,37] were unclear risk of bias (Figure 2). The RCTs were rated as high risk of bias for one study due to high risk for bias due to randomization and intended intervention,

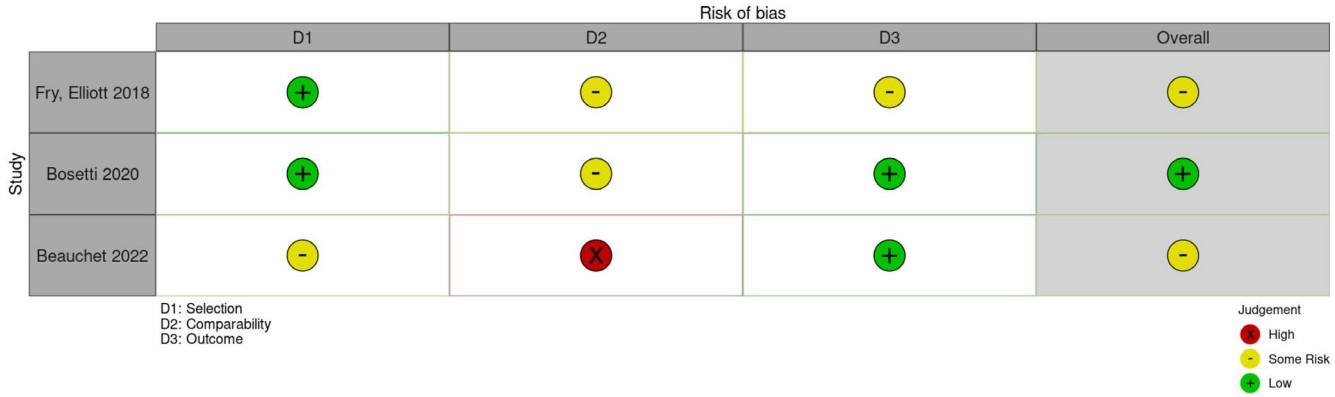

FIGURE 2 Risk of bias (cohort study).

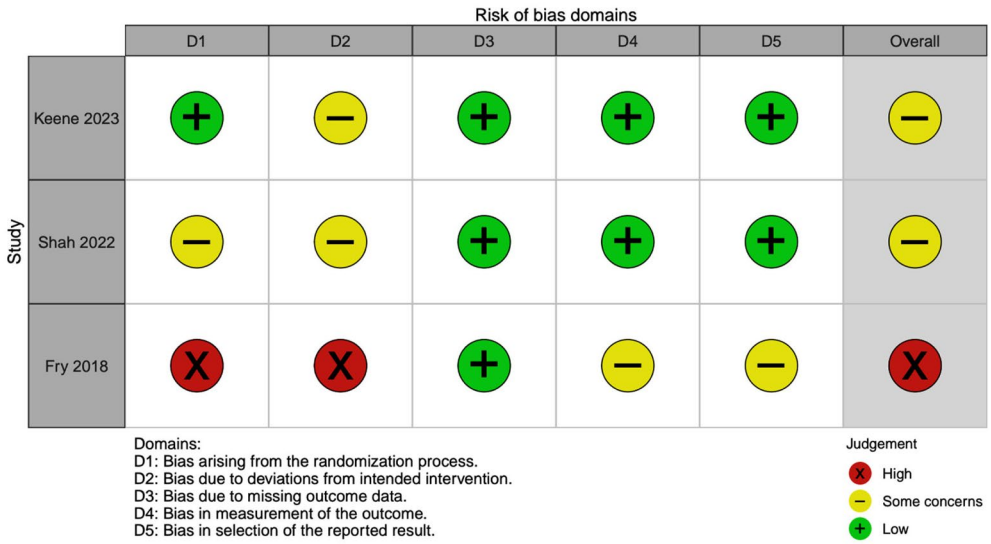

FIGURE 3 Risk of bias (RCT parallel and cluster).

and some concerns for two studies (Figure 3). Based upon the low quantity of direct evidence, the nonuniform approach to identifying PLWD across the included studies, the lack of a single dementia intervention, and the overall high risk of bias for the included RCTs and non-RCTs, the overall GRADE level of certainty for any ED intervention was very low.[46]

DISCUSSION

Our systematic review identified a paucity of primary research evaluating interventions for PLWD in the ED, with six studies published thru September 2024.[33–38] Two studies evaluated the same interventions, and the range of interventions included: light and music therapy, community paramedic home visits, a multidisciplinary team specializing in the care of older ED patients, a multicomponent intervention, and use of the PAINAD tool. None of these studies defined "dementia" or "cognitive impairment" in the same way or evaluated the same dementia intervention. Interventions examined many outcomes other than those typically reported (e.g., ED readmissions and hospitalizations). Patient-reported outcome was listed as our main outcome but was not reported from any of those studies, possibly because of a lack of standardized measurement or timing and logistics of outcome measurement. Our systematic review highlights the need for more standard outcome measures to include patient outcomes, process-oriented outcomes, and patient-reported outcome measures.[47,48]

Despite the increase in incidence of dementia and ED visits by PLWD,[49] the dearth of ED interventions designed to improve the experience, process, or outcomes of care is alarming. Although more than 10 years have passed since the initial Geriatric ED Guidelines[50] were published and 20 years since the American Geriatrics Society Research Agenda Setting process prioritized "interventional trials should be designed to determine the effect on outcomes of better screening and management of cognitive impairment in older ED patients,"[51] trial data is essentially nonexistent. Patient stakeholders and multidisciplinary clinical groups identified various challenges associated with the ED care for PLWDs, including

identifying and managing functional dependence, behavioral symptoms, and pain management using a unique tool or method to evaluate PLWDs.[13] During ED visits, PLWDs may experience disparities in treatment and negative consequences, such as hospitalization rate.[52] The heterogeneity of interventions evaluated and outcomes assessed, has previously prevented specific recommendations for ED interventions to improve outcomes for PLWD,[52] and our systematic review has yielded similar conclusions. The Geriatric Emergency Care Applied Research Network 2.0–Advancing Dementia Care (GEAR 2.0-ADC) is a research program aspiring to improve the experience, process, and outcomes of emergency care for PLWD.[10,12,13,14,16,53] GEAR 2.0-ADC has identified research priorities for improving emergency care for PLWD and their care partners.[10,12,13,14,16,53] These priorities pertain to communication and decision-making, dementia detection, ED care practices, and care transitions. Some recommendations for improving emergency care for PLWD include: evaluating for cognitive impairment,[26,54] limiting the use of sedation and physical restraints,[55] focusing on appropriate autonomy and maintaining functional capacity,[56] adapting communication strategies and conscientious inclusion of care partners, building a reliable geriatric ED and health care infrastructure,[57] and using transdisciplinary outcome measures.[58] To address these issues, some experts suggest adopting a partnership approach between carers and ED nurses and developing research priorities through consensus-driven methods involving diverse stakeholders, including patients and care partners.[16,52]

Given the heterogeneity in interventions and outcomes for the included studies, we were unable to conduct a meta-analysis or to evaluate interventions that influence our primary outcome of patient/caregiver satisfaction. However, two studies report interventions that decreased ED revisits[38] and hospital admissions[36] which were secondary outcomes of our systematic review. These interventions included the GEMU and ER2 disposition guide. Shah et al. also reported that a post-ED paramedic visit and a phone call follow up decreased the rate of 7-day ED returns, but not 14-day ED returns. (Shah et al. Cite) EDs are often the front porch to the health care system for older adults, accounting for 18% of ED visits and 40% of ED-to-hospital admissions.[59] However, the fast-paced ED environment often conflicts with the complex needs of older patients, particularly PLWD.[59] Research priorities include developing geriatric-focused dementia-friendly EDs, improving pain assessment by using the appropriate tools for PLWD, and implementing care transition interventions.[10–14] Nonpharmacologic interventions, such as individualized music, show promise in managing dementia-related behaviors.[60] Overall, these papers highlight the need for pragmatic research that quantifies the potential benefits and unintended harms of tailored approaches to enhance ED care for PLWD and their caregivers.[33–38] The current reality that this systematic review identified just six such studies likely reflects historically limited funding streams to support ED dementia innovations that become associated with a scarcity of investigators in that field in addition to regulatory restrictions from institutional review boards.[61,62]

The studies employed interventions that appeared reasonable and likely to be valued by both clinicians and PLWD. However, the anticipated benefits were not consistently observed when process measures such as increased hospitalizations and longer LOS were evaluated. This highlights the importance of adopting more standardized dementia assessments, reproducible interventions tested by external validations, and the selection of outcomes, namely, patient-reported outcome measures in the future. This systematic review sought to evaluate person-centered outcomes for PLWD during episodes of ED care for serious physical illness or injury, but found no such outcomes assessed. Incorporating person-centered outcomes would provide a more comprehensive understanding by which to prioritize research approaches and funding streams.[63] We are hopeful that multiple future health outcomes research teams will endeavor to explore the same ED interventions PLWD and evaluate the same outcomes in order for stakeholders to begin to understand reproducibility and external validity. We advocate that those researchers employ rigorous study designs[24] that incorporate underlying biases, including historical selection bias stemming from the source population's ability to consent, while simultaneously striving to control for confounders like frailty and social determinants of health. Interventions should be evaluated with disease- and process-oriented outcome measures that are relevant to key stakeholders such as payers, hospital administrators, and funders, such as mortality, 30-day readmission, and disposition to skilled nursing facility. However, patient-oriented outcome measures should not be forgotten, and a balance of disease-, process-, and patient-oriented outcomes will be required to build sustainable evidence-based clinical practice guidelines for ED and post-ED management of PLWD and their caregivers.[47,64] Future studies should focus on promising interventions for PLWD and caregivers, such as timely and effective pain management,[13] dementia-informed communication strategies,[11]conscientious efforts to acknowledge and reduce caregiver stress,[65] the use of an ED activity cart,[66] and reducing delirium superimposed on dementia.[67]

Limitations

First, it is possible that we did not identify an ongoing intervention study as we did not include gray literature or protocol registries in the strategy. Second, there may be interventions outside of the emergency care setting reported in the literature that were not considered but may be relevant for adaptation or implementation. Nonetheless, interventions outside the ED would represent indirect evidence and were outside the scope for this systematic review of direct evidence to inform GRADE-based clinical practice guidelines.[68] Third, without a uniform approach to assessing the presence or absence of dementia, our included studies may have included different proportions of dementia or stratifications of dementia severity, and extrapolating the interventions to different populations of PLWD might render different outcomes. Fourth, our systematic

review did not include any studies that included early-onset dementia in the ED. Lastly, even if all of the included studies had used the same method of defining dementia's presence or absence, relying on past history or proxy history is imperfect in ED settings and may have missed a large proportion of individuals with dementia.[69]

CONCLUSION

Despite the growing incidence of dementia and the increasing burden on EDs, the evidence for effective, consistent, and reproducible interventions remains limited. This systematic review showed that few studies have examined the impact of ED-based interventions for PLWD on process outcomes and found no research exploring patient-oriented outcomes. The scant existing literature cannot support any confident management recommendations, thus highlighting the critical need for ongoing study of interventions to improve emergency care for PLWD. While some interventions demonstrated promising outcomes, such as reduced ED revisits and hospital admissions, significant variability in study design, interventions, and outcomes precluded a meta-analysis. This underscores the urgency for standardized protocols and robust research to address the unique challenges faced by PLWD in ED settings. Future efforts should focus on interdisciplinary collaboration, stakeholder engagement, and consensus-driven research priorities to establish evidence-based guidelines that enhance the safety, quality, and equity of emergency care for this vulnerable population. Our future steps include rating the level of certainty using the GRADE approach.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

S.L., S.W.L., C.R.C., L.L.-S., J.V.O., T.H., and L.C.C. contributed to the design of the study. S.L., M.K., K.H., J.J., C.D.H., L.L.-S., J.V.O., M.S., J.S., and L.R. selected articles, evaluated the risk of bias, and extracted data. A.W. generated the search strategy and identified the articles. All the authors reviewed the initial draft and approved the final manuscript.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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