Delirium prevention and management in an adult intensive care unit through evidence-based nonpharmacological interventions: A scoping review

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ABSTRACT

Objective: To map and review current literature to describe evidence-based nonpharmacological interventions for delirium prevention and management in adult critically ill patients.

Introduction: Previous research has demonstrated the efficacy of nonpharmacological interventions for intensive care unit (ICU) delirium; however, the heterogeneity and complexity of these interventions make it challenging to disseminate and integrate into clinical practice.

Design: This scoping review follows the Joanna Briggs Institute (JBI) Protocol Guidelines.

Data sources: Cumulative Index of Nursing and Allied Health Literature, Medical Literature Analysis and Retrieval System Online, PsycINFO, JBI, ProQuest, and Excerpta Medica databases were searched until August 2023.

Review methods: Double screening, extraction, and data coding using thematic analysis and frequency counts. Reporting followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines using the extension for scoping reviews.

Results: Thirty-three primary research articles were included; thirty-one were quantitative, and two were qualitative. Four categories of interventions were identified: instrument-based therapeutic interventions (n = 10) consisting of the use of music, light, mirror, and occupational therapy; nurse-led interventions (n = 5) consisting of interventions directly delivered by the nurses with mobilisation, orientation, and cognitive stimulation being the most common types of intervention. Family-delivered interventions (n = 5) are delivered directly by family members, with extended visitation and orientation being the most utilised. Multicomponent interventions (n = 13) combine different aspects of single interventions into care bundles and programs.

Conclusion: This review identified a lack of consistency in applying nonpharmacologic interventions to prevent and manage delirium in adult ICUs. Standardised evidence-based guidelines addressing all aspects of single-component or multicomponent nonpharmacological delirium interventions, along with support for ICU staff utilising these interventions and family member education and support, are required. Without consistent involvement from the healthcare team and patient families, opportunities may have been lost to optimise family-centred care practices in critical care settings.

Patient or public contribution: No patient or public contribution was necessary for this review.

Protocol registration: The protocol registration for this review can be accessed via Open Science Framework at https://doi.org/10.17605/OSF.IO/CMQWG.

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Summary of relevance
Problem or Issue
Consistent application of evidence-based non-pharmacological interventions is needed in adult ICUs to address the gap in delirium care.
What is already known
Nonpharmacological interventions have been identified to be effective in preventing and managing delirium in adult ICUs.
What this paper adds
This review synthesised and categorised evidence-based nonpharmacological interventions for delirium prevention and management in adult ICUs and provided valuable insights into the interventions. These insights can support their dissemination and integration into patient care, thereby enhancing the quality of care in adult ICUs.

1. Introduction

Acute delirium is a serious complication that affects hospitalised adults and is associated with increased mortality and morbidity rates (Lauretani et al., 2020). Delirium is an acute brain dysfunction that presents as a collection of signs and symptoms that are characterised by a fluctuating mental status accompanied by inattention, altered level of consciousness, and disorientation in thinking (American Psychiatric Association [APA], 2013; Society of Critical Care Medicine, 2013).

Delirium is a reversible condition that can be prevented, yet continues to be under-recognised and under-managed in clinical practice (Lange, Lamanna, Watson, & Maier, 2019; Wijdicks, 2021). All hospitalised adults are at risk of developing delirium (Marquetand et al., 2021), and delirium is estimated to occur in about 53% of the adult patient population during their hospital stay (Inouye, Westendorp, & Saczynski, 2014). However, the incidence of delirium increases to 74% of all patients in adult intensive care units (ICUs) and to 80% in those patients who have been mechanically ventilated (Inouye et al., 2014).

2. Background

The cause and pathophysiology of delirium are not fully known but are usually associated with an underlying physiological disturbance (Mooyeon et al., 2018). A range of predisposing factors for delirium have been identified. These include age and gender (older men), single relationship status, living alone, lower educational status, reduced functional status, a previous history of delirium, and clinical factors such as low haemoglobin, previous cognitive decline, depression, and abnormal renal markers (Foroughan et al., 2016). The diversity of predisposing factors indicates that a multifactorial approach may be beneficial to the prevention, treatment, and management of delirium (Foroughan et al., 2016). In ICU, the development of delirium is compounded by other physiologically related factors. These include the severity of critical illness, sleep disturbance, unfamiliarity with the ICU environment, sedatives, and nonreversible factors such as cognitive impairment (McPherson et al., 2013). A recent study by Kim, Jin, Jin, and Sun-Mi (2020) concluded that the development of delirium in adult ICU patients may predominantly be related to sepsis, thrombocytopenia, and the presence of infection. Kim et al. (2020) also identified that

sepsis-associated delirium was more likely to occur in critically ill patients aged over 65 years, exhibiting low levels of consciousness, tachypnoea, and high dependency on nursing care. Anticholinergic drug atropine is often used in ICU and has also been linked to delirium due to its effect on the central nervous system, resulting in altered perception, attention, and cognitive function (Maravi, Mishra, Singh, & Niranjan, 2020). Acute alcohol withdrawal was also noted as a predisposing factor to the development of delirium in the ICU (Wijdicks, 2021). Amongst all factors associated with delirium, age, functional dependence, previous cognitive impairment, and critical illness are the most common predisposing factors. These predisposing factors are commonly encountered in ICU, hence contributing to the increased rate of delirium.

Delirium also has a significant psychological impact on patients and family members, caregivers, and health professionals. This has been postulated to be because of the complexity of its development, the lack of standardised interventions, and the challenges associated with managing delirium symptoms such as agitation and combativeness (Ewens, Collyer, Kemp, & Arabiat, 2021). Delirium carries a great risk of mortality and morbidity, with a risk ratio of 2.19 (94% confidence interval) for developing delirium in a cohort of ICU patients (Lauretani et al., 2020). Of the 172 patients enroled in a study by Aliberti et al. (2015), the prevalence of delirium symptoms and their impact on one-year mortality in patients with severe pneumonia in a respiratory high-dependency unit, 44% of patients who died during hospitalisation had delirium compared with 27% of those who survived. This is supported by Fiest et al. (2021) who concluded that ICU delirium is associated with increased mortality (hazard ratio, 1.12 [95% confidence interval]) 0–30 days after hospital discharge.

The incidence of delirium is also associated with long-term cognitive decline and, in the context of dementia, increasing the severity of it in older patients (Goldberg et al., 2020; Lauretani et al., 2020). The impact of delirium can also result in prolonged hospital length of stay (LoS), with high financial costs to patients, healthcare systems, and the economy (Mattison, 2020). Prolonged LoS and ICU admission have been recognised in patients with delirium-related cognitive impairment compared with those without (Tropea, LoGiudice, Liew, Gorelik, & Brand, 2017). The cost associated with hospital LoS for all cognitively impaired patients, including patients with delirium, was 51% greater than for those without cognitive impairment (Tropea et al., 2017).

The management of delirium in the ICU predominantly comprises pharmacological therapies, including antipsychotics. However, there is a paucity of evidence to support the efficacy and safety of these pharmacological interventions in treating delirium (Society of Critical Care Medicine, 2013). The reliance on pharmacological methods to manage delirium has been postulated due to a lack of evidence-based strategies to prevent and manage acute delirium (Ewens et al., 2021; McKenzie & Joy, 2020). Studies have demonstrated that pharmacological interventions are not effective in the context of delirium management; thus, delirium remains highly prevalent in the ICU despite the reliance on pharmacological interventions (Chen et al., 2022; Inouye et al., 2014).

The long-term effects of these pharmacological therapies for delirium management are unknown, and implementing strategies with a limited evidence base to manage this significant health issue is not without risk (Chen et al., 2022; McKenzie & Joy, 2020). As a complementary approach, nonpharmacological interventions have been suggested as more effective than the use of drugs (Chen et al., 2022). Nonpharmacological interventions can include environmental reorientation, family involvement, sensory stimulation, early mobilisation, noise minimisation, sleep promotion, music therapy, and other nonpharmacological interventions that have been identified in the literature (Bannon, McGaughey, Clarke, McAuley, &

Blackwood, 2018; Collet, Thomsen, & Egerod, 2019; Johnson, Fleury, & McClain, 2018). The involvement of family members in delirium care is evolving and has been identified as acceptable to family members and ICU clinical staff (Bannon et al., 2018; Zamoscik, Godbold, & Freeman, 2017). Family involvement is one of the most utilised nonpharmacological interventions in delirium prevention and management, but how family members are involved in delirium care varies considerably from one clinical setting to another (Bannon et al., 2018; Burton et al., 2021). This emerging area has shown promise, but the evidence base is lacking to be able to be widely implemented into clinical practice.

It is therefore timely to explore evidence-based nonpharmacological interventions currently utilised in clinical practice and how these are integrated into patient care. Because of the paucity of literature in this area, it was appropriate to conduct a scoping review of the literature on the topic and assess the quality of the available evidence. This enabled the synthesis and categorisation of the findings and provided insight into the integration of evidence-based nonpharmacological intervention for delirium in the ICU. The significance of this scoping review is that it adds to the body of knowledge around delirium in adult ICU settings by mapping out current evidence up to 2023, which has explored the application of nonpharmacological interventions used in adult ICU to prevent and manage delirium. The interventions identified may provide the foundation for further exploration through systematic review or research study. The review adds to the existing literature by mapping out primary research articles with quantitative and qualitative designs without year limitations and critically appraising the quality of the included articles (Bannon et al., 2019; Burry et al., 2021; Deng, Cao, Zhang, Peng, & Zhang, 2020; Kang et al., 2018; Rivosecchi, Smithburger, Svec, Campbell, & Kane-Gill, 2015; Sahawneh & Boss, 2021). Because of the ambiguity and heterogeneity of the nonpharmacological interventions that exist for delirium in adult ICUs, this comprehensive scoping review will be valuable in enhancing the clarity of these interventions and making the dissemination of these findings more feasible in adult ICUs.

3. The review

3.1. Objectives

To identify and review current literature to describe nonpharmacological interventions for delirium prevention and management in critically ill adult patients and to assess and present the published evidence supporting each intervention. We further assessed the quality of individual evidence, which may support the reader to make more informed decisions in the choice of interventions to apply or standardise in clinical practice.

3.2. Review question

What is the evidence that underpins nonpharmacological interventions for the prevention and management/minimisation of delirium in the adult ICU?

4. Methods

4.1. Design

A scoping review methodology was used to address the aim of the study. The scoping review adhered to the Joanna Briggs Institute (JBI) reporting guidelines for conducting scoping reviews (Peters et al., 2020), with the following nine steps being undertaken: (1) defining and aligning the objectives and question; (2) developing and aligning the inclusion criteria with the objectives and question; (3) describing the planned approach to evidence searching, selection, data extraction, and evidence presentation; (4) searching for the evidence; (5) selecting the evidence; (6) extracting the evidence; (7) analysing the evidence; (8) presentation of the results; and (9) summarising the evidence. Reporting followed the EQUATOR Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using the extension for scoping reviews (PRISMA-ScR) (Tricco et al., 2018). A protocol was registered on Open Science Framework.

4.2. Search methods

The first author (GUJ) drafted the search strategy with the support of an experienced academic librarian and refined it with the co-authors. A preliminary search of Medical Literature Analysis and Retrieval System Online (MEDLINE), the Cochrane Database of Systematic Reviews, and JBI Evidence Synthesis was conducted, and no current systematic reviews or scoping reviews on the topic were identified. An initial limited search of MEDLINE and Cumulative Index of Nursing and Allied Health Literature (CINAHL) was undertaken in June 2022 to identify articles on the topic. The initial limited search of CINAHL and MEDLINE used the Medical Subject Headings (MH) terms "Intensive Care Unit" or "critical* ill*" and "delirium". Following this initial search, the text words in the retrieved papers' titles, abstracts, and index terms were analysed to identify key parameters used to describe the topic area. The authors revised the search strategy, and a systematic search of six databases was commenced, including the CINAHL, MEDLINE, PsycINFO, JBI, ProQuest LLC, and Excerpta Medica databases (Embase). The first author completed the search in December 2022 with no date restriction and rerun the search in August 2023. Table 1 provides the core terms used to develop the search strategy. The Supplementary Material Database Search (Appendices 3–8) includes the combination of keywords used for each database.

4.2.1. Inclusion criteria and exclusion criteria

The scoping review considered primary research papers of qualitative, quantitative, or mixed-method designs published in English in a peer-reviewed journal and all adult categories until August 2023. The reference list of the identified papers was reviewed for any additional relevant articles. Case reports, systematic reviews, meta-analysis and scoping reviews, opinion papers, and unpublished (grey) articles on the research area were excluded from the review as the review seeks to find and synthesise evidence-based nonpharmacological interventions currently being utilised in practice. The criteria for selecting papers were based on the participants, concept, and context mnemonics recommended by JBI methods (Table 1).

Table 1
Search terms.

Participants	ICU patients	Intensive Care Units (MeSH) OR intensive care OR critical care OR critical care (MeSH)
Concept	Nonpharmacological interventions aimed at Delirium prevention/minimisation	Non-pharmacologic* Delirium OR prevention* OR intervention* OR treatment* OR Delirium (MeSH)
Context	Adult ICU	Applied as limiter 'All Adults' to Intensive Care Units (MeSH) OR intensive care OR critical care OR critical care (MeSH)

4.2.2. Participants

Participants comprised any patient (≥18 years old) admitted to an ICU.

4.2.3. Concept

This review's main concept of interest was the non-pharmacological interventions utilised in the prevention, minimisation, or management of delirium. Articles reporting on nonpharmacological and pharmacological interventions were included if the article's emphasis was not on pharmacological interventions only; in such articles, data about nonpharmacological interventions were extracted. Papers focusing on other types of brain dysfunction other than delirium were not included.

4.2.4. Context

Articles were included if they were conducted in an adult ICU. Nonpharmacological interventions utilised for delirium in the general hospital wards, rehabilitation, or community facilities were not included.

4.2.5. Screening and critical appraisal

EndNote (version 20.1; Clarivate Analytics, Boston, Massachusetts) and Rayyan supported the screening of the studies (Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016). All search results were uploaded into EndNote, and duplicates were removed. The search results were uploaded into Rayyan to complete the title, abstract, and full-text screening (Ouzzani et al., 2016). One author screened articles at the title level, which another author verified. Two authors reviewed at the abstract and full-text level for eligibility for inclusion. Any conflicts were resolved by discussion with the third author.

Study quality was assessed and scored independently by two of the authors (GUJ and BE) using the standardised JBI critical appraisal instruments (Munn et al., 2019). Any conflicts were resolved through discussion with the third and fourth authors (AT-B and CM). Cohort studies required 11 questions to be completed, randomised controlled trials (RCTs) required 13 questions to be completed, the analytical cross-sectional study required 8 questions to be completed, and the quasi-experimental study required 9 questions to be completed, whereas the qualitative research studies required 10 questions to be completed (see Supplementary Material Critical Appraisal, Appendix 1 & 2).

4.2.6. Data abstraction

The first author (GUJ) developed a data charting form following JBI recommendations and adapted it to reflect the aims of this review. The data charting form was trialled on a small portion (n = 11) of the articles before using it for all the articles. The extracted data included authors, year published, country of origin, settings, study aims specific to delirium, study design/methods and nonpharmacological interventions, sample size, population, inclusion/exclusion criteria, results relevant to the review and limitations. Data extraction was completed by the first author and reviewed by a second author. The authors discussed the results and updated the data charting form wherever applicable (see Table 2).

4.2.7. Data synthesis and analysis

Results were synthesised and reported according to the concepts of nonpharmacological interventions aimed at delirium prevention or minimisation. The authors performed a descriptive analysis using the extracted data to index and summarise the included studies. Table 2 contains information related to the description of the included studies. Following this, the authors conducted a thematic analysis to discuss the categories of the key results of the review (Thomas & Harden, 2008). A thematic analysis was used to identify the key characteristics of nonpharmacological interventions utilised in delirium prevention and management to provide further clarification and insights into the interventions. The key results of the study focusing on the nonpharmacological interventions aimed at preventing or minimising the severity of delirium in adult ICU formed the basis of the categories. The authors followed the steps in the inductive thematic analysis described by Thomas and Harden to obtain data (Thomas & Harden, 2008). The analysis consisted of the following steps: (i) Line-by-line codes and related categories were extracted based on the description of the studies' findings in relation to the overall study aim. (ii) Creating analytical themes from the studies (see Table 3).

5. Results

5.1. Overview of the review findings

A total of 1079 papers were identified through database searches. Of these, the full text of 72 articles was assessed for eligibility in the review (see PRISMA-ScR diagram in Fig. 1). This review yielded 33 published studies dated between 2011 and 2023. Going by the continents, most publications originated from Asia (n = 11), followed by North America (n = 8), South America (n = 5), Europe (n = 6), Australia (n = 2), and Africa (n = 1). ICU was the setting of all included studies.

A heterogeneous range of study designs was utilised, with the most common being quantitative studies with RCT (n = 22), cohort (n = 7), cross-sectional (n = 1), quasi-experimental (n = 1), and qualitative studies (n = 2). Sample sizes were variable, ranging from 16 to 1749. Most studies aimed to study the association of single-component nonpharmacological interventions with delirium (n = 20), whereas others aimed to study the association of multi-component nonpharmacological interventions with delirium (n = 13).

In the assessment of the methodological quality, it was found that the seven cohort studies were of high quality; it was unclear if confounding variables were identified in three of the studies (Balas et al., 2014; Kruger, Coetzee, & White, 2018; Rosa et al., 2019), and if strategies to deal with the confounding factors were implemented in four of the studies (Patel, Baldwin, Bunting, & Laha, 2014). In all the cohort studies, it was unclear if there were strategies to address incomplete follow-up with participants, while in six of the studies, it needed to be clarified if follow-up was conducted. Most of the included studies were of high quality, and Supplementary Material JBI Critical Appraisal (Appendix 1) outlines the aspects that needed to be addressed or clarified in the studies. Some of the studies included in this review were of low quality, which compromises the reliability of the results. When considering the application of this evidence to practice, the findings should be considered with caution.

5.2. Main findings

The findings of this review have identified that there are many nonpharmacological interventions being utilised for delirium prevention and management in adult ICUs. The first theme was instrument-based therapeutic interventions such as occupational, music, light, and mirror therapy. These interventions were indirectly delivered to patients by the staff by utilising these instruments. The second theme was nurse-led interventions directly delivered by nurses to the patients, consisting of cognitive stimulation, mobilisation, mentorship and family support, multimedia education, and orientation. The third theme was family-led interventions, which are delivered directly to the patients by their family members, and they consist of orientation, memory cues, sensory checks, visitation, cognitive stimulation, and an automated voice reorientation program. The fourth theme is multicomponent interventions, which combine various components of the three categories and bundle-

Table 2
Study characteristics of the articles included in the review.

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
1	Álvarez et al. (2017)Chile	Medical and surgical ICU.	To determine the impact of occupational therapy intervention in duration, incidence, and severity of delirium in elderly patients in the ICU	Pilot randomised controlled trial (RCT), nPP (nonpharmacologic prevention), plus early and intensive occupational therapy within the first 24 hrs of admission. Control group (n = 70) Experimental group (n = 70)	Nonmechanical ventilated ICU patients aged > 60 years, within 24 hrs. 5 days. Confusion Assessment Method for the ICU (CAM-ICU).	Management of delirium: The density of delirium was significantly lower in the experimental group. Incidence of delirium was 20% (n = 14) in the control group and 3% (n = 2) in the experimental group. Delirium severity was similar between the two groups (mean score 10 vs 9). Patient days with delirium, the control group (27.5 days of 335) and the experimental group (3.5 days of 339). The control group had higher risk of delirium than the experimental group.	Exclusion of some predisposing factors of delirium such as mechanical ventilation, cognitive impairment, dementia, and history of delirium. No mention of ethical approval.
2	Contreras et al. (2021) Colombia	Medical & surgical ICU.	To determine the efficacy of a multicomponent nursing program to prevent delirium in critically ill patients.	Parallel, double-blind RCT. Cognitive stimulation nearly 15min: time and space orientation and family support. Control group (n = 41) Experimental group (n = 40)	ICU patients > 18 and > 24 hrs in ICU. Vasoactive drugs, mechanical ventilation, invasive monitoring, RASS −3 to +4, no delirium at admission and 40% chance of delirium per the PRE-DELIRIC model. CAM-ICU. 15 min.	Delirium incidence was 5% in the intervention group vs 24% in control group. Rate of incidence of delirium was 42.37 per 1000 person/days in the control group vs 7.87 per 1000 person/days in the intervention group.	Several nonpharmacological interventions were applied together, making it difficult to determine the effectiveness of each single-component intervention. The effectiveness of the interventions to manage delirium severity was not evaluated.
3	Damshens et al. (2018) Iran	General ICU	To study the effects of music therapy on the incidence of delirium in ICU patients	RCT. Music therapy twice a day for 45 min duration. Control group (n = 40) Experimental group (n = 40)	ICU patients > 15 years with no history of cognitive impairment, depression, taking psychotropic drugs, drug abuse and alcohol abuse, and no visual or hearing loss. CAM-ICU. 45 min.	15 patients (37.5%) in the interventional group vs 16 patients (40%) in the control group had delirium. Therefore, no significant difference.	No mention of ethical approval. The patients were also treated for delirium with pharmacological interventions, and it is unclear if these may have affected the result of the music therapy on the patients.
4	Eghbali-Babadi et al. (2017) Iran	ICU	To assess the effect of the relationship between the family and patient on the incidence of delirium.	RCT. A family member selected by the patient was allowed to visit from the morning after surgery, once a day for 30–40 min and communicated to the patient based on education received by the nurse. Control group (n = 34) Experimental group (n = 34)	Cardiovascular ICU patients aged between 18 and 70 years. Availability of family member, no drug addiction history, alcohol, smoking, delirium, cognitive disorder, blindness and deafness, family history of surgery, no intubation. CAM-ICU. 30–40 min.	Incidence of delirium on postoperative day 2 was 11.76% in the interventional group vs 23.53% in the control group. Postoperative day 3 was 8.83% vs 26.58% in interventional and control groups, respectively.	The follow-up time was short because a longer follow-up duration might provide greater insights into the effects of the intervention.

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Table 2 (*continued*)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria / Delirium tool/duration	Results	Limitations
5	Fahimi et al. (2020) Iran	Cardiovascular ICU	To determine the effect of multimedia education on postoperative delirium in patients undergoing coronary artery bypass graft (CABG)	Parallel RCT. Multimedia CD with 3 educational videos of 4–6 min duration 5–7 days before surgery. Video 1: cardiologist information about the disease and procedure, Video 2: a nurse information about postoperative care, Video 3: a pre- and post-operative experience of a person who has already undergone CABG. Control group (n = 55) Experimental group (n = 55)	CABG patients. First-time CABG, nondevelopment of cardiogenic shock, or myocardial rupture. CAM-ICU. 4–6 min; 5–7 days.	Highest incidence of delirium at 7.3% in the intervention group on postoperative day 1% and 14.5% in the control group on day 2. No significant difference between the two groups on day 1. Higher incidence of delirium in the control group on the mornings of days 2, 3, and 4.	Possibility of obtaining information from other sources from the patients. Differences in communication of the nursing care, influence of social support, family, previous levels of anxiety.
6	Faustino et al. (2022) Brazil	ICU	To evaluate the effectiveness of combined nonpharmacological interventions in preventing delirium in critically ill patients.	Parallel RCT. Bundle of 5 combined nonpharmacological interventions: periodic orientation, cognitive stimulation, correction of sensory deficit, environmental management, and sleep promotion. Control group (n = 72) Experimental group (n = 72)	ICU patients > 18 years and > 48 hrs in ICU. E-PRE-DELIRIC score ≥10. Richmond Agitation-Sedation Scale (RASS) and CAM-ICU. 7 months.	Density of incidence of delirium was significantly lower in the intervention group (1.34×10^{-2} vs 2.29×10^{-2} person-days), with a 60% lower risk of developing delirium in the intervention group. Overall incidence of delirium was 22.2% vs 12.5% in the control and intervention groups, respectively. Total delirium cases were 16 in control group and 8 in intervention group.	Only the research team monitored delirium, and underdiagnoses may have occurred due to the fluctuating nature of delirium. Low adherence to some protocol measures. Patients in coma were excluded who were at risk of delirium. Single-centre study therefore might not be generalised to multicentre due to small population.
7	Giraud et al. (2016) UK	ICU	To explore whether the use of an evidence-based mirrors intervention may be effective in reducing delirium and improving postoperative outcomes such as factual memory encoding of the ICU environment in older cardiac surgical patients.	Pilot time-cluster RCT. Structure mirrors intervention at set times following changes in mental status including standard 23 × 41 cm unbreakable personal mirror and a standard 160 × 50 cm mobile posture mirror. Control group (n = 108) Experimental group (n = 115)	ICU patients aged ≥70 years, admitted after elective or emergency cardiac surgery over a 32-week period. CAM-ICU. 2-weeks.	No significant difference between groups in delirium incidence, median days with delirium, or total ICU stay with delirium.	Inability to rule out placebo and other effects to the intervention. No baseline cognitive testing was carried out.
8	Guo et al. (2016) China	ICU	To investigate the impact of multicomponent nonpharmacologic interventions (MNI) on perioperative cortisol, melatonin levels, and postoperative delirium in elderly oral cancer patients.	RCT. MNI include psychological guidance with environment, time, place and character orientation, cognitive stimulation, effective communication, noise reduction, sleep promotion, and music listening. Control group (n = 79) Experimental group (n = 81)	Surgical ICU Oral cancer patients age ≥65 years and ≤80 years; stay in ICU ≥3 days. RASS and CAM-ICU. Day before surgery and first 3 days after surgery.	Higher incidence and longer duration of delirium in the usual care group day and first 3 postoperative days compared with the intervention group.	No mention of formal ethical approval. There was no clear justification for the age range of participants included in the study.
9	Johnson et al. (2018) USA	Trauma ICU	To evaluate the effects of a music listening intervention in preventing delirium through decreasing physiologic variables, such as systolic blood pressure, heart rate, and respiratory rate among older patients.	Feasibility RCT. Intervention include 60-minute prerecorded and self-selected music listening using iPod and headset, two times per day, 2 pm and 8 pm over a three-day period post admission. Control group (n = 20) Experimental group (n = 20)	ICU patients ≥55 years. Oriented to person, time, and place on admission, negative CAM-ICU, ability to hear music played from an iPod, able to consent for the study. CAM-ICU. 60 minutes twice a day for three days.	CAM-ICU for both intervention and usual care groups were negative.	Exclusion of mechanically ventilated patients. The researcher was not blinded to the interventions and could generate potential observational bias.

Table 2 (*continued*)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
10	Karadas and Ozdemir (2016) Turkey	Medical ICU	To determine the effect of range of motion exercises on preventing delirium and reducing the duration of delirium among patients in ICU aged ≥65 years	RCT. Active, assisted-active or passive range of motion (ROM) exercise once a day until discharge. ROM performed for 4 extremities with 10 repetitions for about 30 min. Control group (n = 47) Experimental group (n = 47)	ICU patients ≥65 years, no history of delirium, ICU stay ≥24 hrs, and voluntary participation. RASS and CAM-ICU. Daily until discharged.	8.5% of patients in the intervention group experienced delirium compared with 21.3% in the control group. Duration of delirium was shorter in the intervention group; 15 hours vs 38 hours in the control group. All patients in the intervention group experienced delirium at night compared with 70% of patients in the control group.	Small study population; limited to participants aged ≥65 years only and nonmechanical ventilation.
11	Mailhot et al. (2017) Canada	Surgical ICU	To assess the feasibility, acceptability, and preliminary efficacy of a nursing intervention involving family caregivers (FC) in delirium management after cardiac surgery.	RCT. Mentoring model between nurse and FC. Seven encounters over 3 days between nurse and FC, 30-minute visit at the patients' bedside. FC used delirium management strategies; reorient the person with delirium. Control group (n = 14) Experimental group (n = 16)	Surgical ICU patients with postsurgical delirium, undergoing either CABG or heart valve surgery, having an FC available to visit the patient at the bedside within 24 hrs of delirium onset then twice daily for 3 consecutive days. Intensive Care Delirium Screening Checklist (ICDSC) and CAM-ICU. Two weeks.	Consent rate of 77% from the FC. Number of patients with clinical complications following delirium onset is similar in the two groups. A more favourable functional recovery in the intervention group. Anxiety scores on days 4, 15, and 30 were better in the intervention group. CAM-ICU scores were positive in 43.8% on day 2 for the intervention group vs 71.4% in the control group. Duration of delirium in the intervention group was shorter (mean days: 1.94 vs 4.14).	Small sample size resulted in imbalance between group characteristics. Single-centre design limits generalisation.
12	McWilliams et al. (2023) United Kingdom	ICU	To conduct a feasibility trial of evening mobilisation to prevent and treat delirium in patients admitted to intensive care	Mixed-method RCT. Intervention: a planned mobilisation session from day 1 of admission to a maximum of 7 consecutive days between 19:00 and 21:00 hours delivered by ICU physiotherapists and nurses Total patient participants (n = 58) Usual care group (n = 29) Intervention group (n = 29)	ICU patients with Richmond Agitation Sedation Scale (RASS) ≥−3 and expected to be admitted for ≥24 hrs. CAM-ICU. 7 days.	Delirium incidence in the intervention group was 5/26 (19%; 95% CI: 6–39%) vs 8/28 (29%; 95% CI: 13–49%) in the control group. Mean delirium duration was two days in the intervention group vs 4.25 days in the control group.	Short length of stay of the participants recruited. A number of the participants did not complete the maximum 7 days duration of the intervention.
13	Mitchell et al. (2017) Australia	Medical and surgical ICU.	To assess the feasibility of design, recruitment, and acceptability for family members and nurses of a family-delivered intervention to reduce delirium in ICU patients	RCT. Intervention: family members providing orientation and memory clues daily, sensory checks, and cognitive stimulation. Total patient participants (n = 90) Pre-randomisation (n = 30) Control group (n = 32) Experimental group (n = 29) Family participants (n = 61) Nurses (n = 11)	ICU patients ≥16 years, in ICU ≥4 days, able to be screened for delirium, and had a family member visit. ICU nurses who had provided direct care to at least one ICU patient who received at least an episode of the intervention. RASS and CAM-ICU. Once daily.	Prevalence of delirium was 59% vs 56% in the intervention and control groups, respectively. For only active participants, delirium prevalence was 50% in intervention vs 54% in control group. The number of days of delirium was similar in both groups.	Single-centre study that limits generalisability. Only patients expected to remain ≥4 days in ICU were recruited, delirium may occur early on in ICU. There was no regular control over how family members implemented the intervention.

Table 2 (continued)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
14	Moon and Lee (2015) Republic of Korea	Medical and surgical ICU	To examine the effects of applying a tailored delirium preventive protocol to ICU patients by analysing its effects on delirium incidence, in-hospital mortality, ICU readmission, and length of ICU stay in a Korean hospital	Single-blind RCT. Delirium prevention protocol consists of cognitive assessment and orientation, environmental intervention, and early therapeutic intervention. Applied during the first 7 days of ICU admission and for 10- to 20-minute duration. Control group (n = 63) Experimental group (n = 60)	ICU patients age ≥18 years, ability to understand the study purpose, and provide consent independently or via a caregiver, ICU stay ≥48 hrs. CAM-ICU. Daily for 7 days.	The control group had a higher incidence of delirium (n = 21) compared with the intervention group (n = 12).	Insufficient delirium training for the nurses delivering the intervention. Patients were assessed only once daily and delirium fluctuates throughout the day. The severity and duration of delirium was not measured, which made comparison impossible.
15	Munro et al. (2017) USA	ICU	To explore the effects of an automated reorientation intervention on ICU delirium in a prospective RCT.	Three-group, prospective RCT. Group 1: automated reorientation messages in a family member's voice. Group 2: received the same message in an unfamiliar voice; Group 3: did not receive any automated reorientation messages. During predetermined daytime hours (9:00 am to 4:00 pm) over 3 days. Maximum of 24 recorded messages. Total patient participants (n = 30; each group n = 10)	ICU patient ≥18 years, within 24 hrs of ICU admission. CAM-ICU.	Delirium-free days were 1.9 in the family voice group, 1.6 in the unknown voice group, and 1.6 in the control group. Mean days of delirium were 0.3 in the family voice, 0.6 in the unknown voice, and 0.9 in the control group.	Small sample size. All subjects did not receive the full intervention.
16	Ono et al. (2011) Japan	ICU	To verify the usefulness of bright light therapy (BLT) for patients following oesophagostomy to use the index acquired through physical activity, autonomic activity, incidence of postoperative arrhythmia, and level of acute delirium.	RCT. Participants assigned to study group and control group. Study group received self-standing exposure device modified to have fluorescent light source. Two-hour of bright light exposure from day 2 from 07:30 am for a total of 4 days. Delirium evaluated twice a day, daytime and night time. Total of patient participants (n = 26)	Adult ICU patients undergoing surgical resection and reconstruction through a right thoracotomy for the treatment of thoracic oesophageal cancer. Patients who can communicate and consent and could undergo extubation the day after surgery. Japanese version of NEECHAM Confusion Scale (J-NCS) Scores. Two hours for four days.	One out of 10 patients in the study group experienced delirium vs 5 out of 12 patients in the control group.	Study was not double-blind. Small sample size. No mention of ethical approval.
17	Parry et al. (2014) Australia	ICU	To determine safety and feasibility of functional electrical stimulation (FES)-cycling and compare FES-cycling with case-matched controls in terms of functional recovery and delirium outcomes.	Single-centre interventional observational study with case-matched control. FES-cycling within 96 hrs of ICU admission daily until discharge. FES-cycling was conducted for 20–60 min daily 5 times a week. Control group (n = 8) Experimental group (n = 8)	ICU patients age ≥18 years. Diagnosis of sepsis or severe sepsis, mechanical ventilation for ≥48 hrs and remain in ICU for ≥4 days. CAM-ICU.	Delirium incidence in the control group was 87% (n = 7) vs 25% (n = 2) in the intervention group. Duration of delirium 6.0 in the control group and 0.0 in the intervention group.	Small sample size. Case-control design. Restrictive inclusion criteria. No mention of ethical approval.

Table 2 (*continued*)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
18	Potharajaroen et al. (2018) Thailand	Surgical ICU	To examine the effects of BLT on the incidence of delirium in postoperative patients admitted to a surgical ICU.	Single-blind RCT. The intervention group was treated with BLT consisting of 5000 lx for 2 hrs from 09:00 to 11:00, placed at a distance of 1.40 m from the patient's face. Light brightness was checked at 09:00 and at 11:00 with digital illuminance – lux metre. Total participants who remained in the study (n = 61) Control group (n = 31) Experimental group (n = 30)	Post-surgery ICU patients, aged ≥50 years, understanding of Thai language. APACHE II Score ≥8 and arousal by voice. CAM-ICU. 3 days.	Significant inverse association of BLT and incidence of delirium. Incidence of delirium: intervention group (2/31) vs control group (11/31).	Not a double-blinded study. No mention of ethical approval.
19	Rice et al. (2017) USA	Neurological ICU	To assess the feasibility of enrolment within the 48-hour window when delirium risk is greatest, measuring cognitive function, delivering interventions 7 days per week and determining delirium incidence in stroke-related cognitive dysfunction.	RCT. Two groups. Multicomponent intervention included all standardised stroke care, physical function and geriatric outcomes, plus trained nonmedical volunteers administered therapeutic activities twice daily for 7 days and 15 min. Control group (n = 67) Experimental group (n = 67)	ICU patients admitted ≤48 hrs with ischaemic and haemorrhagic strokes and ≥50 years, understands English and without delirium on admission. CAM-ICU.	The rate of delirium incident in the intervention group was 8% (10/125).	The sample is not representative of those stroke patients with the highest risk for delirium.
20	Rood et al. (2021) The Netherlands	Medical, surgical, and trauma ICU	To determine the effects of a multicomponent nursing intervention program on delirium in ICU.	Multicentre, stepped-wedge cluster-RCT. The UNDERPIN-ICU (Nursing Delirium Preventive Interventions in the Intensive Care Unit): optimising visual and hearing impairment, orientation loss, sleep deprivation, cognitive impairment, and immobility. Total patient participants (n = 1749) Total number of ICUs (n = 10)	Medical, surgical and trauma ICU patients aged ≥18 years, high risk of developing delirium (E-PRE-DELIRIC score of ≥35%), free from delirium at admission. CAM-ICU. Two months.	Delirium-free days in 28 days were 23 days in the intervention period and 23 days in the control period. Delirium incidence was 39% in the intervention period vs 40% in the control period.	Only patients at high risk of delirium were included; the intervention may be effective in patients who already have delirium. The intervention fidelity was monitored using several proxy measurements instead of direct nursing registration. Overall duration of delirium was lower compared with other recent trials. The large number of interventions of the UNDERPIN-ICU program may have limited the effect determined. There were limited details of the risk factors.

Table 2 (*continued*)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
21	Theresa, Fathima, Kayalvizhi, and Puliken (2022) India	ICU	To determine the effectiveness of a delirium care bundle on sedation and orientation among ICU-acquired delirium patients with mechanical ventilation.	RCT. A self-structure scale developed by the investigator. The scale comprise of oriented, mild disorientation, moderate disorientation, and severe disorientation. ABCDEF delirium care bundle. Control group (n = 28) Experimental group (n = 28)	ICU patients on mechanical ventilation and diagnosed with delirium. RASS. Daily for 7 days.	Control group: Day 1: most of the participants (64.28%) were severely disorientated; Day 2: 60.71% were severely disoriented; Day 3: 50% were severely disoriented and 25% were moderately disoriented; Day 4: 42.85% were mild disoriented and 21.42% were oriented; Day 5: 46.42% mild and 28.57% oriented; Day 6: 42.85% mild and 32.14% oriented; Day 7: 42.85% mild and 35.71% oriented. Experimental group: Day 1: 35.71% mild and 39.28% moderate; Day 2: 39.28% mild; Day 3: 42.85% mild and 35.71% oriented; Day 4: 53.57% oriented and 35.71% mild; Day 5: 57.14% oriented and 39.28 mild; Day 6: 67.85% oriented and 25% mild; Day 7: 71.42% oriented and 21.42% mild.	Non-controlled design. Only ventilated patients with delirium. Small sample size.
22	Van Rompaey et al. (2012) Belgium	Cardiac-surgical, surgical, and medical ICU	To determine if the use of earplugs during the night reduces the onset of delirium in the ICU and does the earplugs during the night improve the quality of sleep in the ICU.	RCT. Patients divided into intervention and control group. Intervention group received earplugs at 22:00 hrs and removed at 06:00 hrs. Control group (n = 67) Experimental group (n = 69)	ICU patients ≥18 years. ICU stay ≥24 hrs. Speaks Dutch or English and minimum GCS of 10. Neelon and Champagne Confusion Scale (NEECHAM). 5 nights.	More cognitively normal patients were found in the intervention group. The control group scored 20% vs 19% in the intervention group. Mild confusion was 15% in the intervention group vs 40% in the control group. Total of 60% in the control group showed delirium and mild confusion vs 35% in the intervention group.	Specific ICU population therefore the results may not be generalised. Focused only on first 24 hrs of ICU admission.
23	Topcu and Tosun (2022) Turkey	Medical ICU	To evaluate the effect of a protocol of nonpharmacological interventions to improve sleep quality in the ICU and the effects on noise levels and delirium rates.	Pre-test post-test design with a control group. Two stages, in stage one, standard care. Stage two, sleep-promotion practices: light reduction, sound reduction, and disturbance reduction. Control group (n = 37) Experimental group (n = 37)	ICU patients with ICU stay ≥24 hrs, GCS ≥11. RASS and CAM-ICU. 7 months.	Frequency of delirium was 45% in the intervention group and 60% in the control group.	Single-centre study limited to patients who can self-report, and ICU patient beds were together. Subjective evaluation of the sleep quality. No mention of ethical approval.

Table 2 (continued)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
24	Patel et al. (2014) UK	Medical and surgical ICU	To investigate whether the implementation of a bundle of nonpharmacological interventions, consisting of environment noise and light reduction designed to reduce disturbing patients at night, was associated with improved sleep and a reduced incidence of delirium.	Cohort study, before and after design. Multicomponent bundle consisted measures taken to reduce noise, light, and iatrogenic sleep disturbance and modify risk factors for delirium over 21-day period. Total number of patients before the bundle (n = 167) Total number of patients after the bundle (n = 171)	ICU patients ≥ 18 years and ≥1 night in ICU. CAM-ICU. 21 days.	Implementation of the intervention resulted in a reduction in the incidence of delirium (55/167, 33%) compared with before the intervention (24/171, 14%). Decrease in the length of delirium 3.4 days vs before 1.2 days.	Single-centre design and nonrandomised cohorts.
25	Martinez, Donoso, Marquez, and Labarca (2017) Chile	Medical and surgical ICU	To assess the efficacy and describe the implementation strategy of a multicomponent intervention to prevent delirium in an ICU.	Before and after cohort study. Components included early mobilisation, physical therapy, reorientation, cognitive stimulation, drug reviews, environmental stimulation, avoidance of sensory deprivation, pain control, avoidance of restraint use, and family participation. Delirium was assessed twice daily using CAM-ICU. Total number of patients (n = 287) Diagnostic phase (n = 60) Intervention phase (n = 227)	ICU patients aged ≥18 years. CAM-ICU. 15 months.	Before implementation, delirium developed in 23 patients (38%) compared with 55 patients (76%) in the interventional phase.	Lack of randomisation of the participants.
26	Kruger et al. (2018) South Africa	Cardiothoracic ICU	To assess the effect of nonpharmacological interventions on the severity and duration of hypoactive delirium and delirium in ICU patients after cardiothoracic surgery.	Quasi-experimental nonequivalent control group design. Nonpharmacological interventions consist of visual and hearing aids, familiar objects from home, use of television/radio, nonverbal music, sleep hygiene, noise control, twice a day mobilisation, physical restraint reduction, sedation weaning, timely removal of intravenous lines. Control group (n = 30) Experimental group (n = 30)	ICU patients aged ≥18 years. Admitted for cardiothoracic surgery, CABG, and valve replacement. Able to understand English. ICDSC.	Delirium prevalence was similar in the control and intervention groups. The severity of delirium for both groups improved to 0. Duration of delirium was shorter in the intervention group.	No blinding or participants. The knowledge of ICU nurses conducting delirium assessment was not tested.
27	Foster and Kelly (2013) USA	Medical ICU	To determine the feasibility of and test a multicomponent, nonpharmacologic, nurse-driven intervention for prevention of delirium.	Prospective, cohort pilot study. Multicomponent protocol consists of sedation cessation, sleep–wake cycles, sensory stimulation, mobility, and music. Two-week education to ICU nurses on CAM-ICU, ICU patients with delirium established over 1-month period. Implementation followed for 2 months. Total number of patients (n = 32)	Medical ICU patients aged ≥18 years, haemodynamically stable and able to hear. CAM-ICU.	At baseline data collection, 46/164 patients were positive for delirium. In the postintervention phase, 26/84 patients were positive for delirium and 57/84 were negative.	No informed consent was obtained from patients.

Table 2 (*continued*)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
28	Colombo et al. (2012) Italy	Medical-surgical ICU	To assess the occurrence of delirium, its risk factors and impact on critically ill outcome, and the efficacy of a reorientation protocol based on mnemonical and environmental stimulation.	Two-stage prospective observational study. Phase one was standard delirium care, and in phase two, a reorientation strategy was introduced. Reorientation strategy consists of frequently calling patients their first names, giving information on the ward, and mnemonically stimulated remember relatives' names. Observational phase (n = 170) Interventional phase (n = 144)	ICU patients from 7 days to 24 hrs after ICU admission. CAM-ICU. Six months observational phase and six months interventional phase.	Overall percentage of delirium was 25.5%, with a median onset of 2 days.	Small population. No mention of ethics. The observational design.
29	Bryczkowski, Lopreiato, Yonclas, Sacca, and Mosenthal (2014) USA	Surgical ICU	To evaluate the efficacy of a delirium prevention program and determine whether it decreased the incidence and duration of hospital-acquired delirium in older adults aged ≥50 years admitted to the surgical ICU.	Prospective pre- and post- cohort study. The intervention involved a pharmacologic protocol to limit the use of medications associated with delirium, decrease sedation, and encourage spontaneous breathing trial. Also a nonpharmacologic sleep enhancement and relaxation protocol and patient and family education. Total number of patients (n = 123) Preintervention (n = 57) Postintervention (n = 66)	Surgical ICU patients aged ≥50 years, in SICU for ≥24 hrs. CAM-ICU. Phase 1: one month Phase 2: four months Phase 3: nine months.	Delirium-free days pre-intervention were 24/30 vs 27/30 post-intervention.	A large number of patients were excluded due to inability to obtain delirium status owing to lack of training of some nurses working in the ICU temporarily. Only older adults included. No randomisation.
30	Balas et al. (2014) USA	Medical and surgical ICU	To evaluate the effectiveness and safety of implementing the awakening and breathing coordination, delirium monitoring/management, and early exercise/mobility (ABCDE) bundle into everyday practice.	Prospective, cohort, before–after study. ABCDE bundle application consist awakening and breathing coordination, delirium monitoring/management, early exercise/mobility. Total number of patients (n = 296) Pre-bundle (n = 146) Post-bundle (n = 150)	Adult ICU patients aged ≥19 years. RASS and CAM-ICU. 18 months.	Incidence of delirium was 62.3% pre-intervention and 48.7% post-intervention. Number delirium days decreased by 17% pre- and 50% post-intervention.	Small sample size. Most of the intervention education occurred pre-intervention.
31	Rosa et al. (2019) Brazil	Medical surgical ICU	To evaluate the effect of an extended visitation model compared with a restricted model on the occurrence of delirium among ICU patients.	Prospective single-centre before and after study. In restricted visitation model, 2 or less family visitors per patient were allowed to visit for up to 4.5 hrs/day over 3 periods. In extended visitation model, at most, 2 family visitors per patient were allowed to visit at daytime and evening and participate in bedside multidisciplinary rounds. Total number of patients (n = 286) Restricted visitation model (n = 141) Extended visitation model (n = 145)	ICU patients aged ≥18 years. ICU stay ≥24 hrs. CAM-ICU. 90 days.	Delirium incidence in extended visiting model was 14 of 145 patients vs 29 of 141 patients in restricted visiting model. Median duration of delirium was 1.5 days in extended visiting model vs 3.0 days in restricted visiting model.	The study design is susceptible to bias due to changes over time. The impact of extended visiting model to ICU staff was not evaluated. Risk factors of delirium was not controlled.
32		Mixed ICUs					

Table 2 (continued)

Code	Study/country	Setting	Study aim	Study design/methods	Study population/criteria Delirium tool/duration	Results	Limitations
	Liang (2022) China		To identify current implementation of nonpharmacological interventions in ICUs of Mainland China.	Qualitative design. Individual face-to-face discussion and semistructured, individual interviews. NVivo transcription and thematic analysis. Total number of nurses (n = 20).	Registered nurses who have worked over 3 years in the ICU. ICDSC and CAM-ICU.	Themes: Lack of a delirium assessment practice, early mobilisation, poor sleep quality of ICU patients, limited duration of ICU visitation, structured sensory stimulation program.	Small sample size limited to nurses with 3 years of ICU experience.
33	Menza (2022) USA	Surgical and neurosurgical ICU	To illuminate the ways in which a diverse group of adults use self-selected recorded music to recover after critical illness and describe patients' perceptions of the effects of listening to self-selected music on symptom experience during mechanical ventilation after critical injury.	Qualitative, grounded theory. Semistructured interviews. Total number of patient and family member participants (n = 16).	Current or recent surgical and trauma ICU patient or family aged ≥18 years. Receiving mechanical ventilation and listening to recorded music in the ICU.	Six novel uses of personally selected music in ICU: Restoring consciousness, maintaining cognition, humanising the hospital experience, providing a source of connection, improving psychological well-being, and resolving the problems of silence. Also for pain and anxiety.	All participants were male. Single-urban trauma centre.

CAM-ICU, Confusion Assessment Method for the Intensive Care Unit; CD, Compact Disc; CI, Confidence Interval; GCS, Glasgow Coma Scale; SICU, Surgical Intensive Care Unit.

based or protocol-based interventions. Whilst robust non-pharmacological delirium prevention and management protocols exist in non–adult ICU settings, the findings of this scoping review revealed inconsistencies in transferring and disseminating those interventions into practice.

5.2.1. Instrument-based therapeutic interventions

Ten of the 32 studies reported using mirrors, earplugs, light devices, music, and occupational therapy involving early mobility as nonpharmacological interventions for delirium prevention and management. All of these studies compared two groups of patients to determine the effect of instrument-based therapeutic interventions on the outcomes of duration, density, incidence, and severity of delirium (Álvarez et al., 2017; Damshens, Sanie, Javadpour, Khaef, & Rastgarian, 2018; Giraud et al., 2016; Johnson et al., 2018; Karadas & Ozdemir, 2016; Menza, 2022; Ono, Taguchi, Kido, Fujino, & Doki, 2011; Parry et al., 2014; Potharajaroen et al. 2018; Van Rompaey, Elseviers, Van Drom, Fromont, & Jorens, 2012). Three studies applied intensive occupational therapy and reported a reduction in the duration, density, incidence, and severity of delirium in the experimental group compared with the control group (Álvarez et al., 2017; Mailhot et al., 2017; Potharajaroen et al., 2018). Three studies implemented music therapy; one of the three studies reported extensive uses of music therapy and its overall outcomes on delirium (Damshens et al., 2018; Johnson et al., 2018; Menza, 2022). However, music therapy was not applied extensively in the other two studies (Damshens et al., 2018; Johnson et al., 2018). Two of the studies applied music therapy to sedated and mechanically ventilated patients (Damshens et al., 2018; Menza, 2022), whereas one of the studies applied music therapy to nonventilated and nonsedated patients (Johnson et al., 2018). Four studies examined the effects of light therapy, earplugs, and mirrors on delirium (Giraud et al., 2016; Parry et al., 2014; Rice et al., 2017; Topcu & Tosun, 2022). Two of these studies found an association between light therapy and delirium, decreasing delirium (Parry et al., 2014; Rice et al., 2017). Earplugs were found to reduce the onset of delirium in one of the studies (Topcu & Tosun, 2022). Occupational, light, and music therapies are the most reported interventions in this category.

5.2.2. Nurse-led interventions

Interventions led and delivered directly by nurses were reported in five of the studies (Contreras et al., 2021; Fahimi, Abbasi, Zahedi, Amanpour, & Ebrahimi, 2020; Foster & Kelly, 2013; McWilliams et al., 2023; Rood et al., 2021). Three of these studies were based on multicomponent nonpharmacological protocols (Contreras et al., 2021; Foster & Kelly, 2013; Rood et al., 2021;), and two were single interventions based on multimedia education and mobilisation (Fahimi et al., 2020; McWilliams et al., 2023). The multimedia education played via videos to patients before cardiac surgery resulted in a reduction in the incidence of delirium on the second, third, and fourth days after surgery (Fahimi et al., 2020). The nurse-led interventions reported in the four studies consisted of cognitive stimulation, reorientation, optimising visual and hearing impairment, sleep promotion, early mobilisation, and family mentorship to provide support. The effects of these interventions were reported in four of the studies (Contreras et al., 2021; Foster & Kelly, 2013; McWilliams et al., 2023; Rood et al., 2021). The interventions reported to be most implemented by nurses are cognitive stimulation, reorientation, sleep promotion, and early mobilisation.

5.2.3. Family-led interventions

Five studies reported integrating family members into the care of their loved ones to prevent and manage delirium (Eghbali-Babadi, Shokrollahi, & Mehrabi, 2017; Mailhot et al., 2017; Mitchell et al., 2017; Munro et al. 2017; Rosa et al., 2019). The family-led interventions consist of providing memory cues, orientation, cognitive

Table 3
Major themes and subthemes extracted from the studies.

Theme 1: Instrument-based therapeutic interventions

Study	Alvarez et al. (2017)	Damshens et al. (2018)	Giraud et al. (2016)	Johnson et al. (2018)	Karadas and Ozdemir (2016)	Ono et al. (2011)	Parry et al. (2014)	Potharjaroen et al. (2018)	Van Rompaey et al. (2012)	Menza (2022)	Total
Occupational therapy	X				X		X				3
Music therapy		X		X						X	3
Light therapy						X		X			2
Use of ear plugs									X		1
Mirror therapy			X								1

Theme 2: Nurse-led interventions / Theme 3: Family-led interventions

Study	Contreras et al. (2021)	Fahimi et al. (2020)	McWilliams et al. (2023)	Rood et al. (2021)	Foster and Kelly (2013)	Eghbali-Babadi et al. (2017)	Mailhot et at. (2017)	Mitchell et al. (2017)	Munro et al. (2017)	Rosa et al. (2017)	Total
Theme 2: Nurse-led interventions											
Multimedia education		X									1
Mentorship/family support	X										1
Cognitive stimulation	X			X							2
Orientation	X			X							2
Optimizing visual & hearing impairment				X							1
Sleep promotion				X	X						2
Mobilisation			X	X	X						3
Sedation cessation					X						1
Memory cues								X			1
Theme 3: Family-led interventions											
Cognitive stimulation								X			1
Orientation							X	X			2
Sensory checks									X		1
Automated reorientation							X				1
Visitation						X	X			X	3

Theme 4: Multicomponent interventions

Study	Contreras et al. (2021)	Faustino et al. (2022)	Guo et al. (2016)	Moon and Lee (2015)	Rice et al. (2017)	Theresa et al. (2022)	Topcu and Tosun (2022)	Patel et al. (2014)	Total
Orientation	X	X	X	X		X			5
Communication		X							1
Environment		X	X						2
Cognitive stimulation	X	X	X	X					4
Sleep promotion		X	X				X	X	4
Noise reduction			X				X	X	2
Light reduction							X	X	1
Early therapy			X	X	X				2
Music therapy			X				X	X	2
Optimise visual & hearing impairment		X						X	1
Modify delirium risk factors					X				1
Avoid sensory deprivation									
Avoid the use of restraint									
Family participation	X		X						2
Psychological guidance									
Education to patients & family									
Drug reviews									
Sedation weaning									
Spontaneous breathing trial								X	1
Timely removal of lines								X	1

Study	Martinez et al. (2017)	Kruger et al. (2017)	Foster and Kelly (2013)	Colombo et al. (2012)	Bryczkowski et al. (2014)	Balas et al. (2014)	Liang (2021)	Rood et al. (2021)	Total
Theme 4: Multicomponent Interventions									
Orientation	X	X		X				X	4
Communication	X			X					1
Environment				X					2
Cognitive stimulation	X			X					3
Sleep promotion		X	X		X			X	5
Noise reduction		X					X	X	1
Light reduction									
Early therapy	X	X	X			X	X	X	6
Music therapy		X	X						2
Optimise visual & hearing impairment		X				X	X	X	2
Modify delirium risk factors									1
Avoid sensory deprivation	X	X	X				X		4
Avoid the use of restraint	X	X							2
Family participation	X								2
Psychological guidance									
Education to patients & family					X				
Drug reviews	X			X	X				2
Pain control	X			X	X				1
Sedation weaning				X	X				3
Spontaneous breathing trial		X			X				2
Timely removal of lines					X				1

stimulation, sensory checks, extended visitation, and the use of automated reorientation in the family members' voices to provide ongoing information and reassurance to critically ill patients. The studies reported the effects of the interventions on the incidence and duration of delirium (Eghbali-Babadi et al., 2017; Mailhot et al., 2017; Mitchell et al., 2017; Munro et al., 2017; Rosa et al., 2019), One of the studies reported 77% (n = 30) participation rate of family members, which encouraged family-led interventions (Mailhot et al., 2017). Visitation was the most utilised intervention reported in three studies that enabled the delivery of the interventions and resulted in better patient outcomes. Orientation is the more implemented intervention in the two studies.

5.2.4. Multicomponent interventions

Sixteen of the 32 studies reported using multicomponent delirium prevention and management interventions. These consist of programs combining various nonpharmacological interventions to deliver a care bundle. The UNDERPIN-ICU (Nursing Delirium Preventive Interventions in the Intensive Care Unit) is reported in one study involving the largest cohort of patients (Rood et al., 2021). In two studies, the multicomponent interventions were also nurse-led (Contreras et al., 2021; Rood et al., 2021). Environmental orientation and communication were reported as the highest occurring interventions, with 15 studies reporting the intervention effects on delirium incidence, duration, and severity. Interventions that promote sleep, such as light and noise reduction, were also reported as the highest utilised interventions within the multicomponent programs in 15 of the studies. Early therapy and music were reported as part of a multicomponent intervention in 11 studies. Nine studies reported drug reviews, spontaneous breathing trials, and timely removal of invasive devices. Seven studies also reported cognitive stimulation as one of the interventions, and six studies reported the avoidance of restraint and sensory deprivation. Four studies reported family participation as part of a multicomponent intervention, but family members were not directly delivering the interventions.

Multicomponent intervention is the most common intervention for delirium prevention and management out of the four categories of interventions. However, one qualitative study reported some barriers to these interventions, including poor delirium assessment and limited duration of family visitation, which could impact the efficacy of these interventions.

5.3. Outcomes

Quantitative delirium outcomes were identified in 31 of the studies and encompassed density (n = 2), incidence (n = 24), severity (n = 2), duration (n = 13), risk (n = 2), acceptability of delirium intervention (n = 2), prevalence (n = 2), and frequency (n = 3). One of the qualitative studies reported six themes of nonpharmacological interventions for delirium (Liang, Chau, Lo, Zhao, & Liu, 2022), and one qualitative study reported six novel uses of personally selected music as a therapeutic intervention for delirium (Menza, 2022).

6. Discussion

This scoping review identified the range of evidence-based nonpharmacological interventions used for delirium prevention and management. It highlighted different preventative and management strategies utilised in different countries and regions. This lack of consistency in nonpharmacological interventions is reflected in the paucity of standardised policies and protocols that guide practice (Collet et al., 2019; Ewens et al., 2021; Zamoscik et al., 2017). The revised Delirium Clinical Care Standard, quality statement 2 of the Australian Commission on Safety and Quality in Health Care, provides recommendations for clinicians regarding the interventions to
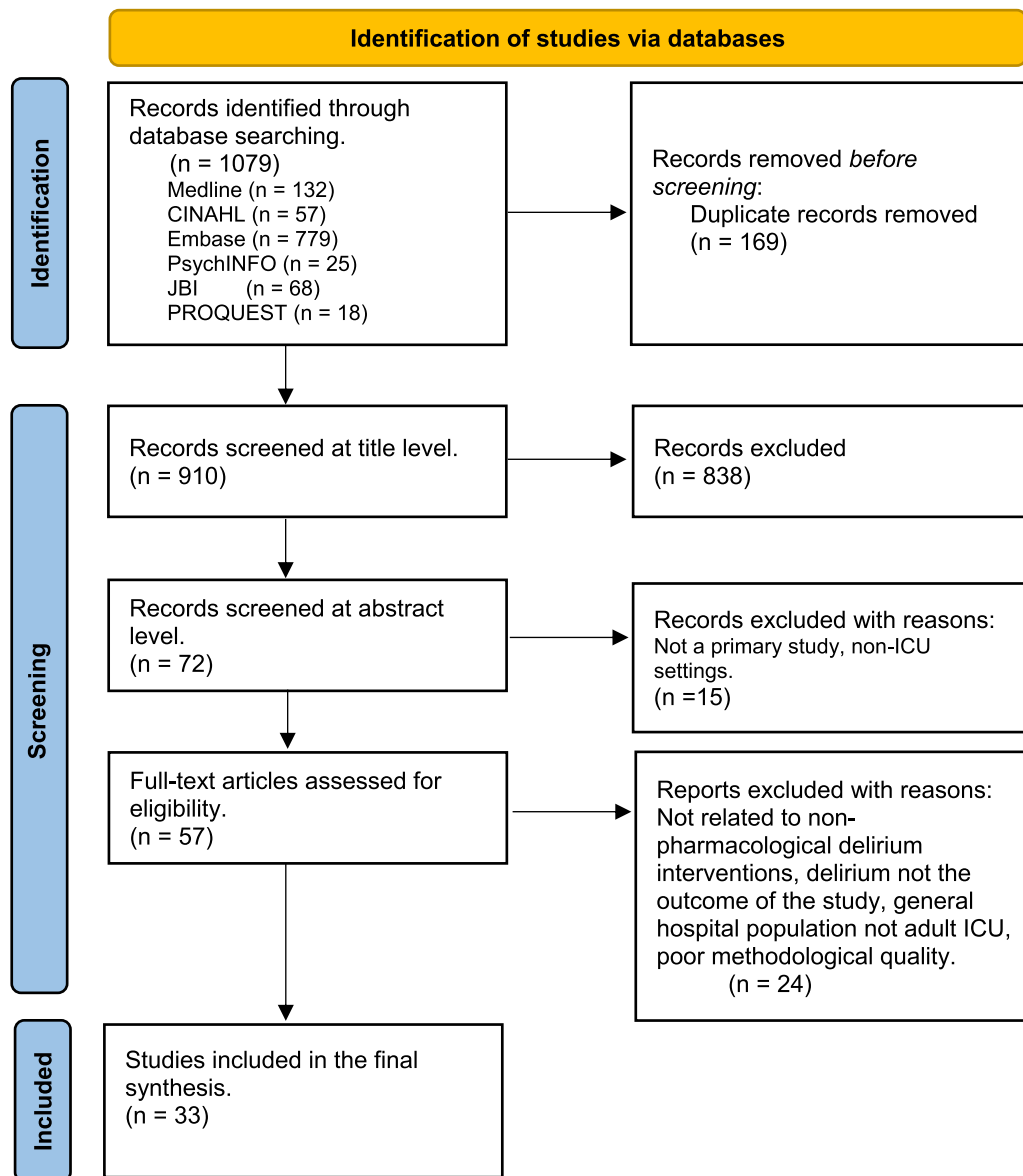
Identification of studies via databases

Fig. 1. PRISMA 2020 flow diagram. CINAHL = Cumulative Index of Nursing and Allied Health Literature; ICU = Intensive care unit; JBI = Joanna Briggs Institute; MEDLINE = Medical Literature Analysis and Retrieval System Online; PRISMA = Transparent Reporting of Systematic Reviews and Meta-analyses.

prevent delirium (Australian Commission on Safety and Quality in Health Care, 2021). The standard recommends multicomponent delirium prevention interventions focusing on risk factor management and environmental optimisation. This review found that multicomponent interventions were predominately utilised across the 33 included studies (n = 16). In the Acevedo-Nuevo, González-Gil, Romera-Ortega, Latorre-Marco, and Rodríguez-Huerta (2018) case report, a multimodal approach was utilised to manage delirium in a critically ill patient. The approach involved nursing interventions and nonpharmacological input from multidisciplinary teams, which was effective. A multifactorial, multicomponent approach to delirium prevention and management may benefit ICU patients and clinicians significantly. The evidence supporting the use of multicomponent nonpharmacological interventions for delirium prevention and management is more substantial than a single component (Burton et al., 2021). However, the impact of single-component interventions may be understood if the interventions are standardised and utilised over an extended period. There is a paucity of literature to support the use of single-component nonpharmacological

interventions for delirium prevention for an extended period, but the evidence identified suggests that such interventions could be highly effective (McKenzie & Joy, 2020).

The integration of family carers of ICU patients as a single-component intervention for delirium management was explored in four studies reported in this review. Mailhot et al. (2017) developed a family carer–nurse intervention that comprised an ICU nurse fostering the efficiency of a family carer to behave in a supportive way towards their loved ones during delirium symptoms, demonstrating improved psychological recovery scores in the intervention group. The intervention was feasible to implement in clinical practice and well received by ICU staff, patients, and families. However, the benefits and impacts of family involvement in delirium management have not been extensively explored in ICU. Studies that include family involvement alongside other nonpharmacological interventions have demonstrated beneficial outcomes for ICU patients and also gained acceptance by the ICU staff and families (Digby et al., 2022; Khan, Digby, Giordano, Hade, & Bucknall, 2022; Liang et al., 2022; McKenzie & Joy, 2020). McKenzie and Joy suggest from their

systematic review that family intervention in delirium reduced hospital LoS but were uncertain if it affected the duration of delirium (McKenzie & Joy, 2020).

A reduction in delirium has also been observed through the delivery of automated family-recorded voice reorientation messages, showing more delirium-free days in the patients who received the intervention than those who did not (Munro et al., 2017). A significant positive effect of integrating familiar voices into the orientation of critically ill patients to prevent delirium has been demonstrated to be effective in other studies not captured in this review (Nielsen et al., 2020). It is shown that interventions designed around family integration are cost-effective and feasible to implement in delirium care, but it has not been standardised as a nonpharmacological intervention (Nielsen et al., 2020). The evidence by Bannon et al. (2018) suggests that this reluctance to implement family interventions may be due to barriers, including safety concerns, family members' anxiety, patients' confidentiality, lack of awareness, and inflexible visiting. These barriers may be managed through staff and relatives' education about the potential benefits of family involvement in delirium intervention and designing a nurse–family carer intervention, which has been recommended (Ewens et al., 2021; Mailhot et al., 2017). This approach may facilitate understanding and promote family confidence in being included in delirium care. Mailhot et al. (2017) reported no significance in family members' anxiety in delirium interventions. Interventions involving family presence and participation are nonpharmacological interventions found to have beneficial effects on delirium and are perceived as feasible and acceptable by family members, ICU staff, and ICU survivors (Bannon et al., 2018; Elcokany & Ahmed, 2019; Ewens et al., 2021). Nursing intervention may also have equivalent beneficial effects to family intervention, but this is yet to be explored.

This review identified that nursing interventions were used as a nonpharmacological delirium intervention but often integrated as a multicomponent strategy (Acevedo-Nuevo et al., 2018; Collet et al., 2019). Nurses remain the key ICU clinicians who can implement delirium care strategies in the ICU and reported that nonpharmacological interventions were fundamental and natural to nursing care (Collet et al., 2019). However, many factors may influence their decision to implement nonpharmacological interventions. A lack of education and standardisation of nonpharmacological interventions may hinder nurses' autonomy to initiate and integrate these practices into delirium care (Bannon et al., 2018; Ewens et al., 2021; Zamoscik et al., 2017).

Evidence supports environmental optimisation as a nonpharmacological intervention for delirium prevention and management. The environmental interventions evident in the literature include sleep promotion, single room, eyeglasses, noise minimisation, comfort promotion, orientation to the window, clock and television, good sight and hearing, and minimal overnight intervention. Also, nurses are more likely to carry out continuity and routines of care as they serve as the cornerstone of critical care, and their skills are most apt for delirium prevention and management (Zamoscik et al., 2017). Nurses are more likely to influence change in inpatient care due to the depth of engagement and familiarity they establish through a therapeutic relationship with patients and their families (Zamoscik et al., 2017). However, nurses have reported anxiety in leading interventions that involve family participation and nonpharmacological strategies due to their unpreparedness, increased workload, and insufficient resources to implement them (Bannon et al., 2018; Ewens et al., 2021). These anxieties can, however, be mitigated through increased utilisation of nonpharmacological delirium care and the development of nurse-led protocols to guide the clinical decision-making process (McKenzie & Joy, 2020). Forsgren and Eriksson reported that 9% of existing nonpharmacological guidelines for delirium are compared with 26% of pharmacological guidelines (Forsgren & Eriksson, 2010). The limited availability of nonpharmacological guidelines infers that nurses rely on medical practitioners to initiate delirium interventions, especially in urgent circumstances where the nurse does not hold drug prescription authority. Intensive care diaries constructed by family members and ICU staff have been identified in the literature as a memory recall approach to help ICU patients remember events that occurred when they were critically unwell (Nielsen et al., 2020). A total lack of recall of events or delirious recall increases the prevalence of Post-traumatic Stress Disorder (PTSD); thus, family interventions may go beyond reducing delirium to preventing PTSD during recovery.

This review found that music therapy, mechanical restraints, and verbal restraints are nonpharmacological interventions utilised in delirium care. Restraints in critical care vary worldwide and depend on the region's culture and background (Kısacık, Sönmez, & Coşğun, 2020). The knowledge of ICU staff regarding the application of physical restraint is poor (Kısacık et al., 2020). There is a paucity of evidence to substantiate the beneficial effects of this intervention on delirium care. However, Johnson et al. (2016) reported that nurses showed a positive attitude towards physical restraints when protecting patients from falling out of bed or chair. These reasons suggest that restraints may be utilised due to a lack of options available or where other options have been exhausted. Physical restraints incorporated with verbal reassurance and reorientation may help avoid using pharmaceutical products to manage delirium and prevent feelings of an ethical dilemma. However, no evidence supported this combination (Kısacık et al., 2020). Although evidence has been found to show the use of mechanical and verbal restraint for nonpharmacological intervention for delirium, several studies have shown insufficient knowledge of ICU staff in the use of restraints resulting in deferring attitudes and unsafe practices when they use it (Stinson, 2016; Suliman, Aloush, & Al-Awamreh, 2017). Physical restraints without formal assessment and diagnosis of delirium have also been reported in the literature (Ankravs, Udy, & Byrne, 2023).

Music therapy was shown as one of the common instrument-based therapeutic interventions to prevent and manage delirium (Damshens et al., 2018; Johnson et al., 2018; Menza, 2022). Nature-based sounds significantly reduce anxiety and agitation in critically ill patients and mitigate the physiological variables (Froutan et al., 2020). Instrument-based interventions may be beneficial as a single-component intervention or incorporated with other nonpharmacological delirium interventions. Its benefits stem from the evidence that supports its positive effect on psychological and physiological outcomes for patients (Froutan et al., 2020; Johnson et al., 2018).

At least 85% of ICUs utilise nonpharmacological interventions without accompanying guidelines (Forsgren & Eriksson, 2010). More recent studies have reported a high appreciation and acceptability of nonpharmacological interventions for delirium accompanied by a decreased incidence of delirium (Bannon et al., 2018; Collet et al., 2019; Zamoscik et al., 2017). The main problem identified with nonpharmacological delirium interventions is the lack of standardisation of the practice. Collating all the information gathered and designing a protocol focusing on nonpharmacological interventions may increase its effectiveness in preventing and managing delirium. This is worth exploring in future research and clinical practice. An evidence-based nonpharmacological protocol may boost the confidence of nurses and family carers in implementing these strategies to practice. However, it appears uncertain if nurses and ICU staff will utilise a developed protocol. A further area of exploration would be to understand the factors that influence the ICU staff's choices of nonpharmacological interventions for delirium. An evidence-based protocol may help guide safe delirium care practice and evaluate the effects, resulting in better quality care and overall outcomes for critically ill patients. Evidence-based protocols may vary depending on the ICU culture of the region where it exists. However, places may adopt a standard protocol and make changes to it based on the

individual needs of their patient population. A review of resources currently available to ICU staff across different countries and an evaluation of the impact of such resources and their utilisation are also an area of future investigation.

7. Limitations

The limitations of this review included that the literature was limited to the peer-reviewed primary research literature published in English, and as such, the relevant literature in other languages or unpublished studies may have been overlooked. The review excluded other reviews and case reports, and these may have papers reported in them or their reference lists, which may have been overlooked.

8. Conclusion

This scoping review revealed the heterogeneous and complex nature of current nonpharmacological interventions used in the prevention and management of delirium in adult ICU settings. The variety of interventions may lead to challenges in the evaluation, dissemination, and application of these interventions to guide nonpharmacological management in the prevention and management of delirium. The decision-making process in choosing interventions used for delirium is not always based on the best available evidence, leading to inconsistencies in practice within individual ICUs. There is a significant range of nonpharmacological interventions, and an extensive exploration of each of these categories of interventions may lead to increased utilisation and implementation within ICU clinical practice, along with an increased body of evidence. Increased ICU utilisation of evidence-based nonpharmacological interventions may eliminate pharmacological therapies and foster person-centred delirium care, optimising overall outcomes for ICU patients and family members (Collet et al., 2019; Ewens et al., 2021; McKenzie & Joy, 2020).

The development and implementation of nonpharmacological interventions and practices that are flexible but based on best evidence would reduce the risk of inconsistent application of nonpharmacological interventions that are currently evident in practice. The development and implementation of flexible, simplified, and evidence-based nonpharmacological interventions that encourage standardised delirium care practices and the integration of family members and nurses into standardised delirium care practices are recommended. This recommendation could reduce reliance on pharmacological interventions and encourage further exploration of the effects of nonpharmacological delirium interventions using methods such as systematic reviews and meta-analyses (Chen et al., 2022; McKenzie & Joy, 2020). Standardised evidence-based guidelines addressing all aspects of single-component or multicomponent nonpharmacological delirium interventions would support ICU staff in utilising these interventions and further enhance family member education and support. Person-centred care involving family integration as an integral component is an evolving practice in ICUs. Further exploration of the impact of delirium on a critically ill adult patient is yet to be conducted. Hence, as this review identified family-delivered interventions as a category of nonpharmacological interventions for delirium in adult ICU, this is an area that should be explored further. In turn, the authors are conducting a study to develop, implement, and evaluate a digital family-led intervention to prevent and manage adult ICU delirium.

Authorship contribution statement

Gideon U. Johnson: Conceptualization, Methodology, Data curation, Formal analysis, Writing – original draft, Writing – review & editing, Project administration. **Amanda Towell-Barnard:** Conceptualization, Methodology, Data curation, Formal analysis, Supervision, Writing – review & editing. **Christopher McLean:** Methodology, Formal analysis, Supervision, Writing – review & editing. **Beverley Ewens:** Conceptualization, Methodology, Data curation, Formal analysis, Supervision, Resources, Writing – review & editing.

Data Availability

The authors declare no research data associated with the work in this manuscript.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.colegn.2024.05.001.

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