

Review Article

The effectiveness of family participation interventions for the prevention of delirium in intensive care units: A systematic review

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ABSTRACT

Aim: To review the effect of family participation interventions in preventing delirium in Intensive Care Units (ICU).

Methods: The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses and the “Synthesis Without Meta-analysis” guidelines. The search was performed using the MEDLINE, CINAHL, Cochrane Database of Systematic Reviews, Web of Science, Scopus, Cochrane Central Register of Controlled Trials and ClinicalTrials.gov databases in April 2024. Eligibility criteria included patients admitted to Intensive Care Units, aged 18 or older exposed to risk factors for delirium, and with family members present; studies about family intervention to prevent delirium, that considered family as a partner in care and included interventions; studies that quantitatively assessed the effect of measures on the incidence and duration of delirium; interventional studies. Two authors independently applied these criteria using the Rayyan® application, assessing study quality with Critical Appraisal Skills Programme tools.

Results: Fourteen studies were included, involving 33,232 patients. A meta-analysis was not feasible due to the highly heterogeneous results, but we concluded that the family participation interventions for delirium prevention were grouped into single-component and multi-component interventions. The single-component interventions, such as familiar voice messages, flexible visitation, and family presence, showed a favorable response in reducing delirium. The multicomponent interventions suggesting a positive effect included family visitation with professional-guided orientation; familiar voice messages for reorientation, newspaper reading, and nighttime eye patch use; sensory stimulation program; the ABCDEF bundle; the DyDel program; family education, emotional support, orientation training, cognitive stimulation, and ICU life care participation.

Conclusions: Several family participation interventions, both single-component and multicomponent, have shown positive effects on outcomes in preventing delirium in ICU patients, particularly in reducing its incidence and duration.

Implications for Clinical Practice: Identifying the family participation interventions that can prevent delirium allows the development of measures to minimize its occurrence in ICU.

Introduction

Delirium has become a concern in the care of critically ill patients as it is a common complication in Intensive Care Units (ICUs) that can be prevented [1]. Epidemiologically, the prevalence of delirium is 31 %, mainly affecting the elderly [2] and up to 87 % of patients with Mechanical Ventilation (MV) [3].

According to the DSM-5 criteria [4,5], delirium is an acute disturbance of cognition and attention, accompanied by reduced

environmental awareness, with variable duration and severity, which tends to fluctuate throughout the day. It generally develops within one or two days [6] and lasts on average between one to five days [7].

Delirium has a multifactorial etiology [4,5] can affect clinical outcomes, and cause severe consequences for the patient [8]. Compared to patients without delirium in the ICU, those who develop it may require prolonged MV [9,10], longer length of ICU or hospital stays, and have a higher risk of hospital readmission and mortality [1,6,11,12]. They also experience physical, psychological, and cognitive impairments [13] and

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have a higher risk of dementia [6,14,15], particularly the elderly patients [16,17].

Adverse events are associated with delirium [6], such as physical restraint [18], accidental self-extubation, and unintentional removal of medical devices [10].

Due to the short- and long-term consequences, it is essential to identify and implement strategies that effectively prevent delirium in the ICU. As delirium prevention focuses on managing modifiable risk factors, current recommendations refer to multi-component interventions to prevent delirium, emphasizing family participation [19,20].

In this context, the critical care nurse promotes non-pharmacological interventions to prevent and manage delirium in the ICU. These interventions not only address the underlying causes of delirium but also contribute to creating a more supportive and therapeutic environment for the patient [21,22].

Furthermore, family participation in nursing care is essential. It not only helps explore the complexity of this issue but also highlights their active inclusion in the fundamentals of care [23].

Previous studies have shown that family participation, as a multi-component intervention, can reduce the risk and prevalence of delirium in ICUs [24]. The authors Krewulak et al. [25] conducted a study in Canada with an educational intervention aimed at families to detect, prevent, and manage delirium in the ICU, finding that family knowledge improved after the intervention. The study by Elcokany and Ahmed [26] conducted in two ICUs in Egypt showed that a reorientation strategy using voice messages recorded by a family member reduced the incidence of delirium compared to a group that received messages from an unknown voice or no messages at all. In South Korea, Hwang and Kim [27] developed a multi-component intervention program with nurses and family members, showing an 81 % reduction in delirium prevalence among elderly ICU patients. However, the conclusions from available evidence are heterogeneous. The variability in study designs, interventions, and patient populations makes it difficult to draw effective interventions for preventing and managing delirium in ICU settings.

Recent systematic reviews on family participation in delirium prevention in the ICU have highlighted some limitations. In Lin's review [24], which included seven studies (RCTs and quasi-RCTs), the authors pointed out limitations such as the inclusion of low-quality studies, emphasizing the need for high-quality studies to determine the effectiveness of the intervention in delirium prevention. Furthermore, this review only included studies in English or Chinese and had limitations regarding the search strategy, highlighting the importance of conducting reviews without language restrictions and with sufficient search terms to cover all relevant interventions. In Qin et al.'s review [28], the authors included six studies (RCTs, cohort, and before-and-after studies), pointing out limitations such as the reduced number of studies with risk of analytical bias, studies with small samples, scarcity of randomized clinical trials and multicenter studies, and the absence of studies that could compare different family participation interventions and evaluate their effectiveness in terms of independent and overall delirium outcomes in the ICU. Both reviews included studies published up until 2021 [24,28]. Thus, the available evidence does not allow for a definitive conclusion on the effectiveness of family participation interventions in preventing delirium in ICU patients.

Our study aimed to systematically review the effect of family participation interventions in preventing delirium in Intensive Care Units to answer the following research question: "What is the effectiveness of family participation interventions in preventing delirium among critically ill patients in Intensive Care Units?"

Methods

Study design

This systematic review was developed following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)

methodology [29] (Appendix A) and the reporting guideline "Synthesis Without Meta-analysis" (SWiM) in systematic reviews [30]. The protocol was registered in PROSPERO (CRD42023438201).

Eligibility criteria

We included studies with patients admitted to Intensive Care Units, aged 18 or older exposed to risk factors for delirium, and with family members present; studies about family participation to prevent delirium that considered family as a partner in care and included interventions were initiated during the patient's stay in the ICU and completed before transfer to another service/hospital; studies that quantitatively assessed the effect of measures on the incidence and duration of delirium (primary outcomes), number of days with mechanical ventilation, length of ICU stay, ICU mortality, hospital mortality and type of adverse events related to delirium (secondary outcomes); interventional studies such as randomized controlled trials, non-randomized pilot clinical trials, before and after studies, and cohort studies.

We excluded studies involving pediatric patients, patients with delirium tremens, patients with delirium related to previous neurological diseases or drug use, studies about pharmacological interventions or interventions that do not include the family in the prevention of delirium in the ICU, studies that considered family as the target of care or studies about interventions with the family post-intensive care. We also excluded editorials, commentaries, opinions, reviews, book chapters, non-comparative studies (case reports, case series, qualitative studies), cross-sectorial studies, conference abstracts, summary reports, or mathematical modeling studies.

Data sources and search strategy

We performed a literature search using the online databases of MEDLINE, CINAHL, Cochrane Database of Systematic Reviews (EBSCO Host), Web of Science, Scopus (ELSEVIER), Cochrane Central Register of Controlled Trials (CENTRAL) and [ClinicalTrials.gov](https://www.clinicaltrials.gov). Searches were carried out on April 22, 2024. To create the search strategy, we consulted previous systematic reviews [24,28,31]. We used medical subject headings (MeSH) and non-MeSH keywords in the current strategy, according to the PICO method, and utilized Boolean operators. We searched in "TITLE, ABSTRACT" for all databases (Appendix B). A second reviewer verified both search terms and Boolean operators.

There were no language restrictions or time filters, as we aimed to focus the entire research on the field. We hand-searched the reference lists of included studies. MV and HRH conducted the database search. We consulted an academic librarian to access some full-text articles.

Selection process

All identified studies were exported to the Rayyan application, which facilitated the collaborative work of the team [32].

Duplicate studies were removed. Then, two reviewers independently assessed the titles and abstracts of the selected studies to determine if they met the eligibility criteria. The reviewers made joint decisions for the first ten articles, reviewing the title and abstract together; they then defined the working processes and conducted an independent screening, discussing any discrepancies until reaching a consensus. All studies that met the inclusion criteria were analyzed through full-text review.

Any disagreements between the two screeners regarding article selection were resolved through discussion to reach a consensus. A third reviewer decided on its inclusion or exclusion if consensus could not be reached for a particular article.

Data collection and extraction

The researchers developed the tools for data extraction using Microsoft Excel®. We used two tables to extract all necessary data for

this review: one for analyzing each included article and another for synthesizing information from all included articles (Appendix C).

The data extraction tables were built and adapted based on the criteria and recommendations provided by the Cochrane Library [33]. The data extraction table for all included articles contains summary information such as article ID, author(s) name, year, country, objective, study design, context, population, family participation interventions, outcome measures, instruments used, results, and conclusions. The table for each study contains details related to the researchers and the study, systematic review information, study characteristics extraction, family participation interventions, primary and secondary outcome measures, conclusions, and additional relevant information.

The data were extracted by one reviewer and validated by a second reviewer.

Quality appraisal

The quality assessment of the studies was independently conducted by two reviewers using Critical Appraisal Skills Programme (CASP) tools, selected according to the type of study [34]. Although there is no standardized recommendation for interpreting the score of the CASP checklist in terms of evidence quality levels, we defined four levels of quality based on the percentage of affirmative responses: critically low (0–25 %), low (26–50 %), moderate (51–75 %), and high (76–100 %).

Cohen’s Kappa-coefficient and the percentage of concordance between authors were calculated.

Effect measures

Effect estimates were reported as differences in means, relative risk (RR), or odds ratio (OR) with 95 % confidence intervals. In the results of studies that presented both adjusted and unadjusted intervention effects, we considered the adjusted effects from the model with information on the variables that were adjusted for.

Data synthesis

Due to the studies’ high methodological and clinical heterogeneity level and diverse measurement tools, a meta-analysis was not feasible. Thus, each study was subjected to a descriptive analysis according to the reporting guideline “Synthesis Without Meta-analysis” (SWiM) in systematic reviews [30]. A narrative synthesis was used to describe the evidence.

Results

Search results

Search results were recorded in the PRISMA flowchart [29] (Fig. 1).

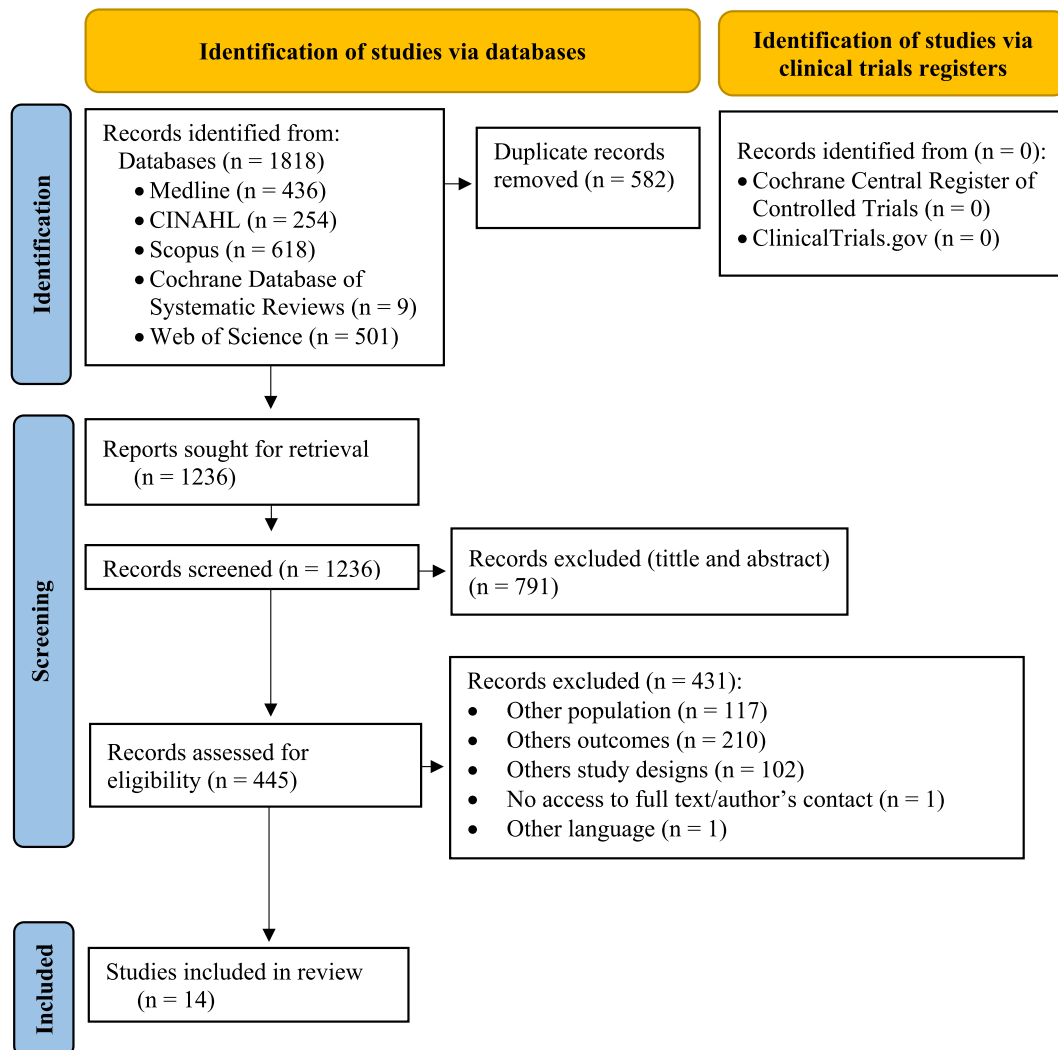


Fig. 1. PRISMA Flowchart.

The database search resulted in 1818 studies exported from selected databases to the Rayyan application. We removed 582 duplicate records and began the first screening state with 1236 studies. We excluded 791 records after analyzing their titles and abstracts. Then, 445 records were assessed for eligibility. Of these, 431 were excluded because they involved other populations (pregnant women, children, patients with specific conditions or diseases such as COVID-19, previous mental disorders, status epilepticus, patients with delirium tremens), other outcomes (risk factors, medication, family or nurse experiences), other study designs (reviews, case reports, qualitative studies, protocols, opinions, book chapters, cross-sectional studies, conference abstracts, summary reports, mathematical modeling studies), or issues with access to full text or language (Chinese). Consequently, we included 14 studies.

Characteristics of included studies

The fourteen studies were published between 2017 and 2024 and included 33 232 patients in this review. The sample size of the studies ranged from 30 [35] to 25 537 [36] patients. The studies were carried out in eight different countries, from Europe (n = 1), America (n = 8), Australia (n = 1) and Asia (n = 4). Nine were randomized clinical trials, two were pilot studies, and three were cohort studies. Five studies reported single-components of family participation, and nine studies reported multi-component family participation interventions (Supplement 1).

Quality of the studies

All studies met the CASP checklist criteria [34], with two different types of CASP checklists applied based on the study designs. The responses were categorized as Y for 'Yes,' CT for 'Can't Tell,' and N for 'No' (Supplement 2 – Table S2.1).

Regarding the strength of agreement in evaluating evidence quality, minor discrepancies were identified, discussed, and resolved through consensus. No studies were excluded based on quality. Consequently, the reviewers reached 80 % agreement for the RCTs, with a Cohen's Kappa coefficient of 0.737 (p = 0.016) (Supplement 2 – Table S2.2) and 100 % agreement for the cohort studies, with a Cohen's Kappa coefficient of 1 (p = 0.046) (Supplement 2 – Table S2.3). According to Landis and Koch [37], these Kappa values reflect substantial agreement for the RCTs and are almost perfect for the cohort studies.

Only four studies were considered high quality: two RCTs with 77 % affirmative answers [38,39] and two cohort studies with all affirmative answers [36,40]. The remaining studies were of moderate quality (54–69 %) [35,41–48]. The participants and investigators were not blinded in any of these studies, and most of them could not determine whether the benefits of the experimental intervention outweighed the harms and costs [35,41–48]. In 80 % of the RCTs, they could not conclude that the experimental intervention provided more significant value to those in care than any of the existing interventions [35,41–48].

All studies addressed a focused research question and the issues related to participant recruitment. In all the RCTs, each study group received the same level of care, apart from the experimental intervention, and the effects of the intervention were reported comprehensively. In all the cohort studies, the exposure and outcomes were accurately measured to minimize bias and questions regarding the identification of confounders were considered. However, there was a risk of bias when applying the results to the local population [42,48]. Therefore, the results' validity, reliability, and synthesis must be carefully considered before any use in practice.

Characteristics of interventions

We considered all studies that presented results of interventions in which family participation was considered for preventing delirium in the ICU (Table 1).

The family participation interventions for preventing delirium in the ICU were grouped into two types of interventions, as suggested by the literature: single-component or multi-component. Single-component interventions consist of individual activities carried out in isolation [50]. In contrast, multi-component interventions are complex and composed of several single-component interventions combined [51].

Given the significant variations in the type of intervention and their effects on delirium prevention in the ICU, we subcategorized the impact of these interventions into favorable effect, unfavorable effect or null effect [52]. This approach allows an understanding of the direction of the effect of different family participation interventions in the prevention of delirium in the ICU (Table 2).

As the studies reported the implementation of different interventions, using various measurement instruments and producing highly heterogeneous results, we considered that a meta-analysis was not feasible. Specifically, the Tau² value exceeded 0.75, and the I² index was greater than 92 % (Supplement 3 – Table S3.1, Table S3.2 and Table S3.3). These values indicate substantial variability between study results that cannot be attributed to chance alone. Such significant heterogeneity suggests that the studies are not sufficiently comparable, and pooling their results would not yield a meaningful or reliable summary estimate [49].

Therefore, we conducted a narrative synthesis without meta-analysis [30].

Single-component interventions

This study identified three single-component interventions with a heterogeneous response effect (Fig. 2). Munro et al. [35] studied one of them, using family-recorded orientation messages, and showed a favorable effect on the mean number of delirium-free days, with the familiar voice group having significantly more delirium-free days than the unknown voice and control groups. The difference was statistically significant (p = 0.0437).

Family presence in the ICU was explored in two studies [36,48]. In patients admitted after elective surgery with an intact Glasgow Coma Scale score (GCS = 15), family presence was associated with a lower delirium prevalence than the control group (OR 0.60, 95 %CI 0.39 to 0.97). Additionally, both family presence and telephone calls were associated with a reduction in the duration of delirium (–1.87 days [95 %CI –2.01 to –1.81] for family presence and –1.41 days [95 %CI –1.52 to –1.31] for telephone calls), compared to the control group (p < 0.001). However, this intervention also had an unfavorable effect on the overall cohort, increasing the prevalence of delirium (OR 1.19, 95 %CI 1.11 to 1.27, p = 0.02) [36]. In contrast, for spine surgery patients admitted to the ICU, family presence did not affect the prevalence of delirium, agitation, or confusion compared to the unaccompanied group (p > 0.05) [48].

A foot massage intervention (administered by either family or nurses) did not significantly affect delirium prevalence, with no differences observed between groups (p > 0.99) [45].

Multi-component interventions

Multi-component interventions involving family participation in managing delirium include various strategies and have a heterogeneous response effect on patient outcomes (Fig. 3). One such intervention, which combined joint family visits with professional-guided orientation, aimed to manage delirium after cardiac surgery [43]. It involved family education, patient reorientation, reporting of events and family memories, compensating for sensory deficits, and providing feedback. This intervention had a favorable response in a lower proportion of patients with positive Confusion Assessment Method for the ICU (CAM-ICU) scores on postoperative day 2 (43.8 % vs. 71.4 % in the control group), and a shorter duration of delirium (mean days: 1.96 vs. mean days: 4.14 in the control group). However, there were no significant differences in delirium severity, hospital stay duration, or clinical complications (p > 0.05).

Table 1
Characteristics of included studies.

ID Study, author	Publication year	Country	Aim	Study design	Context	Participants	Outcomes			Conclusions
							Measures	Measure tools	Results	
Munro et al. [34]	2017	USA	To explore the effect of an automated reorientation Intervention on delirium in the ICU.	Randomized controlled clinical trial	5 ICUs	Group 1: 10 patients received recorded messages from a family member; Group 2: 10 patients received the same messages in an unfamiliar voice; Control group: 10 patients did not receive any message.	Delirium free days, mean (SD) Mean days of delirium (SD)	Confusion Assessment Method – ICU	Group 1: 1,9 (0,99); Group 2: 1,6 (1,07); Group 3: 1,6 (1,13) Group 1: 0,3 (0,48); Group 2: 0,6 (0,84); Group 3: 0,9 (1,28)	The mean number of delirium-free days was higher in the family voice group compared to the unknown voice group and the control group (p = 0.0437). Although the mean number of days with delirium showed a decreasing trend across the three groups, the differences were not statistically significant.
Mitchell et al. [40]	2017	Australia	To evaluate the feasibility and acceptability to family members and nurses of an intervention carried out by the family to reduce delirium in the ICU.	Randomized controlled clinical trial single center	1 Medical-Cirurgical ICU	Intervention group: 29 family members provided messages of guidance, therapeutic involvement, and sensory stimulation after receiving education. Control group: 32 family members received routine care.	Prevalence of delirium (%/median days) Prevalence of delirium >= one day of data recording (%/median days) Mean days with delirium (SD)	Confusion Assessment Method – ICU	Intervention group: 59 %/1; Control group: 56 %/1 Intervention group: 54 %/1; Control group: 50 %/0,5 Intervention group: 1,34 (1,57); Control group: 1,03 (1,12)	The prevalence of delirium in the ICU in the intervention group and control group did not show statistical differences (p > 0,05). The number of days with delirium was also similar between the groups, both with a median of one day of delirium.
Mailhot et al. [42]	2017	Canada	To evaluate the feasibility, acceptability and preliminary effectiveness of a nursing intervention involving family caregivers in the management of delirium after cardiac surgery.	Randomized pilot study	1 ICU	Intervention group: 16 families carried out 7 joint visits with the nurse mentor; Control group: 14 families received routine daily care.	Mean delirium severity score (SD) Number of patients with clinical complications Mean of length of hospital stay (SD) Positive CAM-ICU scores on day 2 (%) Mean days of delirium (SD)	Delirium Index Patient's clinical files Patient's clinical files Confusion Assessment Method – ICU	Intervention group: day 1: 10,56 (3,5), day 2: 5,38 (5,45), day 3: 3,43 (4,96); Control group: day 1: 12,07 (4,05), day 2: 8 (6,34), day 3: 5,5 (7) Intervention group: 2; Control group: 3 Intervention group: 6,3 (7); Control group: 12,10 (11,19) Intervention group: 43,8%; Control group: 71,4% Intervention group: 1,94 (1,34); Control group: 4,14 (4,04)	The mean severity scores of delirium on days 1, 2, and 3, the number of clinical complications per patient nem the mean length of hospital stay were not statistically different between groups (p > 0,05). The positive delirium score was lower in the intervention group on day 2 compared to the control group and the mean duration of delirium tended to be lower in the intervention group than in the control group.
Rosa, R. et al. [41]	2017	Brazil	To evaluate the effect of an Extended Visit Model (EVM)	Single-center prospective	1 Medical-Cirurgical ICU	Intervention group: 145 patients were visited by two family	Cumulative incidence of delirium (%)	Confusion Assessment Method – ICU	Intervention group: 9,6%; Control group: 20,50 %	The cumulative incidence of delirium was lower in patients

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Table 1 (continued)

ID Study, author	Publication year	Country	Aim	Study design	Context	Participants	Outcomes			Conclusions
							Measures	Measure tools	Results	
			compared to a Restricted Visit Model (RVM) on the occurrence of delirium in the ICU.	before-and-after study		members, one at a time, for up to 12 h per day (9:00–21:00) and participated in multidisciplinary meetings; Control group: 141 patients received visits by two family members, one at a time, for up to 4.5 h per day, divided into three periods (9:00–11:00, 16:00–17:30, and 21:00–22:00).	Duration of delirium/coma (d), median Any ICU-acquired infection (%) ICU-acquired pneumonia (%) ICU-acquired bloodstream infection (%) UCI-acquired urinary tract infection (%) ICU mortality (%) Length of ICU stay (d), median	Richmond Agitation-Sedation Scale (RASS) Patient's clinical files Patient's clinical files Patient's clinical files Patient's clinical files Patient's clinical files Patient's clinical files	Intervention group: 1,5 (1–2); Control group: 3 (2,5–5) Intervention group: 5,5%; Control group: 9,2% Intervention group: 1,3%; Control group: 1,3% Intervention group: 4,1%; Control group: 8,5% Intervention group: 1,3%; Control group: 1,4% Intervention group: 2,1%; Control group: 6,3% Intervention group: 3 (2–4); Control group: 4 (2–6)	with the EVM than in patients with the RVM (p = 0,03). The median duration of delirium/coma was shorter in patients with EVM compared to the RVM group (p = 0,03). The median length of ICU stay was shorter for patients with EVM compared to the RVM group (p = 0,04). The rate of ICU-acquired infections and ICU mortality did not differ significantly between the two groups (p > 0,05).
Eghbali-Babadi et al. [43]	2017	Iran	To evaluate the effect of the relationship between the family and the patient on the incidence of delirium in the ICU.	Randomized controlled clinical trial	Cardiac surgery ICU	Intervention group: 34 family members identified by the patients received an education session and a scheduled visit; Control group: 34 family members received routine daily care.	Relative frequency of delirium (%)	Confusion Assessment Method – ICU	Intervention group: 2nd day morning after surgery: 11,76 %; 3rd day morning after surgery: 8,83 %; Control group: 2nd day morning after surgery: 23,53 %; 3rd day morning after surgery: 20,58 % Intervention group: 1st time (next morning after surgery): 11,76 %; 2nd time (next evening after surgery): 11,76 %; 3rd time (2daysaftersurgery): 8,83 %; Control group: 1st time: 23,53 %; 2nd time: 32,35 %; 3rd time: 20,58 %	The incidence of delirium on the morning of the 2nd and 3rd postoperative days, as well as on the night of the 2nd postoperative day, was lower in the intervention group than in the control group (p < 0.05). The relative frequency of delirium was lower in the intervention group compared to the control group on the morning after surgery, the afternoon following surgery, and two days after surgery (p < 0.05).
Rosa et al. [49]	2019	Brazil	To determine whether flexible family visitation reduces the incidence of delirium in the ICU.	Randomized controlled clinical trial (cluster-crossover)	36 Medical-Cirurgical ICUs	Intervention group: 652 families had flexible visitation (up to 12 h per day) supported by family education; Control group: 643 families had the usual restricted visitation (median of 1.5 h per day).	Incidence of delirium (%) Daily hazard of delirium, mean (SD) ICU-acquired infections (%)	Confusion Assessment Method – ICU Prediction of Delirium in ICU Patient Patient's clinical files	Intervention group: 18,9%; Control group: 20,10 % Intervention group: 0,09 (0,23); Control group: 0,1 (0,23) Intervention group: 3,7%; Control group: 4,5%	The flexible visiting group had significantly longer daily visit durations compared to the restricted visiting group. However, there was no significant difference between the groups in terms of delirium incidence, use

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Table 1 (continued)

ID Study, author	Publication year	Country	Aim	Study design	Context	Participants	Outcomes			Conclusions
							Measures	Measure tools	Results	
Momeni et al. [44]	2021	Iran	To determine the effect of foot massage, performed by nurses and family members, on the level of consciousness and delirium in patients admitted to the ICU	Randomized controlled clinical trial	3 Trauma ICU	Group 1: 34 patients received massage from a nurse; Group 2: 37 patients received massage from family members; Group 3: 38 patients received routine care.	Days free of coma within the first 7 days, mean (SD)	Patient's clinical files	Intervention group: 5,9 (3,3); Control group: 5 (3,3)	of antipsychotics, need for mechanical restraints, accidental removal of medical devices, or ICU-acquired infections (pneumonia, urinary, or bloodstream infections) ($p > 0,05$). The flexible visiting group showed no significant differences in daily delirium risk, ICU-acquired infections, days without mechanical ventilation, ICU length of stay, or hospital mortality compared to the restricted visiting group.
							ICU-acquired pneumonia (%)	Patient's clinical files	Intervention group: 2,8%; Control group: 3,5%	
Momeni et al. [44]	2021	Iran	To determine the effect of foot massage, performed by nurses and family members, on the level of consciousness and delirium in patients admitted to the ICU	Randomized controlled clinical trial	3 Trauma ICU	Group 1: 34 patients received massage from a nurse; Group 2: 37 patients received massage from family members; Group 3: 38 patients received routine care.	ICU-acquired UTI (%)	Patient's clinical files	Intervention group: 0,4%; Control group: 0,4%	While there were reductions in delirium prevalence after both family and nurse-led massage interventions, these changes were not statistically significant ($p > 0,05$). However, all three groups, including the control, showed significant improvements in the level of consciousness from before to one week after the intervention, though no significant difference was observed between the groups ($p > 0,05$).
							ICU-acquired bloodstream infection (%)	Patient's clinical files	Intervention group: 1,4%; Control group: 1,2%	
Momeni et al. [44]	2021	Iran	To determine the effect of foot massage, performed by nurses and family members, on the level of consciousness and delirium in patients admitted to the ICU	Randomized controlled clinical trial	3 Trauma ICU	Group 1: 34 patients received massage from a nurse; Group 2: 37 patients received massage from family members; Group 3: 38 patients received routine care.	Level of consciousness (LOC), mean (SD)	Full Outline of UnResponsiveness Scale and Glasgow Coma Scale	Group 1: before intervention: 10,00 (0); one week after: 10,56 (0,58); Group 2: before intervention: 10,25 (0,74); one week after: 10,63 (0,82); Group 3: before intervention: 9,92 (0,64); one week after: 10,50 (0,58)	While there were reductions in delirium prevalence after both family and nurse-led massage interventions, these changes were not statistically significant ($p > 0,05$). However, all three groups, including the control, showed significant improvements in the level of consciousness from before to one week after the intervention, though no significant difference was observed between the groups ($p > 0,05$).
							Prevalence of delirium (%)	Confusion Assessment Method – ICU	Group 1: before intervention: 16 %; one week after: 8 %; Group 2: before intervention: 20 %; one week after: 12 %; Group 3: before intervention: 16 %; one week after: 12 %	
Mohsen et al. [35]	2022	Canada	To evaluate the effect of family presence on the prevalence and duration of delirium in the ICU.	Retrospective cross-sectional study	14 Medical-Cirurgical ICUs	Group 1: 23 121 patients had physical family presence; Group 2: 591 received a family phone call;	Incidence of delirium (OR)	Intensive Care Delirium Screening Checklist	Group 1: 1,19 (1,11–1,27); Group 2: 1,14 (0,87–1,48);	Family presence increased delirium incidence compared to the control group, but reduced it in post-

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Table 1 (continued)

ID Study, author	Publication year	Country	Aim	Study design	Context	Participants	Outcomes			Conclusions
							Measures	Measure tools	Results	
						Control Group: 1825 patients did not receive a family visit or phone call.	Mean days with delirium (SD)	Patient's clinical files	Group 1: -1,87 days; IC 95 %, (-2,01 a -1,81); Group 2: -1,41 days; IC 95 %, (-1,52 a -1,31)	surgery patients with a Glasgow Coma Scale (GSC) score of 15. Both family visits and phone contact decreased the mean of delirium days.
Kasapoğlu and Enç [45]	2022	Turkey	To compare the effects of non-pharmacological multicomponent nursing interventions to prevent delirium in the ICU.	Randomized controlled clinical trial	2 General and respiratory ICU	Group 1: 39 patients listened to guidance messages recorded by an unfamiliar person, listened to the newspaper read and wore blindfolds at night; Group 2: 34 patients received the same interventions as Group 1, but with family guidance messages; Control group: 34 patients received routine care.	Incidence of delirium (%)	Confusion Assessment Method – ICU	Group 1: 16,7%; Group 2: 6,5%; Group 3: 27,3%	The group 2, which received familiar voice messages, showed a significant reduction in delirium compared to the control group, highlighting the effectiveness of this intervention. There was no significant difference between Groups 1 and 2, but both groups' interventions were effective in preventing delirium when compared separately to the control group, suggesting that interventions play an important role in reducing delirium in ICU patients.
Adineh et al. [46]	2023	Iran	To determine the effect of implementing a sensory stimulation program on delirium, carried out by family members, in patients with brain injury admitted to the ICU.	Randomized controlled clinical trial	1 ICU	Intervention group: 33 family members carried out a sensory stimulation program, 1 h a day; Control group: 33 family members received routine care.	Incidence of delirium (%) Mean days of delirium (SD) Length of ICU stay, mean (SD) Length of mechanical ventilation, mean (SD) ICU dead rate (OR)	Confusion Assessment Method – ICU Patient's clinical files Patient's clinical files Patient's clinical files	Intervention group: OR = 0,057, IC 95 % (0,017–0,19) Intervention group: 3 (0,75); Control group: 8,57 (3,09) Intervention group: 14,3 (3,9); Control group: 24,24 (7,02) Intervention group: 7,54 (3,17); Control group: 16,36 (6,46) Intervention group: 0,80, IC 95 % (0,21–2,94)	The odds of developing delirium were lower in the intervention group compared to the control group. While no statistically significant difference was found in ICU mortality rates between the two groups (p = 0,741), the intervention group had significantly shorter durations of delirium, ICU stays, and mechanical ventilation (p > 0,05).
Welsch et al. [47]	2023	USA	To evaluate the effect of family presence on acute confusion/delirium during the night of the first postoperative day in patients undergoing spine surgery admitted to the ICU.	Pilot, prospective, non-randomized clinical trial	1 Spine surgery ICU	Intervention group: 16 patients who had a family member present during the 1st night after surgery; Control group: 14 patients without family presence.	Delirium postoperative day 0 (%) Agitation postoperative day 0 (%) 4AT Delirium postoperative day 0 (%)	Confusion Assessment Method – ICU Richmond Agitation Sedation Scale 4AT (Alertness, Attention, Abbreviated mental	Intervention group: 18,7%; Control group: 35,7% Intervention group: 6,3%; Control group: 7,1% Intervention group: 12,5%; Control group: 21,4%	While the prevalence of delirium or confusion on postoperative day 0 was lower in the intervention group compared to the control group, the difference was not statistically significant.

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Table 1 (continued)

ID Study, author	Publication year	Country	Aim	Study design	Context	Participants	Outcomes			Conclusions
							Measures	Measure tools	Results	
Barr et al. [39]	2024	USA	To measure how the ICU Liberation Bundle (ABCDEF) influences clinical outcomes in ICU patients under Mechanical Ventilation (MV) and measure the sustainability of the multicomponent intervention and its dissemination across a healthcare system.	Prospective, cohort, multicenter observational study	11 ICUs	Intervention group: 2685 patients received the ABCDEF bundle; Control group: 2248 patients received routine care.	Confusion postoperative day 0 (%)	test and Acute change) Glasgow Coma Scale	Intervention group: 25 %;	Although a clinically relevant reduction in delirium or confusion was observed on postoperative day 1 in the family-present group, it did not reach statistical significance (p > 0,05).
							Any delirium or confusion postoperativa day 0 (%)	>= 1 event of delirium or confusion	Control group: 21,4% Intervention group: 31,3%;	
							CAM-ICU Delirium postoperative day 1 (%)	Confusion Assessment Method – ICU	Control group: 42,9% Intervention group: 6,3%;	
							Agitation postoperative day 1 (%)	Richmond Agitation Sedation Scale	Control group: 21,4% Intervention group: 0 %;	
							4AT Delirium postoperative day 1 (%)	4AT	Control group: 0 % Intervention group: 0 %	
							Confusion postoperative day 1 (%)	Glasgow Coma Scale	Control group: 0 % Intervention group: 0 %	
							Any delirium or confusion postoperative day 1 (%)	At least one event of delirium or confusion	Control group: 6,3% Intervention group: 21,4%	
							ICU length of stay (d), mean (SD)	Patient's clinical files	Control group: 5,09 (4,17); Intervention group: 5,55 (4,58)	
							Hospital length of stay (d), mean (SD)	Patient's clinical files	Control group: 11,68 (13,14); Intervention group: 12,34 (15,67)	
							Mechanical ventilation (d), mean (SD)	Patient's clinical files	Control group: 4,35 (4,82); Intervention group: 4,94 (5,5)	
ICU length of stay 7 days (%)	Patient's clinical files	Control group: 23,1% Intervention group: 38,2%								
Mortality rate (%)	Patient's clinical files	Control group: 8,2% Intervention group: 10,2% R ^{2*} : 0,18								
A: Assess, manage, prevent pain	Pain assessed, managed									
B: Spontaneous awakening trials (SAT) and spontaneous breathing trials (SBT)	Daily SAT Daily SBT Reintubation < 24 h	R ² : 0,04 R ² : 0,04 R ² : 0,11								

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Table 1 (continued)

ID Study, author	Publication year	Country	Aim	Study design	Context	Participants	Outcomes			Conclusions
							Measures	Measure tools	Results	
							C: Choice of sedation strategies	RASS Sedation with benzodiazepine infusions Sedation with non-benzodiazepine infusions	R ² : 0,45 R ² : 0,57 R ² : 0,04	
							D: Delirium: assess, prevent, manage	Confusion Assessment Method – ICU	R ² : 0,36 R ² : 0,35	
							E: Early mobility and exercise	Mobility screening ICU Mobility Score >= 2	R ² : 0,32 R ² : 0,11	
							F: ICU family engagement, empowerment	Paliative care screening tool completed	R ² : 0,01	
Tovar & Castaño [37]	2024	Colombia	To determine the effectiveness of a nursing intervention based on the Dynamic Symptom Model and scientific evidence (DyDel) vs. daily care to reduce the incidence and duration of delirium in the ICU.	Randomized controlled clinical trial	1 ICU	Intervention group: 71 patients received the DyDel program on each shift and delivered materials (magazines, books, radios, tablets, board games, blindfolds, earplugs and other patient preferences); Control group: 142 patients received daily care.	Incidence of delirium (%) Mean days of delirium (SD) Mean of days RASS between –2 and + 1 (SD) Mean days with Visual Analogic Scale (VAS) < 4 (SD) Mean days with Campbell Scale < 3 (SD) Mean days of mechanical ventilation (SD) Length of ICU stay, mean (SD) Mean days with physical restrains (SD)	RASS Assessment Method – ICU (CAM-ICU) VAS Campbell Scale Patient's clinical files Patient's clinical files Patient's clinical files	Intervention group: 5,6%; Control group: 14,8% Intervention group: 0,07 (0,308); Control group: 0,34 (1,28) Intervention group: 5,1 (3,45); Control group: 4,81 (3,47) Intervention group: 4,07 (3,34); Control group: 3,15 (2,92) Intervention group: 0 (1); Control group: 0 (1) Intervention group: 0,3 (1,22); Control group: 0,6 (2,17) (3,62); Intervention group: 5,21 (3,62); Control group: 4,8 (3,93) (1,21); Intervention group: 0,24 (1,21); Control group: 0,46 (1,27)	The DyDel intervention reduced the incidence, risk, and duration of delirium in the ICU compared to the control group. Although not statistically significant, the intervention group had more days with low pain intensity and fewer days with physical restraints. The intervention group had a higher number of patients who remained delirium-free, while the control group had a higher risk of extended ICU stays.
Lin et al. [38]	2024	China	To evaluate the effects of family intervention on the incidence of postoperative delirium (POD) and the prognosis of patients undergoing heart valve surgery in the ICU.	Randomized controlled clinical trial	1 Cardiovascular ICU	Intervention group: 42 patients received the family intervention; Control group: 42 patients received routine care.	Incidence of delirium (%) 1st Episode of delirium (%)	Confusion Assessment Method – ICU	Intervention group: 7,5%; Control group: 27,5% Intervention group: 1st day of surgery: 0 %; 2nd day: 66,7%; >=3rd day: 33,3%; Control group: 1st day of surgery: 36,4%; 2nd day:	The multicomponent intervention reduced the incidence of postoperative delirium and ICU length of stay in patients undergoing heart valve surgery. Although the 1st episode of delirium occurred later in the

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Table 1 (continued)

ID Study, author	Publication year	Country	Aim	Study design	Context	Participants	Outcomes Measures	Measure tools	Results	Conclusions
							Duration of mechanical ventilation (h), median Length of ICU stay (h), median	Patient's clinical files Patient's clinical files	45,5%; > =3rd day: 18,2% Intervention group: 20,5 (16,38–38,25); Control group: 19,75 (14,13–35,88) Intervention group: 66,50 (48,13–87,13); Control group: 45,75 (40,38–67,38)	intervention group, this difference was not statistically significant, and there were no significant differences in the duration of mechanical ventilation between the groups ($p > 0,05$).

A similar intervention focused on family visitation with professional guidance, which included education sessions on communication, orientation, providing personal meaningful objects, and compensation for sensory deficits [44], also showed a reduction in delirium incidence on postoperative days 2 and 3 ($p = 0.04$ and $p = 0.03$, respectively), as well as a lower relative frequency of delirium on the morning and afternoon following surgery, and two days post-surgery ($p = 0.04$, $p = 0.004$, $p = 0.03$).

The flexible family visitation studied by Rosa et al. [42] combined several patient care strategies, including pain prevention and management, daily spontaneous awakening and breathing trials, minimization of benzodiazepine and opioid use, early mobilization, and patient orientation. The intervention was implemented through two visitation models: the Extended ICU Visitation Model (EVM), which allowed up to two family members to visit 12 h/day and attend bedside multidisciplinary meetings, and the Restricted Visitation Model (RVM), which limited visits to 4.5 h/day [42]. The results showed that the EVM group had a significantly lower incidence of delirium (9.6 %) compared to the RVM group (20.5 %), a higher survival rate of delirium during the ICU stay (log-rank $p = 0.01$), a shorter duration of delirium (median 1 day vs. 2 days for the RVM group, $p = 0.007$), and a shorter duration of delirium/coma (median 1.5 days vs. 3 days [for the RVM group, $p = 0.03$]). The EVM group also had a shorter ICU stay (median 3 days vs. 4 days for the RVM group, $p = 0.04$). However, patients who developed delirium had significantly longer ICU stays than those without delirium (mean days: 6.0 vs. mean days: 1.0, $p < 0.001$), which affected their recovery.

A multi-component intervention combining flexible family visitation, structured meetings, and ICU team training was studied by Rosa et al. [53], showed no significant effect on delirium incidence, the need for antipsychotics or mechanical restraint, accidental removal of medical devices, or ICU-acquired infections ($p > 0.05$).

The intervention involving orientation messages recorded by a family member's voice, daily newspaper reading, and the application of an eye patch by ICU nurses was analyzed by Kasapoğlu and Enç [46]. This intervention had a favorable effect on delirium incidence, which was significantly lower in the family voice message group (6.5 %) compared to the non-family voice group (16.7 %) and the control group (27.3 %) ($p = 0.036$). Patients with positive CAM-ICU scores had higher Acute Physiology And Chronic Health Evaluation (APACHE) II scores, higher expected mortality and older mean ages compared to patients with negative CAM-ICU scores, with significant differences ($p < 0.001$ for APACHE II, $p = 0.048$ for mortality, $p = 0.035$ for age). However, there were no significant differences between the groups regarding duration of ICU stay, invasive catheters/tubes, or risky drug use ($p > 0.05$).

A sensory stimulation program designed to address delirium in ICU patients, conducted by family members, included stimulation through reorientation strategies, auditory stimulation with the patient's favorite music, visual stimulation using photographs, videos, and images of personal significance, olfactory stimulation with familiar scents, tactile stimulation via massage, and motor stimulation through limb mobilization [47]. The program showed a favorable response in reducing the incidence of delirium, with the intervention group having a 94 % lower risk of delirium compared to the control group (OR = 0.057, $p = 0.001$). The intervention also led to a significantly shorter duration of delirium (3 days vs. 8.57 days, $p = 0.001$), reduced ICU length of stay (14.3 days vs. 24.24 days, $p = 0.001$), and shorter duration of mechanical ventilation (7.54 days vs. 16.36 days, $p = 0.001$). However, the intervention did not significantly affect ICU mortality rates ($p = 0.741$).

The "ABCDEF" bundle was a multi-component intervention aimed at improving ICU outcomes in mechanically ventilated adult ICU patients [40]. It included: A) assess, manage, and prevent pain, B) Spontaneous Awakening Trials (SATs) and Spontaneous Breathing Trials (SBTs), C) choice of sedation strategies, D) delirium assessment, prevention, management, E) early mobilization and exercise, and F) ICU family

Table 2
Direction of the effect of family participation interventions.

ID study	Statistical analysis	Type of interventions	Favorable effect	Unfavorable effect	Null effect	Conclusions
Munro et al. [34]	Descriptive statistics were used to describe the three groups and compare their characteristics, ANOVA and Fisher's Exact Test, with a significance level of $p < 0.05$.	Single component: Orientation voice messages for delirium	The group using guidance messages with a familiar voice had a higher mean of delirium-free days compared to the unknown voice and control groups. A statistically significant difference was observed in delirium-free days between the groups ($p = 0.0437$).	–	Although the descriptive statistics for the mean number of days with delirium showed a trend of reduction among the control group, the unfamiliar voice group, and the familiar voice group, the differences were not statistically significant.	The family voice group had the highest mean number of delirium-free days, followed by the unknown voice and control groups. Although the family voice group showed fewer delirium days compared to the other groups, the trend was not statistically significant.
Mitchell et al. [40]	Demographic characteristics were analyzed using frequencies or median values, with group comparisons conducted using the Kruskal-Wallis H test, Pearson's Chi-square test, or Mann-Whitney <i>U</i> test. A significance level of $p < 0.05$ was applied. Means and standard deviations of delirium days were used to calculate Cohen's <i>d</i> .	Multicomponent: Guidance messages, therapeutic involvement, and sensory stimulation carried out by family members	–	–	The prevalence of ICU delirium did not show a statistically significant difference among the pre-randomization, intervention, and control groups. The difference in the number of days with delirium was not statistically significant between the groups.	ICU delirium prevalence was similar across the pre-randomization, intervention, and non-intervention groups, with no significant differences ($p > 0.80$). The number of delirium days was also comparable between groups, with a median of one day ($p = 0.60$), and this non-significance persisted for "active" participants ($p = 0.97$). Mean delirium days did not differ significantly between the intervention and control groups.
Mailhot et al. [42]	Descriptive statistics were used to analyze the sociodemographic and clinical data, the occurrence of delirium reflected by CAM-ICU scores on days 1, 2, and 3, and the duration of delirium. The groups were compared using the ANCOVA model.	Multicomponent: Conducting joint family visits with a nurse	The positive CAM-ICU score was lower in the intervention group on day 2 (43.8 %) compared to the control group (71.4 %). The duration of delirium tended to be shorter in the intervention group (mean days: 1.96 (1.34)) than in the control group (mean days: 4.14 (4.04)).	–	The mean delirium severity scores were not statistically different on days 1, 2, and 3 in both groups ($p = 0.27$), nor was the number of clinical complications per patient ($p = 0.90$). The mean duration of postoperative hospital stay was shorter in the intervention group compared to the control group, but this was not statistically significant ($p = 0.34$).	With this multicomponent intervention, delirium severity scores and the number of clinical complications were not significantly different between groups ($p > 0.27$). Although the intervention group had a shorter postoperative hospital stay, the difference was not significant. On day 2, the intervention group had a lower positive delirium score. The mean duration of delirium was shorter in the intervention group compared to the control group.
Rosa et al. [41]	Fisher's exact test, Chi-square test, Wilcoxon rank-sum test, and Student's <i>t</i> -test were applied to determine if baseline covariates differed between the groups. The Wilcoxon rank-sum test and univariate and multivariate Poisson regression models were used. Relative risk (RR) and adjusted RR (aRR) were estimated with 95 % confidence intervals (CIs) and a significance level of 0.05.	Multi-component: flexible family visitation	The cumulative incidence of delirium occurred in 9.6 % of patients with the EVM and in 20.5 % of patients with the RVM ($p = 0.03$). Survival free of delirium during ICU stay was also significantly higher in EVM vs. RVM patients (log-rank $p = 0,01$). The median duration of delirium/coma was lower for EVM than RVM patients (1.5 d [IQR, 1.0–3.0] vs 3.0 d [IQR, 2.5–5.0]; $p = 0.03$). The median length of ICU stay was shorter for EVM vs. RVM patients (3 d [IQR, 2.0–4.0] vs. 4 d [IQR, 2.0–6.0]; $p = 0.04$).	The duration of mechanical ventilation in patients with delirium (mean days: 1,0 (0,5–2,0)) was shorter than in patients without delirium (mean days: 6,0 (2,0–14,0), $p < 0.001$).	The rate of ICU-acquired infections and ICU mortality did not differ significantly between the groups ($p > 0,05$).	This intervention demonstrated a statistically significant reduction in the cumulative incidence of delirium in the Extended Visit Model (EVM) group compared to the Restricted Visitation Model (RVM) group. EVM patients had a higher delirium-free survival rate during their ICU stay. The median duration of delirium/coma and ICU length of stay were reduced in the EVM group compared to the RVM group. No significant differences were found in ICU-acquired infections or ICU mortality between the groups.

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Table 2 (continued)

ID study	Statistical analysis	Type of interventions	Favorable effect	Unfavorable effect	Null effect	Conclusions
Eghbali-Babadi et al. [43]	Descriptive statistical tests (frequency distribution, mean, and standard deviation) and inferential statistics (Chi-square test, Mann-Whitney test, Student's <i>t</i> -test, and Fisher's exact test) were used to analyze the data and compare the groups.	Multicomponent: family visitation with professional guided orientation	The median duration of delirium was lower for EVM vs. RVM patients (1 d [IQR, 1.0–1.0] vs. 2 d [IQR, 1.2–3.2]; $p = 0.007$). Delirium patients had longer median length of ICU stay in comparison with patients who did not develop delirium (7.0 d [IQR, 4.0–12.0] vs 3.0 d [IQR, 2.0–4.0] $p < 0.001$). The incidence of delirium on the morning of the 2nd postoperative day was lower in the intervention group (11.76 %) compared to the control group (23.53 %) ($p = 0.04$), and on the morning of the 3rd postoperative day (8.83 % in the intervention group and 20.58 % in the control group, $p = 0.03$). The incidence of delirium was 11.76 % in the intervention group and 32.35 % in the control group on the night of the 2nd postoperative day ($p = 0.04$). The relative frequency of delirium was lower in the intervention group the morning after surgery (11.76 %, $p = 0,04$), the afternoon following surgery (11.76 %, $p = 0,004$), and two days after surgery (8.83 %, $p = 0,03$) compared to the control group (23.53 %, 32.35 %, 20.58 % respectively).	– – – – –	– – – – –	The incidence of delirium was significantly lower in the intervention group compared to the control group. On the 2nd and 3rd postoperative days, delirium was lower in the intervention group than in the control group. The intervention group also experienced less delirium on the night of the 2nd postoperative day. Throughout the postoperative period, delirium was consistently lower in the intervention group on the morning after surgery, the afternoon of the same day, and two days after surgery.
Rosa et al. [49]	Generalized estimating equations (GEE) were used with adjustments. Bonferroni correction was applied for multiple comparisons, and significance was set at a 2-sided <i>p</i> -value of less than 0.05.	Multicomponent: flexible family visitation	– – –	– – –	There was no significant difference in the incidence of delirium between the flexible visiting group and the restricted visiting group (aRR, –1.7 % (95 % CI, –6.1 % to 2.7 %; $p = 0.44$). There were no significant differences in the use of antipsychotics ($p = 0.59$), mechanical restraints ($p = 0.98$), accidental removal of medical devices ($p = 0.89$), or ICU-acquired infections ($p > 0.05$). There were no significant differences in the daily risk of delirium ($p = 0.52$), incidence of infections acquired in the ICU ($p = 0.38$), number of days without mechanical ventilation per 7 days ($p = 0.99$), number of days spent in the ICU ($p = 0.99$), and hospital mortality ($p = 0.99$) between groups.	Flexible visiting significantly increased daily visit duration (4.8 vs 1.4 h; $p < 0.001$), but there were no significant differences between groups in terms of delirium incidence, need for antipsychotics, use of mechanical restraint, accidental device removal, ICU-acquired infections, days without mechanical ventilation, ICU length of stay, or hospital mortality.

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Table 2 (continued)

ID study	Statistical analysis	Type of interventions	Favorable effect	Unfavorable effect	Null effect	Conclusions
Momeni et al. [44]	Descriptive statistics (frequency, percentage, mean, and standard deviation), Chi-Square, Fisher's exact test, Kruskal-Wallis, and ANOVA were used to test group similarities. The Friedman and Fisher's Exact tests were also used. Significance was set at 0.05.	Single component: foot massage by a nurse and patient's family on delirium in patients admitted to the intensive care units	–	–	Pre-intervention, in the massage group by family, 20 % of the samples had delirium, and this amount reduced to 12 % one-week post-intervention, but it was not statistically significant ($p = 0,37$). After the intervention, delirium prevalence reduced from 16 % to 8 % in the massage group and from 16 % to 12 % in the control group, but neither reduction was statistically significant ($p = 0.31$ and $p = 0.87$, respectively). The prevalence of delirium before the intervention, immediately, and one week after intervention were not significantly different among the three groups ($p > 0,99$).	Delirium prevalence decreased in all groups after the intervention, but none of the changes were statistically significant. However, consciousness levels improved significantly in all groups, though no significant differences were observed between the groups themselves.
Mohsen et al. [35]	A 5 % significance level and 95 % confidence intervals were used, with descriptive statistics summarizing patient characteristics. Mixed-effects logistic and linear regression models were applied to analyze the association between family presence and delirium, adjusting for patient readmission or ICU site when necessary.	Single component: family presence on delirium (physical presence, telephone call or no visit)	The family physical presence was associated with lower prevalence of delirium for patients admitted following elective surgery with intact GCS (GCS = 15) (OR, 0.60; 95 % CI, 0.39–0.97), compared with patients in the reference group (no visit or telephone call). The family physical presence and telephone call were associated with a decrease in the mean number of days with delirium (–1.87 d; 95 % CI, (–2.01 to –1.81); –1.41 d; 95 % CI, (–1.52 to –1.31), respectively) compared to the control group ($p < 0.001$).	Family physical presence was associated with increased prevalence delirium in the overall cohort (unadjusted OR [OR], 1.19; 95 % CI, 1.11–1.27; $p = 0.02$), compared with patients in the other groups.	–	The physical presence of family increased the incidence of delirium compared to the control group. However, family presence reduced the incidence of delirium in post-surgery patients with a GCS score of 15, and both family presence and telephone contact were associated with fewer days of delirium in all patients. The impact of family presence on delirium varied depending on visit type, ICU admission reason, and initial consciousness level.
Kasapoğlu and Enç [45]	The Shapiro-Wilk test assessed data normality, and outliers were checked before statistical analysis to avoid affecting error variance. The Fisher exact test compared differences between groups, while the Mann-Whitney <i>U</i> test evaluated the relationship between APACHE-II scores, expected mortality rates, and CAM-ICU results. The independent <i>t</i> -test was used to assess the relationship between age and other variables.	Multicomponent: orientation messages recorded from the voice of a family member, reading the daily/ local newspaper and eye patch was put on to patients by ICU nurse	The incidence of delirium, which was lower in the intervention group with family voice messages (6.5 %) compared to the non-family voice group (16.7 %) and the control group (27.3 %), $p = 0.036$. Patients with positive CAM-ICU scores had a statistically significant difference with higher mean APACHE II score (18.5 (13–27)), mean expected mortality (19.15 (5.60–54.10)) and mean age (80.18 years (8.86)) compared to patients with negative CAM-ICU scores (14 (5–27); 13.70 (2.10–74.20); 73.75 years (11.40), respectively), $p < 0.05$.	–	There was no statistically significant difference between the CAM-ICU results and the duration of stay in the ICU, presence of invasive catheter/ tube, and risky drug use ($p > 0.05$). No statistically significant difference was found between orientation messages recorded in a non-family member's group (G1) and orientation messages recorded in a family member's voice group (G2) ($p = 0,221$), and between G1 and control group in terms of CAM-ICU scores ($p = 0,312$).	Significant differences were found between CAM-ICU scores and APACHE-II scores, with interventions in family group effectively reducing delirium compared to the control group. Engaging patients with newspaper reading, sales, and familiar voice messages proved effective in preventing delirium.

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Table 2 (continued)

ID study	Statistical analysis	Type of interventions	Favorable effect	Unfavorable effect	Null effect	Conclusions	
Adineh et al. [46]	Descriptive statistics (frequency, percentage, mean, standard deviation, minimum and maximum), Shapiro–Wilk Independent t-test, Binary logistic regression model, independent samples t-test and Chi-square test were used. Significance was set at 0.05.	Multicomponent: sensory stimulation program in delirium, carried out by family members	The incidence of delirium in the intervention group was statistically significant, being 94 % lower than in the control group (OR = 0.057, 95 % CI 0.017, 0.19, $p = 0.001$). The mean duration of delirium was shorter in the intervention group (mean days: 3 (0.75)) than in the control group (mean days: 8.57 (3.09)), $p = 0.001$. The mean ICU length of stay was shorter in the intervention group (mean days: 14.30 (3.90)) than in the control group (mean days: 24.24 (7.02)), $p = 0.001$. The mean duration of mechanical ventilation was shorter in the intervention group (mean days: 7.54 (3.17)) than in the control group (mean days: 16.36 (6.46)), $p = 0.001$.	–	–	There was no statistically significant difference between the study groups in the ICU mortality rate ($p = 0.741$). – –	The intervention group experienced a 94 % lower incidence of delirium compared to the control group, but there was no significant difference in ICU mortality rates. The intervention group had significantly shorter durations of delirium, ICU stay, and mechanical ventilation.
Welsch et al. [47]	Descriptive statistics (frequency, percentage, mean, standard deviation), the Cochran-Mantel-Haenszel test, multiple χ^2 models, and analysis of variance was used.	Single component: family presence in the spine intensive care unit (ICU) during the night after surgery	–	–	Baseline delirium, agitation, and confusion were similar for both groups ($p > 0.05$). The percentage of postop day 1 delirium or confusion was lower in the family- present versus unaccompanied group (6.3 % vs 21.4 %), but this difference was not statistically significant ($p = 0.23$).	The prevalence of delirium at admission was lower in patients with family presence than in the control group, showing a clinically relevant but not statistically significant reduction in postop day 1 delirium.	
Barr et al. [39]	Standard binomial proportion test, Chi-square test, Student t test and linear regression analyses were used, with a 95 % CI. Significance was set at 0.05.	Multicomponent: bundle ABCDEF	The implementation of the intervention reduced the length of stay in the ICU by 0.5 days (mean days pre-implementation: 5.55 (4.58); mean days post-implementation: 5.09 (4.17), $p = 0.02$). The mean duration of mechanical ventilation days reduced by 0.6 days (mean days pre-implementation: 4.94 (5.50); mean days post-implementation: 4.35 (4.82), $p = 0.01$).	–	–	There was an insignificant trend toward reductions in hospital length of stay, in-hospital mortality, and Case Mix Index in mechanically ventilated patients during the bundle performance period ($p > 0.05$). Comparing baseline and performance period bundle compliance in mechanically ventilated ICU patients, compliance with pain assessment and management within 48 h of ICU admission was high at baseline (> 90 %) and did not significantly change ($p = 0.11$, $R^2 = 0.18$), similar to compliance with daily SATs/SBTs ($p = 0.49$, $R^2 = 0.04$).	The intervention reduced ICU stay by 0.5 days and mechanical ventilation duration by 0.6 days, with a notable decrease in prolonged ICU stays (≥ 7 days) by 18.1 %. While adherence to pain management and sedation assessments improved, patient mobilization and family engagement showed no significant progress, although overall compliance with the intervention across the health system was higher than in the study ICUs.

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Table 2 (continued)

ID study	Statistical analysis	Type of interventions	Favorable effect	Unfavorable effect	Null effect	Conclusions
Tovar and Castaño [37]	Descriptive statistics (frequency, percentage, mean, standard deviation), Kolmogorov Smirnov test, median and interquartile ranges, Kruskal-Wallis test, Pearson's chi-square or Fisher's chi-square test, Z test were used. The Relative Risk (RR), Absolute RR, Kaplan Meier estimation, the Number Necessary to Treat (NNT), and Cox regression were calculated. Significance was set at 0.05.	Multicomponent: DyDel program included providing materials such as magazines, books, radios, tablets, board games, eye masks, earplugs, and attending to patient preferences	The length of stay in the ICU greater than or equal to 7 days was shorter by 18.1 % after implementing the intervention (pre-implementation: 38.2 %, post-implementation: 23.1 %, $p < 0.01$).	–	Reintubation rates were very low at baseline ($< 2\%$) and did not significantly increase in period bundle compliance ($p = 0.23$, $R^2 = 0.11$).	The intervention group had a lower incidence of delirium compared to the control group, with a significant reduction in the mean number of days with delirium. The intervention group experienced higher mean days of low pain intensity and a greater number of patients without delirium, suggesting that family involvement and patient-centered care in the DyDel intervention effectively reduced delirium incidence and duration in the ICU.
			The score of RASS increased significantly at baseline to 12 months post-bundle ($p < 0.01$, $R^2 = 0.45$).	–	Use of non-benzodiazepine did not significantly change over time ($p = 0.49$, $R^2 = 0.04$).	
			The use of benzodiazepine infusions for sedation decreased significantly at baseline to 12 months post-bundle ($p < 0.01$, $R^2 = 0.57$).	–	Family engagement initially increased, then decreased over time, but the change was not significant ($p = 0.75$, $R^2 = 0.01$).	
			CAM-ICU delirium screening significantly increased at baseline and performance period bundle compliance ($p = 0.02$, $R^2 = 0.36$) and the prevalence of ICU delirium significantly decreased ($p = 0.02$, $R^2 = 0.35$).	–	–	
			The incidence of delirium was lower in the intervention group (5.6 %) than in the control group (14.8 %) ($p = 0.0492$).	–	–	
			The days with delirium were lower in the intervention group (0.07 ± 0.308) than in the control group (0.34 ± 1.28) ($p = 0.016$).	–	–	
			The relative risk of delirium was 0.38 (CI 95 %: 0.124–1.167, $p = 0.0455$), meaning a 62 % reduction of delirium risk in the intervention group.	–	–	
			The risk of developing delirium was lower in the intervention group compared to the control group ($p = 0.037$).	–	–	
			The mean of days with low pain intensity was higher in the intervention group (VAS < 4 , mean days: 4.07 (3.34); Campbell < 3 , mean days: 0 (1)) compared to the control group (VAS < 4 , mean days: 3.15 (2.92); Campbell < 3 , mean days: 0 (1)); VAS < 4 , $p = 0.002$; Campbell < 3 , $p = 0.015$.	–	–	
			The mean of patients without delirium was higher in the intervention group (17.329 ± 0.946 , CI 95 %: 15.476,19.183) than in the control group (11.793 ± 0.696 , CI 95 %: 10.429, 13.156), $p = 0.038$.	–	–	

(continued on next page)

Table 2 (continued)

ID study	Statistical analysis	Type of interventions	Favorable effect	Unfavorable effect	Null effect	Conclusions
Lin et al. [38]	Descriptive statistics (frequency, percentage, mean, standard deviation), Shapiro-Wilk, Mann-Whitney U test, Independent t-test, Paired t-test, Chi-square test or Fisher's exact test were used. Significance was set at 0.05.	Multicomponent intervention: family education; family participation (emotional support, orientation training, cognitive stimulation, participation in life care in the ICU)	There was a higher ICU length of stay risk in the control group compared to the intervention group (HR = 2.90, CI 95 %: 1.000, 8.421, p = 0.0255). The incidence of delirium in the experimental group was 7.5 %, significantly lower than the 27.5 % in the control group (p < 0.019). The length of ICU stay was 45.75 (40.38, 67.38) hours for the experimental group versus 66.50 (48.13, 87.13) hours for the control group, p = 0.010.	-	The first episode of delirium occurred later in the experimental group, but the difference was not significant between the groups (p = 0.459). There were no significant differences in the length of mechanical ventilation between the groups (p = 0.199).	The intervention group experienced a lower incidence of postoperative delirium and a shorter mean ICU stay, suggesting that this multicomponent intervention effectively reduces both delirium and length of stay in patients undergoing heart valve surgery.

engagement, empowerment. This bundle demonstrated a favorable effect, significantly reducing ICU length of stay by 0.5 days (p = 0.02) and the duration of mechanical ventilation by 0.6 days (p = 0.01). It also decreased the proportion of patients staying in the ICU for seven or more days by 18.1 % (p < 0.01). In comparing baseline versus performance period bundle compliance, the bundle improved several key measures, including increased Richmond Agitation-Sedation Scale (RASS) scores (p < 0.01), decreased benzodiazepine use (p < 0.01), higher CAM-ICU screening rates (p = 0.02), and reduced ICU delirium prevalence (p = 0.02) [40]. However, the intervention had null effect on compliance with pain assessment and management, daily SATs/SBTs, use of non-benzodiazepines, reintubation rates, family engagement, hospital length of stay, in-hospital mortality, and Case Mix Index (p > 0.05).

The DyDel program, studied by Tovar and Castaño [38], aimed to reduce delirium in ICU patients by providing materials like books, radios, tablets, and eye masks, while addressing patient preferences. The intervention showed a favorable response, significantly reducing delirium incidence, with a 62 % lower risk of delirium in the intervention group compared to the control group (5.6 % vs. 14.8 %, p = 0.0492). Furthermore, the intervention shortened the duration of delirium (mean days: 0.07 vs. 0.34, p = 0.016) and improved pain management, as patients in the intervention group reported less intense pain (p < 0.01) [38]. The proportion of patients without delirium was higher in the intervention group (17.329, 95 %CI 15.476 to 19.183) than in the control group (11.793, 95 %CI 10.429 to 13.156, p = 0.038), and the intervention group also had a lower risk of extended ICU stays (HR = 2.90, 95 %CI 1.000 to 8.421, p = 0.0255).

The intervention involving family education and participation (emotional support, orientation training, cognitive stimulation, participation in life care in the ICU) was studied by Lin et al. [39] to assess its impact on the incidence of postoperative delirium in patients undergoing cardiac valve surgery in the ICU. The intervention showed a favorable effect, significantly reducing the incidence of delirium in the intervention group (7.5 %) compared to the control group (27.5 %) (p < 0.019). The intervention group also had a shorter ICU stay (median 45.75 h) compared to the control group (median 66.50 h, p = 0.010). No significant differences were found between the groups regarding the onset of the first delirium episode or the duration of mechanical ventilation (p > 0.05).

The intervention involving family participation, which included guidance messages, therapeutic involvement, and sensory stimulation carried out by family members, was studied by Mitchell et al [41]. However, the effect of this intervention was null. The prevalence of delirium was similar between the intervention and control groups (p > 0.05), and the duration of delirium showed no statistically significant difference (p = 0.97).

Discussion

The fourteen studies included identified both single-component and multi-component family participation interventions for delirium prevention in the ICU, aligning with the broader body of evidence [54,55]. The results demonstrate that, compared to conventional care, family participation had a favorable response in preventing delirium in the ICU, consistent with findings from previous reviews [28,39,56].

Our findings suggest that family participation has positive effects on delirium prevention, which were orientation messages with a family member's voice recording [35], family physical presence [36], family visitation with professionally guided orientation [43,44], flexible family visitation [42], familiar voice orientation messages, reading newspapers, nighttime use of an eye patch [46], sensory stimulation program for delirium by family members [47], ABCDEF Bundle [40], DyDel program [38], family education, emotional support, orientation training, cognitive stimulation, and participation in ICU care [39].

The variability of the interventions highlights key considerations for nursing care planning, particularly when involving families in delirium

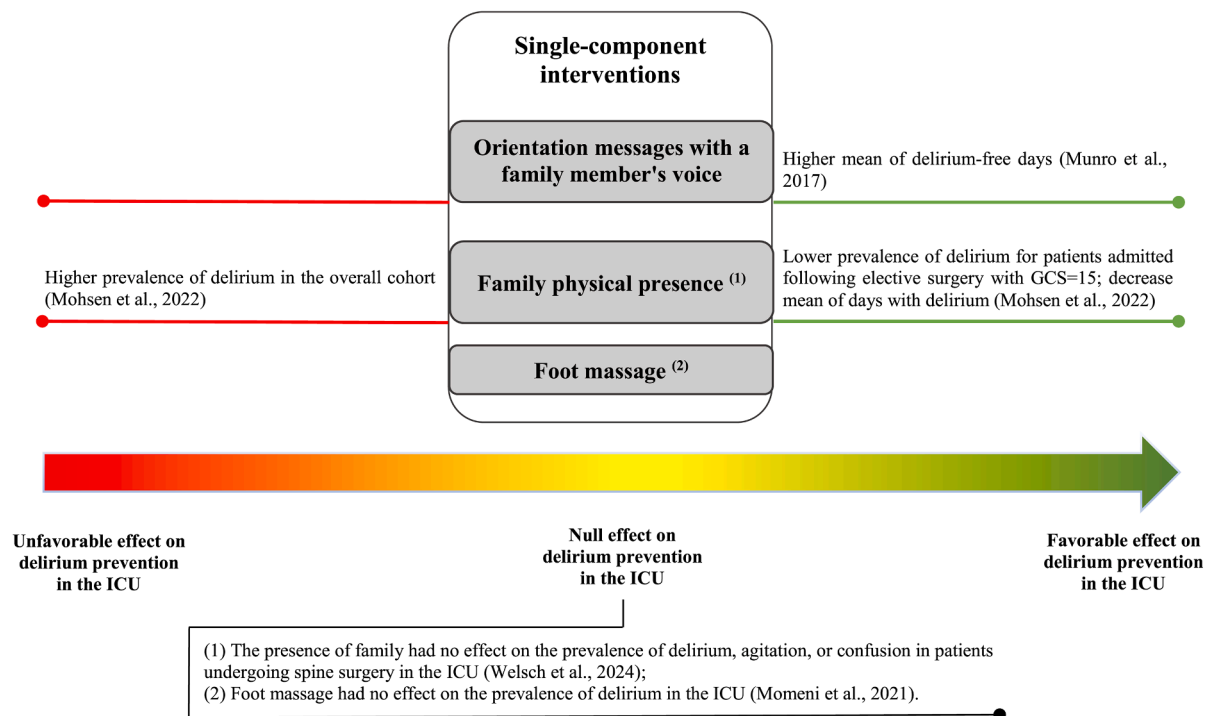


Fig. 2. Single-component family participation interventions.

prevention. This diversity reflects the different types of interventions and their outcomes, emphasizing the inherent complexity of nursing care that integrates family participation. Each family's unique characteristics, dynamics, and needs introduce additional layers of complexity, requiring tailored approaches to ensure the development of effective and meaningful care strategies [23,57–59].

Family participation plays a crucial role in delirium prevention, as humanizing delirium care relies on a person-centered approach involving the patient, family, and healthcare team. This approach is grounded in respect and trust, communication skills, empathy, personality, acceptance, accompaniment, autonomy, resilience, safety, and hope [60].

Family members are those who best understand the patient's mode of expression, preferences, and abilities [44]. Therefore, presence promotes better communication and stronger relationships with the healthcare team [20], leads to more personalized care that addresses the unique needs and complexities of each patient and family [18,21,22] and aids in the early identification of signs and symptoms associated with delirium [36]. Furthermore, the presence of family members helps the patient feel supported, improves their perception of the environment and sense of safety, and reduces fear and anxiety related to ICU hospitalization [24,44,61].

In our study, the physical presence of family members reduced the prevalence of delirium in patients admitted following elective surgery with a GCS of 15 and a mean number of days with delirium [36]. This finding is consistent with the systematic review by Li et al. [56], which included 11 RCTs and demonstrated a significant reduction in both the incidence and duration of delirium, as well as ICU length of stay. Notably, the authors concluded that the effectiveness of delirium prevention depended on the level of family involvement, with direct participation in care having the greatest impact on reducing delirium incidence. These findings suggest that family members can provide essential emotional support, leading to positive outcomes for the patient's recovery and well-being (such as preventing delirium), as they serve as a crucial reference point throughout the process [62].

Flexible family visitation was also described as a multi-component intervention with a favorable response effect in delirium prevention

[42], which aligns with the findings of a systematic review on the effects of flexible family visitation in the ICU [63]. Although this review included only two studies with small sample sizes, the authors found that flexible visitation may be associated with a reduction in the incidence of delirium in the ICU. However, they also highlighted that it could be linked to an increased risk of burnout among ICU staff [63]. In contrast, the study by Bannon et al. [64] revealed that healthcare professionals considered the family to be an underutilized resource in patient care in the ICU, although they recognized its importance in fostering a sense of familiarity and safety for the patient.

The effect of flexible family visitation prompts us to reflect on adherence to a framework based on the fundamental of care, which encourages the participation of patients and families in decision-making and care delivery [23,58,65]. This, in turn, could contribute to a review of family visitation policies, applicable across various contexts [66].

These considerations align with the principles outlined in the International Learning Collaborative Maine Declaration [67], which emphasizes the need for a comprehensive approach to care that prevents and manages the risks associated with delirium. This approach should engage healthcare professionals, patients, and families to assess and address fundamental care needs, while integrating the experiences and preferences of the patients [67].

Consistent with this perspective, Kitson et al. [23] emphasize that the physical, spiritual, relational, and psychosocial needs of patients should be discussed and addressed by the healthcare team. By integrating the contributions of healthcare professionals, patients, and families, the goal is to ensure an individualized, holistic, and integrated approach to Fundamental Care.

The review highlights the potential of multi-component nursing interventions, such as the DyDel program [38], to reduce delirium incidence and improve patient outcomes in critical care settings. Those interventions address risk factors and holistic needs, including cognitive stimulation, family support, and personal preferences, emphasizing the importance of individualized care. Similarly, Contreras et al. [12] conducted a randomized clinical trial with 81 critical patients to assess the effectiveness of a multi-component nursing program for delirium prevention. This program included cognitive stimulation, auditory and

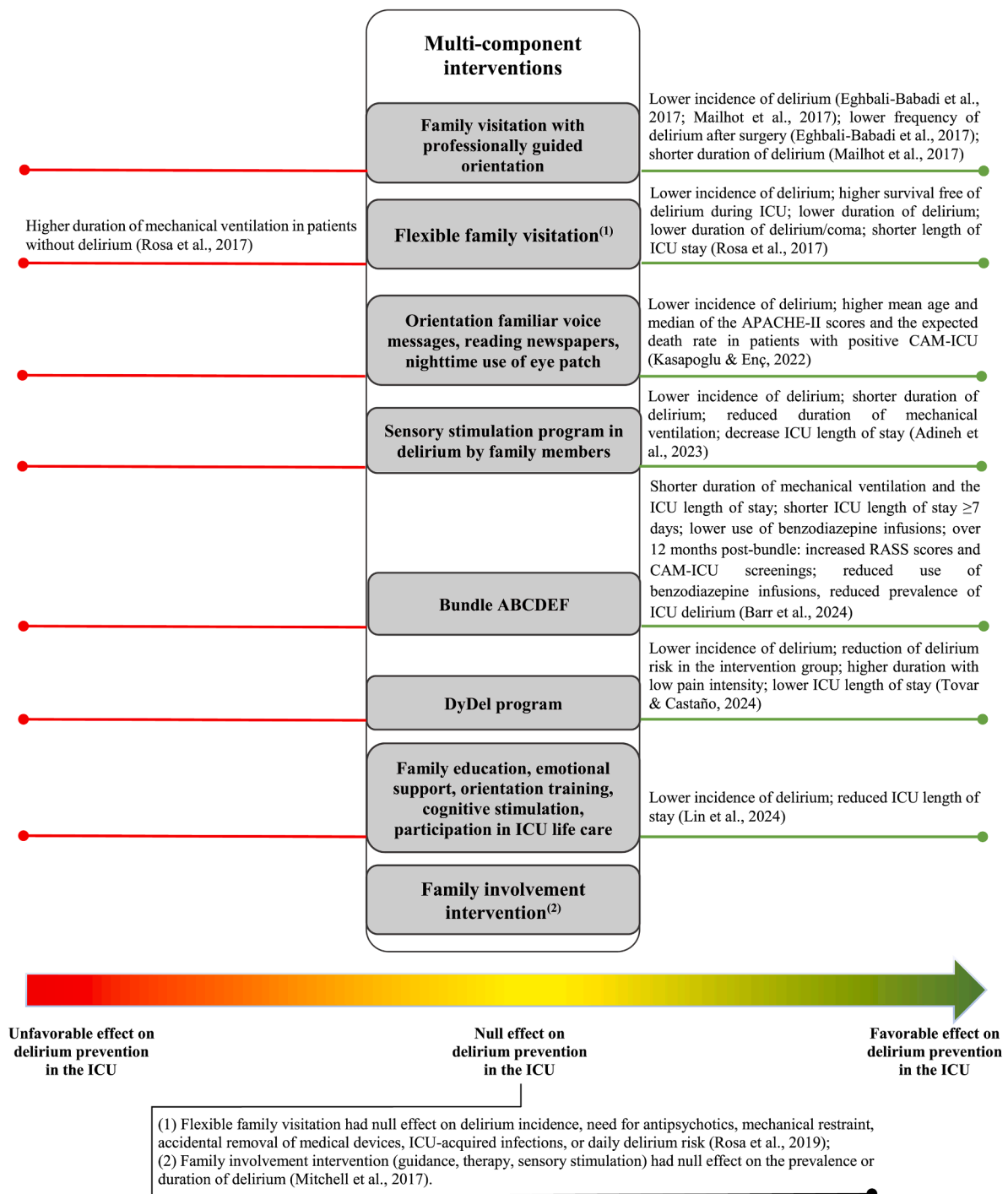


Fig. 3. Multi-component family participation interventions.

visual stimuli, family support, and the provision of personal items that the patient would prefer to have during their hospital stay (e.g., glasses, hearing aids, dentures, family photos, religious objects, etc.). The study found that the program significantly reduced the incidence of delirium in the ICU.

Another essential consideration to discuss involves contextual factors, external elements that, while not part of the intervention itself, play a pivotal role in determining its success. These factors can act as barriers or facilitators, influencing health interventions' effectiveness, feasibility, and long-term sustainability [68].

From the included studies, we identified several contextual factors that may have influenced family participation interventions: the

contextual environment [38,39,42,44,46], the type of ICU [35,36,38–40,42–44,46,47], the type of surgery [44], and the manner in which family interactions are implemented [35,36,38–40,42–44,46,47].

Regarding the contextual environment, several reviews highlight that environmental conditions are non-invasive, low-risk, and low-cost strategies that can help prevent delirium in the ICU, especially when integrated into a multi-component intervention [69]. However, they emphasize the need for studies with more consistent methodologies and larger sample sizes. Notably, three studies in our review found that the family participation intervention was conducted in a single patient room [42], and two multi-component family interventions considered environmental control in the ICU to address common risk factors for

delirium. This included the use of blinds [38,46], noise reduction, management of natural or artificial light exposure, and the use of earplugs at night, all aimed at promoting the patient's sleep quality [38].

Similarly, the study by Lee et al. [70], which enrolled 192 patients admitted to the surgical ICU, implemented an environmental intervention program involving family participation. This program included cognitive assessments, orientation, and comfortable environment with appropriate sleep conditions. The authors concluded that this environmental control program significantly reduced delirium duration and ICU length of stay for critically ill surgical patients.

Environmental control in the ICU is a key factor to consider in patient care and delirium prevention. This is supported by the results of the study by Kilic and Kav [71], a single-blinded randomized controlled trial involving 60 patients, which found that the use of earplugs and eye masks at night helped improve sleep quality and prevent delirium in ICU patients. However, in a meta-analysis conducted by Kang et al. [72], which included 100 studies, it was found that the only non-pharmacological intervention that improved sleep quality while simultaneously preventing and reducing the duration of delirium was the reduction of light and noise in the ICU. In contrast, the review by Teng et al. [73], which included 15 RCTs, concluded that no non-pharmacological sleep interventions were effective in preventing delirium in ICU patients.

Despite the heterogeneity of interventions and results identified in this review, we conclude that non-pharmacological strategies, such as flexible family visitation, family presence, and the development of family-mediated basic care activities, are effective in reducing delirium incidence in the ICU and offer multiple benefits for the patient and their family.

In this sense, family participation is essential in the therapeutic process of the patient [23], and creating a context that facilitates this participation is equally crucial [59], especially for preventing delirium in the ICU [38].

The results of the family participation interventions in the included studies align with most available evidence, which highlights the importance of combining multiple interventions to prevent delirium in the ICU [54,55]. However, further research is needed to assess the effectiveness of these interventions, especially considering the variability in outcomes, the influence of contextual factors, and the complexity of family dynamics.

Limitations

Our review has several strengths, including methodological rigor, excluding non-comparative studies due to their inherent limitations. Additionally, we consider the strategy employed in the narrative synthesis, which involved analyzing the effect size of interventions, to be a significant strength. However, several limitations to our study must be acknowledged.

We were unable to conduct a meta-analysis due to significant methodological and clinical heterogeneity across the studies, limiting our ability to pool data and draw definitive conclusions. Future research should standardize outcome measures and study designs to enhance data synthesis and improve the reliability of findings. Additionally, future trials could benefit from clearly defined protocols and uniform reporting standards, which would facilitate data synthesis and increase the robustness of findings.

Another limitation was the lack of studies assessing the effectiveness of family participation interventions on delirium-related adverse events, which prevented us from evaluating this outcome. There is a clear need for experimental studies to investigate how family participation can prevent delirium and associated complications.

Additionally, future research should focus on identifying the specific components of family participation that most effectively prevent delirium. Understanding whether elements such as education, engagement, or emotional support have the greatest effect on delirium

prevention could inform the development of more targeted and effective interventions.

We also noted a lack of clarity in the studies regarding whether interventions were designed to prevent delirium. Future research should clearly distinguish between these objectives, as the strategies for avoiding delirium may differ significantly from those aimed at treating or reducing its severity once it has developed.

There was a notable risk of bias in the quality of the studies reviewed. Many studies have not addressed key aspects, such as the blind application of interventions. We also identified a gap in assessing the balance of benefits, harms, and costs of family participation interventions. Future research should prioritize well-designed, double-blind, experimental studies that comprehensively evaluate these factors.

Conclusion

The family participation interventions used to prevent delirium in ICUs were grouped into single or multi-component interventions. The heterogeneity of the results of the included studies did not allow for an evaluation of the effectiveness of family participation interventions in preventing delirium in the ICU. Therefore, further research and large-scale trials are required on family participation interventions focused on preventing ICU delirium that compare the effectiveness of interventions between studies and analyze the aggregation of results to provide robust and consistent evidence. However, based on the results of this systematic review, single-component and multi-component family participation interventions should be considered in ICU settings, as they showed a positive effect on outcomes in preventing delirium in ICU patients, particularly in reducing the incidence and duration of delirium.

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CRediT authorship contribution statement

Marli Lopo Vitorino: Writing – original draft, Visualization, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Adriana Henriques:** Writing – original draft, Methodology, Formal analysis, Conceptualization. **Graça Melo:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Helga Rafael Henriques:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing 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 paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.iccn.2025.103976>.

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