Efficacy and safety of care bundles in the treatment of delirium in ICU patients: a meta-analysis and systemic review

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Abstract

Objective The aim is to explore the impact of care bundles on the efficacy and safety of delirium management in intensive care unit (ICU) patients compared to standard care through a meta-analysis and systematic review.

Method China National Knowledge Infrastructure (CNKI), Wanfang, PubMed, Web of Science (WOS), Embase, Cochrane, Chinese Biomedical Database (CBM), and VIP databases were searched from the database inception to December 1, 2024. The inclusion criteria based on the PICOS strategy include ICU patients (P), and randomized controlled trials (RCT) (S) comparing the treatment outcomes (such as incidence of delirium, duration of delirium, duration of mechanical ventilation, mortality rate, etc.) (O) between the care bundles (I) and standard care (C). Two investigators independently screened the literature, extracted the data, and assessed the quality of the included literature using the Cochrane Quality Assessment Tool. Meta-analysis was performed using STATA15.0 software.

Results Eighteen studies were included with a total of 2,717patients involved. Most studies have a high/moderate risk of bias. The results of the meta-analysis demonstrated that care bundles was effective in decreasing the (1) incidence of delirium in ICU patients [risk ratio [RR] = 0.38, 95% confidence interval [CI] : 0.32, 0.45; $P < 0.001$], shortening the (2)duration of delirium(days) (weighted mean difference [WMD] = -1.60, 95% CI : -1.96, -1.23; $P < 0.001$), and (3)duration of mechanical ventilation in corresponding patients(days) (standardized mean difference [SMD] = -1.65, 95% CI : -2.40, -0.89; $P < 0.001$). However, there was no statistical difference in patient (4) mortality (RR = 0.78, 95% CI : 0.44, 1.40; $P = 0.41$).

Conclusions Care bundles have positive effects on delirium in ICU patients. However, results with significant heterogeneity should be interpreted with caution, and differences in bundles need to be taken into account. More multi-center, largesample randomized controlled studies are required to further explore the optimal components and combinations of care bundles.

Keywords ICU, Delirium, Care bundles, Meta-analysis

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Background

The intensive care unit (ICU) is a hospital unit for critically ill patients requiring immediate and intensive care. ICU patients have a higher likelihood of experiencing delirium, which can be triggered by elevated blood pressure, increased heart rate, anxiety, and stress resulting from sympathetic nervous system activation. This is attributed to their treatment in a confined environment, where they face significant psychological and mental stress due to their medical conditions, frequent and varied medical interventions, the rapid pace of work in the ICU, constant conversations among healthcare providers at the bedside, discussions regarding their conditions, movement around medical equipment, alarms from multiple devices, and noise from neighboring patients as well as family visits [1, 2]. Delirium is manifested as acute organ dysfunction and may rapidly progress to conscious disturbance and cognitive disorder with volatility within 1 day [3]. Delirium, also known as acute cerebral syndrome, is not a single disease but a set of clinical syndromes resulting from multiple causes. Delirium has an acute onset and noticeably fluctuating course, and is characterized by consciousness disturbance, inappropriate behavior, a lack of awareness, and attention deficit [4]. This syndrome is prevalent in older and hospitalized patients and affects 1/3 of the general population aged 70 years and older [5]. Recent studies have indicated that delirium has become a significant risk factor affecting the therapeutic efficacy of ICU patients, with the incidence of delirium exceeding 30% in ICU patients and even exceeding 60% in those treated with mechanical ventilation [6–9]. In addition, the occurrence of delirium also has the potential to induce central nervous system dysfunction and exacerbate primary diseases, which further results in prolonged treatment duration, increases treatment difficulties, and heavily affects prognosis of patients [10, 11]. Therefore, taking effective measures to prevent and control the occurrence of delirium is of great significance.

Currently, there are studies mentioning the application of ABCDEF bundles in ICU delirium patients. They have specified the procedure elements that need to be included, but it is necessary to consider how various fixed elements are specifically applied to patients and whether different patients require different combinations of procedure elements. Recently in Asia, especially in China, researchers are increasingly focusing on care bundles, with different studies reporting various elements of care bundles. Care bundles, first proposed by the US National Institutes of Health, refer to an integration of 3–5 evidence-based treatment and nursing measures for patients with clinically refractory diseases. Each of those measures is clinically proven to improve patient outcomes and is more effective when they are implemented together [12]. Several clinical trials have identified evidence-based interventions for reducing the risk of delirium in ICU patients, including home visitation [13], sedative and analgesic medications [14], physical and occupational therapy [15], and sleep support. When these measures are combined, the synergy is likely superior to the effect of a single intervention [16]. Previous reviews have explored related topics. Zhang's [17] research investigated the application of care bundles in mechanically ventilated patients, while Zhu's [18] study focused on perioperative care. However, both studies mainly introduced care bundles and summarized the research progress without performing a quantitative analysis. Therefore, it is necessary to conduct a comprehensive quantitative analysis of all published relevant studies to visibly demonstrate the efficacy and safety of care bundles in managing delirium in ICU patients. This study aimed to conduct a systematic review and meta-analysis to assess the efficacy of care bundles in reducing delirium in ICU patients compared to standard care, and to explore the most commonly used elements in care bundles.

Data and method

Literature search strategy

China National Knowledge Infrastructure (CNKI), Wanfang, PubMed, Web of Science (WOS), Embase, Cochrane, Chinese Biomedical Database (CBM), and VIP were retrieved from establishment of the database to December 1, 2024 to identify randomized controlled trials of care bundles for preventing delirium in ICU patients. English databases were searched by subject plus free words, including the following keywords: Intensive Care Units, ICU, Delirium, Cluster nursing, Care Bundle; Chinese databases were searched with the following keywords: Intensive Care Medicine, ICU, Delirium, Delirious Speech, And Care Bundles. The references of relevant articles were also manually searched to screen other eligible studies. The specific search strategy used is presented in Supplement Materials.

Inclusion criteria

The literature to be included must meet the following criteria: (1) ICU patients > 18 years of age; (2) The control group adopted standard care (specifically: consciousness assessment, pain management, pipeline nursing, safety management, and hospital infection control), and the test group received care bundles plus standard care. (3) Evaluated outcome measures included: incidence of delirium, satisfaction with care, delirium recovery rate, mortality, incidence of complications, duration of delirium, hospital length of stay, and duration of mechanical ventilation. (4) Randomized controlled trials published in English or Chinese.

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Exclusion criteria

(1) Studies published in other languages than English or Chinese. (2) Interventions included other cares except for the care bundles. (3) Reviews, conference abstracts, animal experiments, or repeated publications. (4) There was no available data.

Data extraction

Two investigators screened the literature independently. Titles and abstracts were screened to eliminate ineligible studies. Then, a full-text review was conducted to determine eligible studies. Any controversial issue was resolved through discussion between the two investigators, and was consulted to a third party if necessary. Data were extracted independently by two investigators using a predefined electronic form. The following information was extracted and recorded: name of the first author, date and country of publication of literature, study type, group, sample size, and outcome measures. Any controversial issue was resolved through discussion between the two investigators, and was consulted to a third party if necessary.

Quality evaluation

Two investigators (Fangxia and Zhang) assessed the quality of the included randomized clinical trials (RCTs) independently using the Cochrane risk of bias method [19]. The quality assessment involved the following 7 domains: random sequence generation (selection bias), allocation concealment (selection bias), blinding of patients (performance bias), blinding of outcome assessors (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias), and other bias. Each item was graded as low risk, unclear risk, or high risk. Any controversial issue was resolved through discussion between the two investigators, and was consulted to a third party if necessary.

Statistical analysis

Binary variables were expressed as relative risk (RR) with a 95% confidence interval (CI). Continuous variables were presented with weighted mean difference (WMD) with 95% CI or standardized mean difference (SMD) with 95% CI. The Cochran's Q and Higgins I^2 tests were used to evaluate heterogeneity. When P was greater than 0.1 or I^2 was less than 50%, the heterogeneity was considered low, and a fixed effects model was used for statistical analysis. A $P < 0.10$ or $I^2 > 50\%$ was considered to have statistical heterogeneity, and a random-effects model was used. In case of significant heterogeneity, the source of heterogeneity was explored using sensitivity analysis or subgroup analysis. Publication bias was assessed by funnel plots and quantitatively identified by Begg and Egger tests. A $P < 0.05$ indicated a significant bias. Statistical analysis was performed using STATA 15.0.

Results

Literature search process and results

2,099 articles were retrieved from CNKI, Wanfang Data, PubMed, WOS, Embase, Cochrane, CBM, and VIP databases, and 515 duplicates were removed. After the titles and abstracts were screened to delete irrelevant studies, 1478 articles were left. After excluding 16 papers for which the full texts were not available, a full-text review was performed on 90 papers. Then, 72 studies were further excluded due to no report of diagnostic targets ($n = 19$), unavailable data ($n = 27$), duplicated data ($n = 10$), and unclear populations ($n = 16$). Finally, 18 papers were included. The flow chart of literature screening is shown in Fig. 1.

Basic information of the included literature

A total of 18 [20–37] studies were included, with 1,419 (52.23%) patients in the care bundles group, and 1298 (47.77%) patients in the control group (received only standard care). Most of the studies were from China and only 1 was from India [33]. The specific characteristics of the included literature are tabulated in Table 1. Table 2 summarizes the specific care bundles interventions reported in the included literature. The elements of care bundles in the included literature can be divided into six categories: (1) psychological support: psychological counseling, compassionate care (communication, emotional support, family visits); (2) humanistic support: control of the ward environment, health-promoting conversation, and sleep support; (3) medication support: analgesic and sedative medication; (4) training support: physical therapy and early mobility, spontaneous breathing training, cognitive and orientation interventions, and music therapy; (5) prognostic support: assessment and prevention of complications; and (6) comprehensive bundled managements: teams were set up to develop care bundles procedures based on patient's conditions. Care-specific meetings were held to designate a scientific care plan for each patient.

Quality evaluation

The quality of the included RCTs was evaluated using the Cochrane risk bias assessment tool, and overall quality was good. Quality evaluation results are shown in Fig. 2.

Meta-analysis results

Primary outcomes

Incidence of delirium (percentages) Sixteen articles reported the incidence of delirium. The heterogeneity test yielded $I^2 = 0$, so a fixed model was used for analysis. The analysis results showed that the incidence of delirium in
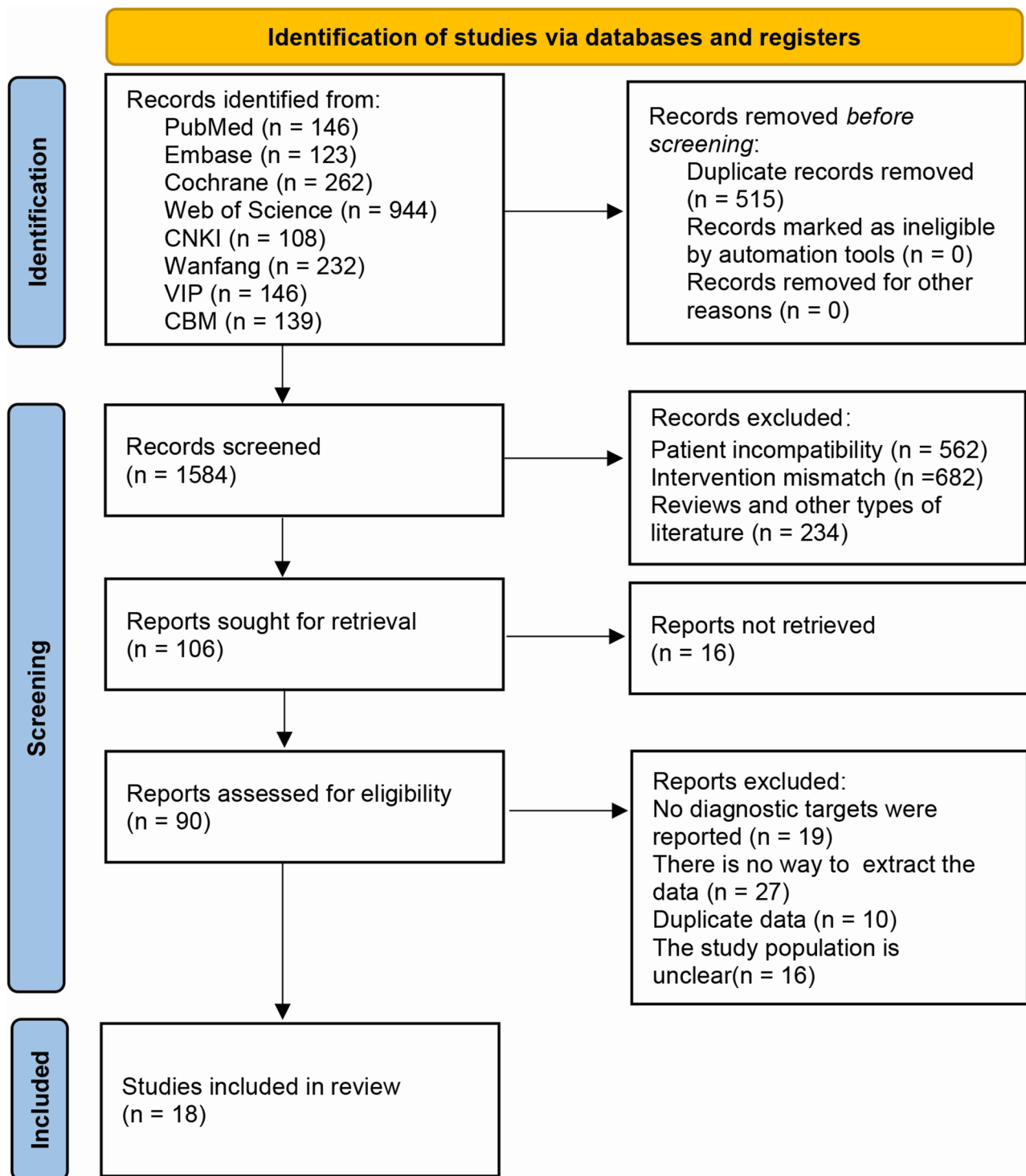
Fig. 1 Literature search flow chart

the care bundles group was lower than that in the routine care group (RR: 0.38, 95% CI: 0.32, 0.45), and the difference was statistically significant ($P < 0.001$), as shown in Fig. 3A. Further subgroup analysis by country revealed that in the Chinese population, the incidence of delirium

in the care bundles group was lower (RR: 0.37, 95% CI: 0.3, 0.44, $P < 0.001$) (Fig. 4A).

Duration of delirium(days) Nine articles reported the duration of delirium. The hete rogeneity test yielded

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Table 1 Basic information of the included literature

No.	First author	Publication year	Country of patient	Age		Sample size (M/F)		Outcome indicators
				Test	Control	Test	Control	
1	Jie Di	2021	China	71.1 ± 2.6	70.3 ± 3.5	85 (46/39)	82 (43/39)	1,2,4,8
2	Suping Huang	2021	China	63.57 ± 5.25	63.11 ± 6.14	54 (35/19)	54 (31/23)	1,2,3,4,5,6
3	Anil K Malik1	2021	India	37.72 ± 15.93	46.40 ± 18.05	25 (13/12)	25 (10/15)	1,2, 6
4	Mengxia Chen	2020	China	56.59 ± 14.73	62.94 ± 12.93	34 (16/18)	32 (18/14)	1,2,5,6
5	Jie Chen	2016	China	56.5 ± 15.4	55.7 ± 14.8	100 (52/48)	100 (54/46)	1,2,4
6	Jinling Gu	2018	China	49.9 ± 7.17	51.17 ± 6.69	35 (19/16)	35 (18/17)	1,2,3,4,5,7
7	Liping Yuan	2018	China	15–90	14–91	229 (152/77)	162 (98/64)	1
8	Shanyi Jin	2019	China	65.87 ± 16.13	64.94 ± 16.29	233 (158/75)	220 (142/78)	1,2
9	Xiaoxiang Jiang	2019	China	72.50 ± 6.40	72.40 ± 6.8	50 (29/21)	50 (28/22)	8
10	Yaqiong Jiang	2021	China	74.5 ± 14.5	75.3 ± 15.8	60	60	1,2,3,4,5,7
11	Yingqin Li	2021	China	46. 41 ± 2. 89	45. 82 ± 2. 71	48 (30/18)	48 (25/23)	1,2,3,5
12	Yuexia Li	2021	China	45.8 ± 13.8	44.8 ± 14.2	33 (15/18)	33 (16/17)	1,4
13	Huaying Lin	2021	China	59.41 ± 4.14	58.19 ± 3.75	30 (16/14)	30 (18/12)	4
14	Qiang Song	2021	China	54.06 ± 1.23	53.13 ± 1.42	30 (14/16)	30 (13/17)	1,3
15	Sha Yu	2023	China	64.93 ± 15.05	60.38 ± 15. 12	45(24/21)	45(26/19)	1,2,3,5
16	Junyi Han	2023	China	45. 31 ± 5. 26	45. 75 ± 5. 92	46(23/23)	46(22/24)	1,3,5,7
17	Zongjia Yue	2023	China	64.92 ± 6.35	65.37 ± 3.24	214(136/78)	214(140/74)	1,2,3,5
18	Tuyong Liang	2023	China	54.87 ± 14.51	54.92 ± 14.28	50(26/24)	50(30/20)	1,2,5

Notes: 1: incidence of delirium, 2: hospital length of stay, 3: duration of delirium, 4: satisfaction with care, 5: duration of mechanical ventilation, 6: mortality, 7: incidence of complications, and 8: delirium outcome rate

$I^2 = 96.1\%$, so a random model was used for analysis. The analysis results showed that the duration of delirium in the care bundles group was shorter than that of the routine care group (WMD = -1.60, 95% CI (-1.96, -1.23), and the difference was statistically significant ($P < 0.001$), as shown in Fig. 3B. Further subgroup analysis by country revealed that in the Chinese population, the duration of delirium in the care bundles group was shorter (WMD: -1.59, 95% CI: -1.96, -1.22, $P < 0.001$) (Fig. 4B).

Secondary outcomes
Hospital length of stay(days) Ten articles reported the hospital length of stay. The heterogeneity test yielded $I^2 = 94.7\%$, so a random model was used for analysis. The analysis results showed that the hospital length of stay of patients in the care bundles group was shorter than that of the routine care group(WMD: -3.19, 95%CI: -4.19, -2.18), and the difference was statistically significant ($P < 0.001$), as shown in Fig. 5A.

Satisfaction with care Five articles reported patient's satisfaction with care. The heterogeneity test yielded $I^2 = 71.9\%$, so a random model was used for analysis. The analysis results showed that the satisfaction rate of care in the care bundles group was higher than that of the routine care group (RR: 1.18, 95%CI: 1.04, 1.34), and the difference was statistically significant ($P = 0.009$), as shown in Fig. 5B.

Duration of mechanical ventilation(days) Nine articles reported the duration of mechanical ventilation. The heterogeneity test yielded $I^2 = 96.4\%$, so the fixed model was used for analysis. The analysis results showed that the duration of mechanical ventilation in the care bundles group was shorter than that of the routine care group(SMD: -1.65, 95% CI: -2.4, -0.89), and the difference was statistically significant ($P < 0.001$), as shown in Fig. 5C.

Incidence of complication(percentages) Four articles reported the incidence of complications. The heterogeneity test yielded $I^2 = 0$, so a fixed model was used for analysis. The analysis results showed that the incidence of complications in the care bundles group was lower than that in the routine care group (RR: 0.35, 95%CI: 0.19, 0.67), and the difference was statistically significant ($P = 0.001$), as shown in Fig. 5D.

Mortality(percentages) Three articles reported patient mortality. The heterogeneity test yielded $I^2 = 0$, so a fixed model was used for analysis. The analysis results showed that there was no statistically significant difference between the two groups (RR:0.78, 95%CI:0.44,1.40, $P = 0.41$), as shown in Fig. 5E. Further subgroup analysis by country indicated that there was no statistically significant difference between the two groups in the Chinese population (RR: 0.55, 95% CI: 0.19, 1.56, $P = 0.26$) (Fig. 4C).

Table 2 Operations in the care bundle

Author	Year	Elements of care bundles
Jie Di	2021	Psychological counseling, control of ward environment, physical therapy and early mobility, assessment and prevention of complications
Suping Huang	2021	Comprehensive bundled managements, physical therapy and early mobility, assessment and prevention of complications, health-promoting conversation
Anil K Malik1,	2021	Sleep support, analgesic and sedative medications, compassionate care (communication, emotional support, family visits), physical therapy and early mobility, spontaneous breathing training
Mengxia Chen	2020	Analgesic and sedative medication, spontaneous breathing training, assessment and prevention of complications, physical therapy and early mobility, compassionate care (communication, emotional support, family visits)
Jie Chen	2016	Comprehensive bundled managements, physical therapy and early mobility, compassionate care (communication, emotional support, family visits), music therapy
Jinling Gu	2018	Comprehensive bundled managements, psychological counseling, assessment and prevention of complications, control of ward environment, physical therapy and early mobility
Liping Yuan	2018	Analgesic and sedative medication, control of ward environment, sleep support, compassionate care (communication, emotional support, family visits)
Shanyi Jin	2019	Avoiding sensory deprivation, helping patients to adapt to the environment, sleep support, compassionate care (communication, emotional support, family visits)
Xiaoxiang Jiang	2019	Comprehensive bundled managements, physical therapy and early mobility, sleep support, analgesic and sedative medication, assessment and prevention of complications, compassionate care (communication, emotional support, family visits)
Yaqiong Jiang	2021	Comprehensive bundled managements, control of ward environment, avoiding sensory deprivation, helping patients to adapt to the environment, cognitive and orientation interventions, analgesic and sedative medication
Yingqin Li	2021	Health-promoting conversation, spontaneous breathing training, assessment and prevention of complications, physical therapy and early mobility
Yuexia Li	2021	Comprehensive bundled managements, health-promoting conversation, control of ward environment, compassionate care (communication, emotional support, family visits)
Huaying Lin	2021	Comprehensive bundled managements, health-promoting conversation
Qiang Song	2021	Comprehensive bundled managements, health-promoting conversation, sleep support, control of ward environment, physical therapy and early mobility
Sha Yu	2023	Comprehensive bundled managements, psychological counseling, physical therapy and early mobility
Junyi Han	2023	Comprehensive bundled managements, physical therapy and early mobility, compassionate care (communication, emotional support, family visits), analgesic and sedative medication
Zongjia Yue	2023	Comprehensive bundled managements, physical therapy and early mobility, analgesic and sedative medication
Tuyong Liang	2023	Comprehensive bundled managements, physical therapy and early mobility, compassionate care (communication, emotional support, family visits), analgesic and sedative medication, music therapy

Sensitivity analysis

Sensitivity analysis was performed for delirium incidence, duration of delirium, hospital length of stay, and duration of mechanical Ventilation by removing the literature one by one. The results showed that the results of this meta-analysis were stable and reliable. Sensitivity analysis results are shown in Figures S1-S4.

Publication bias

Funnel plots were used to visually demonstrate the publication bias of delirium incidence, duration of delirium, hospital length of stay, and duration of mechanical Ventilation. Egger and Begg tests were used to statistically test the publication bias (Table 3). The results showed that all P values were greater than 0.05, suggesting that there may be no publication bias. Funnel Plots for publication bias are illustrated in Figures S5-S8.

Discussion

This systematic review and meta-analysis included 18 articles involving 2,717 patients. The meta-analysis results showed that care bundles had a positive effect on the prevention of delirium in ICU patients and could shorten the duration of delirium, the duration of mechanical ventilation in mechanically ventilated patients, and hospital length of stay, reduce the incidence of complications, and improve patient's satisfaction with care. However, no significant difference in mortality was found. Significant heterogeneity in the length of stay, delirium duration, and care satisfaction was observed, possibly because no study used the same elements for the care bundles. However, all studies used 2 or more types of care elements, typically including comprehensive bundled management, psychological support, humanistic support, and training support.

Studies have shown that each element of the multi-bundle strategy can effectively prevent the occurrence of delirium, and the integration of measures has a synergistic effect, allowing medical workers to effectively manage
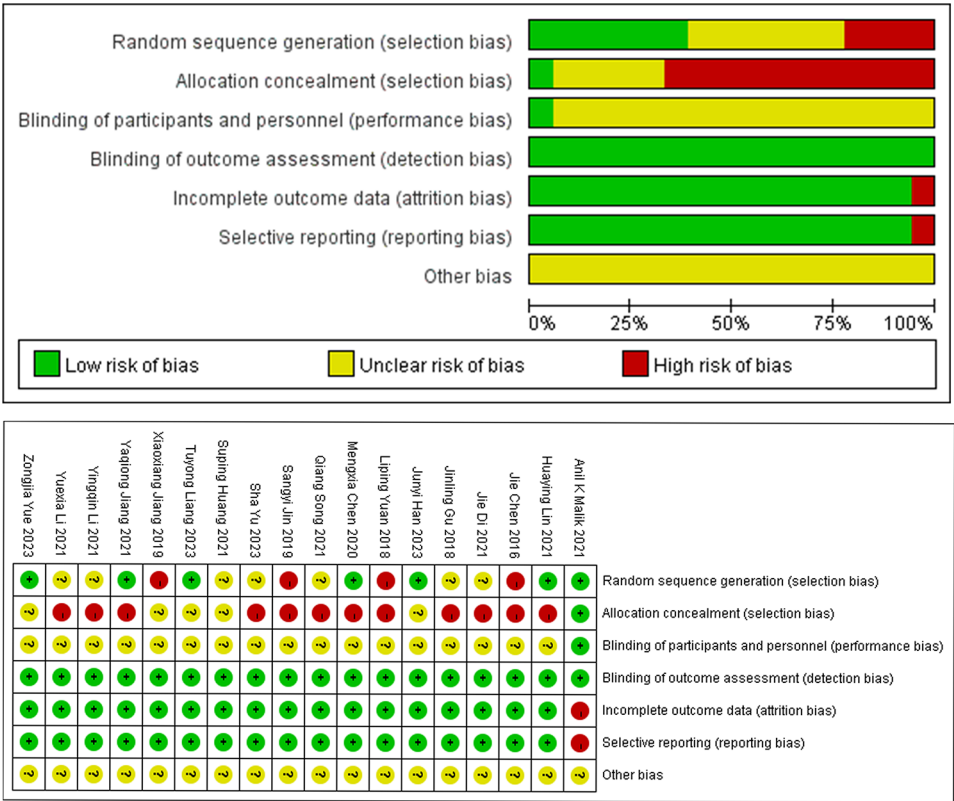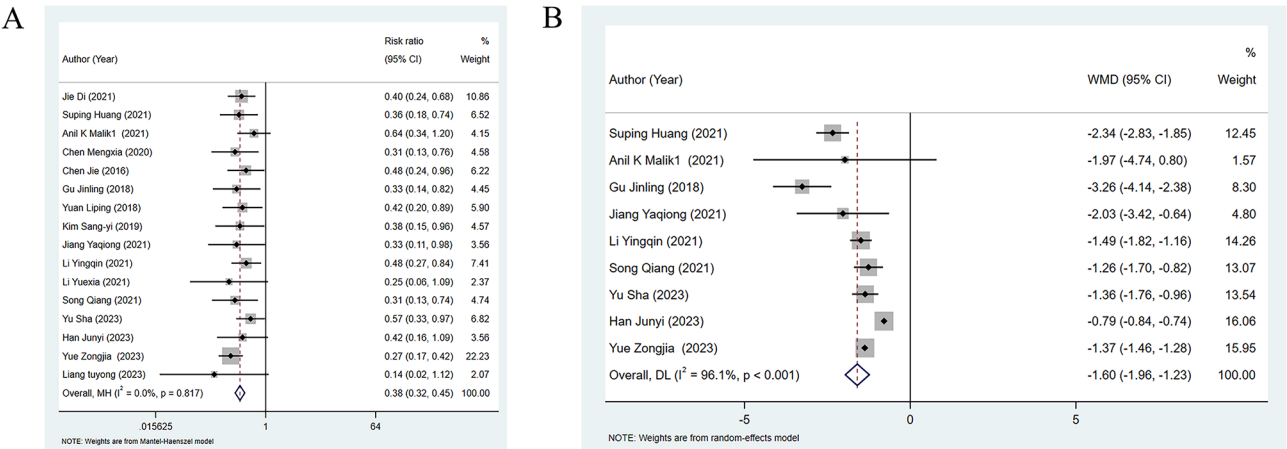
Fig. 2 Quality evaluation diagram

Fig. 3 (**A**) Meta-analysis of delirium incidence; (**B**) Meta-analysis of duration of delirium

patient's pain, respiration, and delirium. This is conducive to reducing the dose of analgesic and sedative drugs, shortening the duration of mechanical ventilation and ICU length of stay, significantly reducing the incidence of delirium, improving patient's treatment and sleep quality, and reorienting and mobilizing patients [38]. A previous study [39] reported similar findings, except for the dosage of analgesic and sedative drugs, which was not analyzed due to the limitations of the original data. This further confirms the effectiveness of care bundles

for clinical improvement in ICU patients. Further, care bundles also showed a lower incidence of complications and higher patient satisfaction compared to standard care. Because care bundles are a set of evidence-based interventions implemented as a whole, these outcomes represent collective effects rather than any single factor [40]. Inconsistency in the elements of care bundles in the study precludes the recommendations that specific components should be included in care bundles for ICU patients with delirium. Future studies should focus on
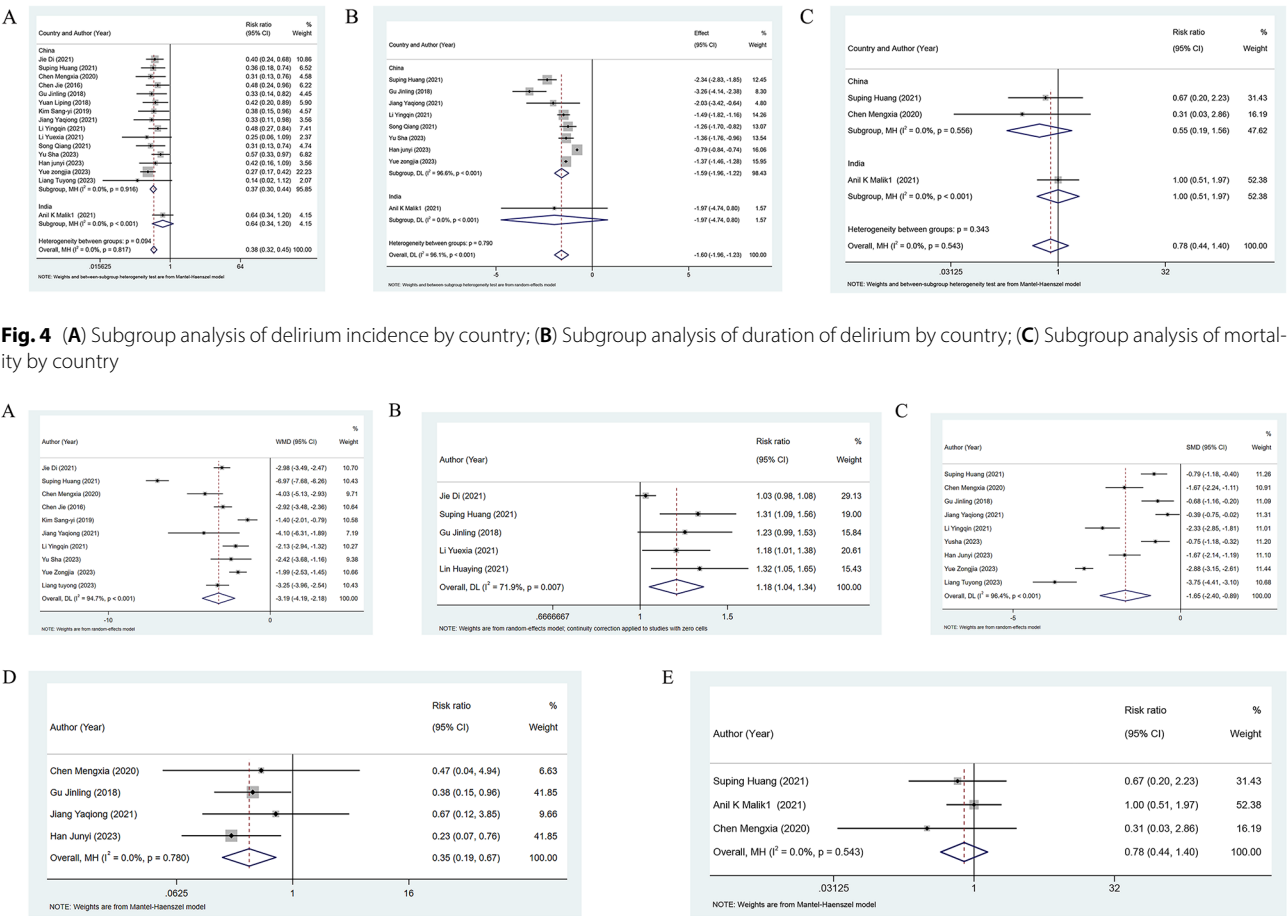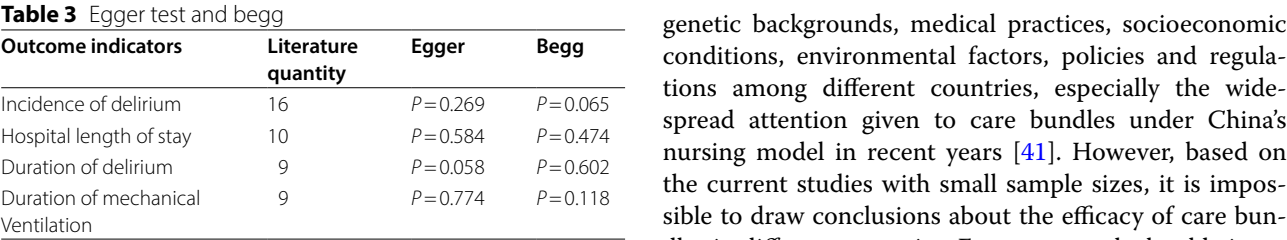
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Fig. 4 (**A**) Subgroup analysis of delirium incidence by country; (**B**) Subgroup analysis of duration of delirium by country; (**C**) Subgroup analysis of mortality by country

Fig. 5 (**A**) Meta-analysis of hospital length of stay; (**B**) Meta-analysis of satisfaction with care; (**C**) Meta-analysis of duration of mechanical ventilation; (**D**) Meta-analysis of incidence of complications; (**E**) Meta-analysis of mortality

Table 3 Egger test and begg

Outcome indicators	Literature quantity	Egger	Begg
Incidence of delirium	16	$P = 0.269$	$P = 0.065$
Hospital length of stay	10	$P = 0.584$	$P = 0.474$
Duration of delirium	9	$P = 0.058$	$P = 0.602$
Duration of mechanical Ventilation	9	$P = 0.774$	$P = 0.118$

which components and combinations for care bundles are most effective. Additionally, considering the differences in the countries included in our studies, we conducted subgroup analysis by country to investigate the specific impact of care bundles in different countries. The findings showed that care bundles can improve both the incidence and duration of delirium in the Chinese population, but they do not provide significant advantages regarding mortality. Data from a single article reporting on India suggested that there was no statistically significant difference between care bundles and standard care in terms of the incidence of delirium, duration of delirium, and mortality. This may be due to differences in

genetic backgrounds, medical practices, socioeconomic conditions, environmental factors, policies and regulations among different countries, especially the widespread attention given to care bundles under China's nursing model in recent years [41]. However, based on the current studies with small sample sizes, it is impossible to draw conclusions about the efficacy of care bundles in different countries. Future research should aim to broaden the range of centers involved, and we look forward to further trials and explorations in other countries and regions.

Care bundles strategies are an integration of therapeutic care measures based on the evidence-based medicine (EBM), including pain assessment, daily awakening and spontaneous breathing, selection of sedative and analgesic drugs, delirium monitoring, early mobility, and family involvement [42]. Each step of the bundle analgesic sedation strategy requires nurse's engagement or communication with other participants. Whether a patient's endotracheal tube can be removed requires nurses to consult respiratory therapists and physicians, and whether early exercise is needed requires nurses to

consult physiotherapists and physicians. Nurses also manage the implementation of bundle analgesic sedation strategies in different regions and institutions because they understand the conditions of their hospitals and are able to put forward constructive opinions on resources as well as training to promote the implementation of bundle analgesic sedation strategies [38, 40]. Professor Ely [43] of Vanderbilt University in the United States and his team, when reviewing the management of mechanically ventilated patients, discovered and proposed evidence-based bundle strategies to improve neurological and functional outcomes in critically ill patients, including spontaneous awakening test and spontaneous breathing test, selection of sedation, monitoring and management of delirium, and early mobilization. Like most clinical treatments, bundle care continues to improve over time. Black et al. [44] investigated the effect of the family psychological support intervention on delirium incidence and psychological rehabilitation. They found that the incidence of delirium was lower in the intervention group (29-77%) than in the conventional care group. In addition, the participation of family members in the care of ICU patients has other significant benefits, including (i) better identification and treatment of PAD (pain, agitation, delirium) and weakness; (ii) providing important non-pharmacological stress relief and reorientation interventions (e.g., provide body touch, music, sensory aids, home photographs); (iii) more open and effective communication between the patient and ICU clinicians [45–47]. These findings indicate that family involvement is necessary, irreplaceable, and helpful for the treatment of delirium and illness in patients.

This study is the first meta-analysis based on randomized controlled studies, demonstrating that care bundles have a positive effect on the prevention of delirium in ICU patients and can shorten the duration of delirium, the duration of mechanical ventilation in mechanically ventilated patients and hospital length of stay, reduce the incidence of complications, and improve patients' satisfaction with care. However, it still has the following limitations. First, the number of included studies and participants is small, and all studies come from Asia, with the vast majority being from the Chinese population, which may lead to some bias, resulting in the poor extrapolation of the conclusions. Second, few included studies described the use of blinding, which may also affect the reliability of the conclusions. Third, there is large heterogeneity between the included studies, but due to the limited number of included articles, we cannot perform subgroup analysis to explore the source of heterogeneity. Finally, due to the limitations of the included original studies not reporting relevant data, we are unable to conduct a categorical analysis of different delirium phenotypes. We hope that future research will consider further reporting and analysis of delirium phenotypes and more disease-related information (such as disease severity scores), which will be beneficial for clinical practice.

Conclusion

Care bundles have a positive effect on the prevention of delirium in ICU patients and can shorten the duration of delirium, the duration of mechanical ventilation in mechanically ventilated patients, and hospital length of stay, reduce the incidence of complications, and improve patients' satisfaction with care. Care bundles are a promising intervention. In clinical practice, it is suggested to emphasize coordination among nurses, doctors, and family members to participate in and implement concise, personalized care for patients. However, due to the obvious limitations of the study, more multi-center, large-sample randomized controlled studies are needed for further validation. In addition, future studies should focus on which components and combinations in care bundles are most effective.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-025-03013-z.

Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

PROSPERO registration number
CRD42023391551.

Competing interests
The authors declare no competing interests.

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