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CONTRIBUIÇÕES DA BUNDLE ABCDEF NOS CUIDADOS À PESSOA EM SITUAÇÃO CRÍTICA NA UCI: SCOPING REVIEW

CONTRIBUTIONS OF THE ABCDEF BUNDLE TO THE CARE OF CRITICALLY ILL PATIENTS IN THE ICU: SCOPING REVIEW

CONTRIBUCIONES DEL PAQUETE ABCDEF EN LA ATENCIÓN A PERSONAS EN SITUACIÓN CRÍTICA EN LA UCI: SCOPING REVIEW

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RESUMO

Introdução: A hospitalização em unidades de cuidados intensivos associa-se a complicações que comprometem a recuperação da pessoa. Estratégias baseadas na evidência, como a *bundle* ABCDEF, são essenciais para melhorar a qualidade e segurança dos cuidados.
Objetivo: Mapear a evidência sobre as contribuições da *bundle* ABCDEF nos cuidados à pessoa em situação crítica em unidades de cuidados intensivos.
Métodos: Realizou-se uma *scoping review* segundo orientações do *Joanna Briggs Institute*. A pesquisa bibliográfica foi realizada na plataforma EBSCO, utilizando descritores MeSH, nas bases *MEDLINE, CINAHL Complete, Academic Search Complete, MedicLatina, Nursing & Allied Health Collection – Comprehensive, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Cochrane Methodology Register, Cochrane Clinical Answers e Library, Information Science & Technology Abstracts, PubMed* e o Repositório Científico de Acesso Aberto de Portugal. Incluíram-se estudos publicados em português ou inglês. A seleção foi documentada num diagrama PRISMA e os dados sintetizados descritivamente.
Resultados: Foram incluídos quarenta estudos. A evidência demonstra que a *bundle* ABCDEF reduz o tempo de ventilação mecânica, a incidência de *delirium* e a sedação excessiva, diminuindo taxas de reinternamento e mortalidade. Promove a mobilização precoce, reforça a comunicação multiprofissional e otimiza a gestão de recursos. O envolvimento da família favorece a adesão terapêutica, o bem-estar emocional e a satisfação com os cuidados.
Conclusão: A *bundle* ABCDEF melhora a qualidade dos cuidados em unidades de cuidados intensivos, evidenciando benefícios clínicos, organizacionais e relacionais.

Palavras-chave: enfermagem; *bundle* ABCDEF; unidade de cuidados intensivos; cuidados críticos; pessoa em situação crítica

ABSTRACT

Introduction: Hospitalization in intensive care units is associated with complications that compromise patient recovery. Evidence-based strategies, such as the ABCDEF bundle, are essential for improving the quality and safety of care.
Objective: To map the evidence on the contributions of the ABCDEF bundle to the care of critically ill patients in intensive care units.
Methods: A scoping review was conducted according to the guidelines of the Joanna Briggs Institute. The bibliographic search was performed on the EBSCO platform, using MeSH descriptors, in the MEDLINE, CINAHL Complete, Academic Search Complete, MedicLatina, Nursing & Allied Health Collection – Comprehensive, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Cochrane Methodology Register, Cochrane Clinical Answers and Library, Information Science & Technology Abstracts, PubMed, and the Portuguese Open Access Scientific Repository. Studies published in Portuguese or English were included. The selection was documented in a PRISMA diagram, and the data were summarized descriptively.
Results: Forty studies were included. The evidence shows that the ABCDEF bundle reduces the duration of mechanical ventilation, the incidence of delirium, and excessive sedation, thereby decreasing readmission and mortality rates. It promotes early mobilization, strengthens multidisciplinary communication, and optimizes resource management. Family involvement promotes therapeutic adherence, emotional well-being, and satisfaction with care.
Conclusion: The ABCDEF bundle improves the quality of care in intensive care units, demonstrating clinical, organizational, and relational benefits.

Keywords: nursing; ABCDEF bundle; intensive care unit; critically ill patient; critical care

RESUMEN

Introducción: La hospitalización en unidades de cuidados intensivos se asocia con complicaciones que comprometen la recuperación del paciente. Las estrategias basadas en la evidencia, como el paquete ABCDEF, son esenciales para mejorar la calidad y la seguridad de la atención.
Objetivo: Recopilar la evidencia sobre las contribuciones del paquete ABCDEF en la atención a personas en situación crítica en unidades de cuidados intensivos.
Métodos: Se realizó una revisión exploratoria según las directrices del Joanna Briggs Institute. La búsqueda bibliográfica se llevó a cabo en la plataforma EBSCO, utilizando descriptores MeSH, en las bases MEDLINE, CINAHL Complete, Academic Search Complete, MedicLatina, Nursing & Allied Health Collection – Comprehensive, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Cochrane Methodology Register, Cochrane Clinical Answers and Library, Information Science & Technology Abstracts, PubMed y el Repositorio Científico de Acceso Abierto de Portugal. Se incluyeron estudios publicados en portugués o inglés. La selección se documentó mediante un diagrama PRISMA y los datos se sintetizaron de forma descriptiva.
Resultados: Se incluyeron cuarenta estudios. La evidencia demuestra que el paquete ABCDEF reduce el tiempo de ventilación mecánica, la incidencia de delirio y la sedación excesiva, disminuyendo las tasas de reingreso y mortalidad. Asimismo, promueve la movilización temprana, refuerza la comunicación multiprofesional y optimiza la gestión de recursos. La participación de la familia favorece la adherencia terapéutica, el bienestar emocional y la satisfacción con la atención.
Conclusión: El paquete ABCDEF mejora la calidad de la atención en las unidades de cuidados intensivos, poniendo de manifiesto beneficios clínicos, organizativos y relacionales.

Palabras clave: enfermería; paquete ABCDEF; unidad de cuidados intensivos; cuidados críticos; persona en situación crítica

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INTRODUCTION

It is generally acknowledged that hospitalization in Intensive Care Units (ICUs) may entail several complications capable of compromising patient recovery, such as excessive sedation, long periods of Invasive Mechanical Ventilation (IMV), delirium, immobility, and acquired muscle weakness (Boehm et al., 2020). These complications – which depend on the underlying diagnosis and the individual's previous health status – enhance morbidity, length of stay, and mortality (Boehm et al., 2020).
The Post-Intensive Care Syndrome (PICS) encompasses various physical, cognitive, and psychological changes, which affect the individual's quality of life after discharge (Sociedade Portuguesa de Cuidados Intensivos & Ordem dos Médicos, 2024). It is estimated that more than half of ICU patients develop PICS. Hence, the involved professionals must implement effective strategies to minimize the adverse effects of hospitalization (Baptista et al., 2024; Demoro et al., 2020; Zhang et al., 2025).

1. THEORETICAL FRAMEWORK

In the scenario portrayed above, a multidimensional strategy has emerged, which improves care quality, while promoting a safer, more functional, and more humanized recovery – the ABCDEF bundle (Barr et al., 2013; Society of Critical Care Medicine, n.d). This strategy comprises a structured set of evidence-based interventions that can be divided into six components: "**A**ssess, Prevent and Manage Pain"; "**B**oth Spontaneous Awakening Trials (SATs) and Spontaneous Breathing Trials (SBTs)"; "**C**hoice of Analgesia and Sedation"; "**D**elirium: Assess, Prevent and Manage"; "**E**arly Mobility and Exercise"; and "**F**amily Engagement and Empowerment" (Society of Critical Care Medicine, n.d). Each component is described below.

A – "Assess, Prevent and Manage Pain"
This element promotes a proactive and multimodal approach to pain in critically ill individuals, based on regular assessment, prevention, and treatment. There is a constant focus on the patients' comfort and safety, always viewing pain as a subjective and multidimensional phenomenon (Ordem dos Enfermeiros, 2008; Society of Critical Care Medicine, n.d).

B – "Both Spontaneous Awakening Trials (SATs) and Spontaneous Breathing Trials (SBTs)"
This component includes two fundamental strategies: SATs (in which sedation is suspended in a programmed manner) and SBTs (in which the individual's ability to breathe autonomously is assessed). These strategies are coordinated, ultimately allowing the suspension of IMV (Society of Critical Care Medicine, n.d).

C – "Choice of Analgesia and Sedation"
This element emphasizes the importance of adapting the administered medication to the patient's pathophysiological profile, carefully selecting analgesics and sedatives. It also highlights the value of an individualized and monitored administration, which should be coordinated with the other components of the bundle (Society of Critical Care Medicine, n.d).

D – "Delirium: Assess, Prevent and Manage"
This element favors a systematic and early assessment of delirium, using validated scales. Moreover, regarding the aforesaid phenomenon, it supports the implementation of non-pharmacological preventive strategies (Pereira et al., 2016; Society of Critical Care Medicine, n.d).

E – "Early Mobility and Exercise"
This component addresses the issue of immobility in ICU settings, since, in such contexts, prolonged immobility is one of the most prevalent and debilitating complications, being associated with Intensive Care-Acquired Muscle Weakness (ICAMW), also known as ICU-Acquired Weakness (ICU-AW) (Chen & Huang, 2024). It encompasses a wide range of strategies (from passive bed exercises to assisted walking), thus requiring the collaboration of the entire multidisciplinary team (Society of Critical Care Medicine, n.d).

F – "Family Engagement and Empowerment"
This element promotes several key aspects, namely: an active and structured family involvement throughout care provision; effective communication; emotional support; support in decision-making processes; and respect for the patients' beliefs and values. These aspects are essential to ICU humanization (Sá, 2013; Society of Critical Care Medicine, n.d).
Seeking to attain a comprehensive and integrated overview of the topic under study, with a focus on nursing care, we conducted the present scoping review. Accordingly, its objective was to map the existing evidence on the contributions of the ABCDEF bundle to critical care in ICUs, in order to thoroughly understand the involved phenomena, and we established the following research question: "How does the ABCDEF bundle contribute to critical care in ICU settings?"

2. METHODS

This scoping review was based on the methodology recommended by the Joanna Briggs Institute (JBI) (Peters et al., 2021). For that reason, it included several steps, which are described below.

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To perform the bibliographic search, we used the following MeSH descriptors: *"Bundle ABCDEF"; "Bundle ABCDE"; "ABCDEF"; "ABCDE"; "Patient Care Bundles"; "UCI"; "ICU"; "Intensive Care Unit"; "Intensive Care Units"; "Critical Illnesses"; "Critically Ill"; "Nurse"; "Nursing"; "Nurses"; "Nursing Intervention"; "Nurse Specialist"; "Health Team, Interdisciplinary"; "Health Teams, Interdisciplinary"; "Healthcare Team"; "Healthcare Teams"; "Interdisciplinary Health Team"; "Interdisciplinary Health Teams"; "Medical Care Team"; "Medical Care Teams"; "Multidisciplinary Care Team"; "Multidisciplinary Health Team"; "Pediatric"; "Pediatric Nurse Practitioner"; "Nurse, Pediatric"; "Pediatric Nurse"; "Pediatric Nurses"; and "Intensive Care Units, Pediatric"*. The employed MeSH descriptors were combined with the Boolean operators "OR", "AND", and "NOT".

Inclusion criteria

To define the research question, we followed the PCC ("Population", "Concept", and "Context") mnemonic. The target population consisted of critically ill adults (aged 18 years or older). Consequently, we excluded all works addressing pediatric care (from birth to 18 years of age). Regarding the concept, we sought to explore the contributions of the ABCDEF bundle to multidisciplinary care, identifying the ICU as the context under study. In addition, we did not apply any time restrictions and, with respect to language, we only considered works published in Portuguese or English.

Source typology

We considered various types of works, based on qualitative, quantitative, or mixed methodologies: descriptive exploratory studies; randomized and non-randomized clinical trials; intervention studies; observational studies; cohort studies; case studies; focus group studies; literature reviews; and gray literature (master's and doctoral dissertations). During the selection process, we did not take into account the works' level of evidence.

Search strategy

To find relevant publications, we conducted an extensive bibliographic search, in which we used the EBSCO platform to access several electronic databases, namely: MEDLINE; CINAHL Complete; Academic Search Complete; MedicLatina; Nursing & Allied Health Collection – Comprehensive; Cochrane Central Register of Controlled Trials; Cochrane Database of Systematic Reviews; Cochrane Methodology Register; Cochrane Clinical Answers; and Library, Information Science & Technology Abstracts (LISTA). We also accessed PubMed and *Repositórios Científicos de Acesso Aberto de Portugal* (RCAAP), in an attempt to obtain further material. Initially, we performed a general search in MEDLINE and CINAHL Complete to identify the most frequent descriptors by analyzing the available titles and abstracts. In a second stage, we combined the abovementioned descriptors and validated them on the MeSH platform. Next, we defined a search equation, which was entered into each database, as shown in Table 1. Finally, the works' bibliographic references were carefully examined to detect potentially relevant material.

Data extraction and synthesis

Four independent reviewers extracted the available data in a systematic manner, using a previously developed and tested form, specifically adapted to this review's purpose. The extracted data included the following parameters: title; author(s); year of publication; country of origin; objective(s); study design; target population; relevant interventions/phenomena of interest; and key findings. Discrepancies were solved by consensus, with the assistance of two extra reviewers. Data synthesis was performed narratively, with the collected data being organized by category, according to the pre-defined analytical axes. Lastly, the results were presented in a table format to facilitate visualization and comparison.

Table 1 - Search strategy (applied on March 1, 2025)

Databases	Search Equation
MEDLINE; CINAHL Complete; Academic Search Complete; MedicLatina; Nursing & Allied Health Collection – Comprehensive; Cochrane Central Register of Controlled Trials; Cochrane Database of Systematic Reviews; Cochrane Methodology Register; Cochrane Clinical Answers; LISTA; PubMed; RCAAP.	S1: *Bundle ABCDEF OR Bundle ABCDE OR ABCDEF OR ABCDE OR Patient Care Bundles [All Fields]* S2: *UCI OR ICU OR Intensive Care Unit OR Intensive Care Units OR Critical Illnesses OR Critically Ill* [AB] S3: *Nurse OR Nursing OR Nurses OR Nursing Intervention OR Nurse Specialist OR Health Team, Interdisciplinary OR Health Teams, Interdisciplinary OR Healthcare Team OR Healthcare Teams OR Interdisciplinary Health Team OR Interdisciplinary Health Teams OR Medical Care Team OR Medical Care Teams OR Multidisciplinary Care Team OR Multidisciplinary Health Team [All Fields]* S4: *Pediatric OR Pediatric Nurse Practitioner OR Nurse, Pediatric OR Pediatric Nurse OR Pediatric Nurses OR Intensive Care Units, Pediatric [All Fields]* S1 AND S2 AND S3 NOT S4

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Data collection instruments

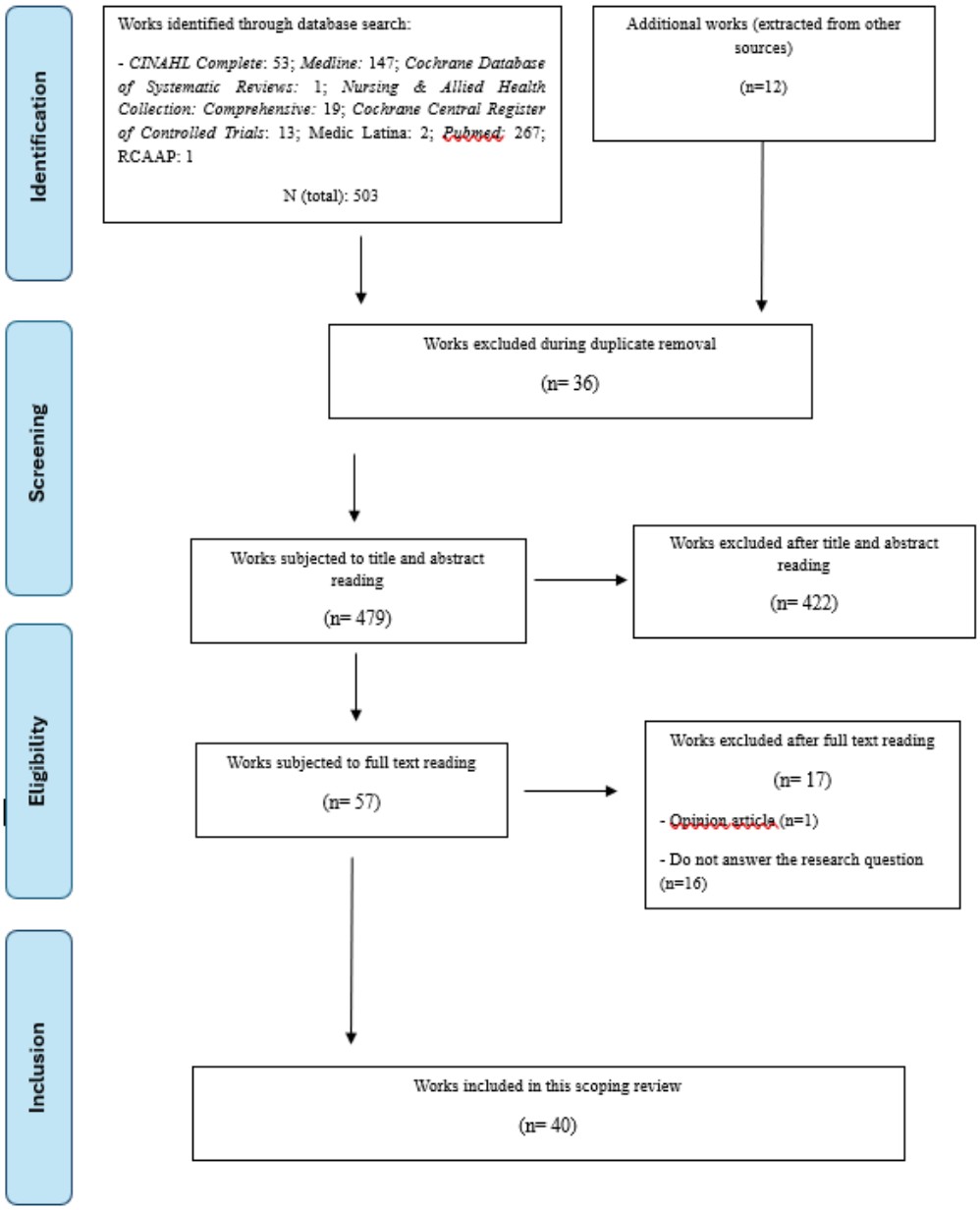

Figure 1 - PRISMA flowchart of the works' selection process

3. RESULTS

The preliminary sample comprised 515 documents (of which 503 were obtained through database search, while 12 were extracted from other sources). After duplicate removal (36), the remaining 479 works were subjected to title and abstract analysis, which resulted in the exclusion of 422 documents that did not meet the inclusion criteria. Accordingly, 57 works were read in full. At this point, one document was excluded for being an opinion article, and 16 documents were excluded for not answering the research question. Thus, 40 works were included in the review. The entire selection process is depicted in Figure 1. To summarize the collected data, we developed Table 2, which was filled out with the gathered information.

Of the 40 included works, the vast majority (n = 32) (Balas et al., 2012; Balas et al., 2013; Balas et al., 2014; Balas et al., 2016; Balas et al., 2019; Bardwell et al., 2020; Barnes-Daly et al., 2018; Boehm et al., 2017; Boltey et al., 2019; Bounds et al., 2016; Chai et al., 2015; Collinsworth et al., 2016; Concepcion, 2013; Costa et al., 2017; Costa et al., 2018; Dang, 2013; Davidson, 2013; DeMellow et

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al., 2020; Desai et al., 2011; Ely, 2017; Guest et al., 2024; Hsieh et al., 2019; Maraboto, 2013; Marra et al., 2017; Miller et al., 2013; Miller et al., 2015; Morandi et al., 2011; Pun et al., 2019; Stollings et al., 2019; Stollings et al., 2020; Vasilevskis et al., 2010) came from the United States of America (USA), representing 80% of the final sample. In turn, Australia accounted for 7.5% of the final sample (n = 3) (Sosnowski et al., 2018; Sosnowski et al., 2021; Sosnowski et al., 2023). Other countries were represented by a single document (n = 1): Italy (Negro et al., 2022), China (Ren et al., 2017), Spain (Frade-Mera et al., 2022), and South Korea (Lee et al., 2020), each corresponding to 2.5% of the final sample. Only one of the included works (also corresponding to 2.5%) had an undefined origin (Morandi et al., 2017).

Chronological analysis revealed that the included publications were distributed over several years: approximately 2.5% (n = 1) (Guest et al., 2024) dated from 2024; 2.5% (n = 1) (Sosnowski et al., 2023) from 2023; 5% (n = 2) (Frade-Mera et al., 2022; Negro et al., 2022) from 2022; 2.5% (n = 1) (Sosnowski et al., 2021) from 2021; 10% (n = 4) (Bardwell et al., 2020; DeMellow et al., 2020; Lee et al., 2020; Stollings et al., 2020) from 2020; 12.5% (n = 5) (Balas et al., 2019; Boltey et al., 2019; Hsieh et al., 2019; Pun et al., 2019; Stollings et al., 2019) from 2019; 7.5% (n = 3) (Barnes-Daly et al., 2018; Costa et al., 2018; Sosnowski et al., 2018) from 2018; 17.5% (n = 7) (Boehm et al., 2017a; Boehm et al., 2017b; Costa et al., 2017; Ely, 2017; Marra et al., 2017; Morandi et al., 2017; Ren et al., 2017) from 2017; 7.5% (n = 3) (Balas et al., 2016; Bounds et al., 2016; Collinsworth et al., 2016) from 2016; 5% (n = 2) (Chai et al., 2015; Miller et al., 2015) from 2015; 2.5% (n = 1) (Balas et al., 2014) from 2014; 15% (n = 6) (Balas et al., 2013; Concepcion, 2013; Dang, 2013; Davidson, 2013; Maraboto, 2013; Miller et al., 2013) from 2013; 2.5% (n = 1) (Balas et al., 2012) from 2012; 5% (n = 2) (Desai et al., 2011; Morandi et al., 2011) from 2011; and 2.5% (n = 1) (Vasilevskis et al., 2010) from 2010.

Furthermore, the included works reflected various study typologies, namely: narrative literature reviews (around 30%; n = 12) (Balas et al., 2016; Balas et al., 2019; Concepcion, 2013; Dang, 2013; Davidson, 2013; Desai et al., 2011; Ely, 2017; Maraboto, 2013; Marra et al., 2017; Morandi et al., 2011; Vasilevskis et al., 2010; Barnes-Daly et al., 2018); prospective cohort studies (around 20%; n = 8) (Balas et al., 2014; Bardwell et al., 2020; Boltey et al., 2019; Bounds et al., 2016; Frade-Mera et al., 2022; Hsieh et al., 2019; Pun et al., 2019; Ren et al., 2017); quasi-experimental studies (around 10%; n = 4) (Balas et al., 2012; Chai et al., 2015; Costa et al., 2018; Guest et al., 2024); descriptive cross-sectional studies (around 7.5%; n = 3) (Boehm et al., 2017; Miller et al., 2015; Morandi et al., 2017); systematic reviews (around 7.5%; n = 3) (Collinsworth et al., 2016; Costa et al., 2017; Sosnowski et al., 2021); retrospective observational studies (around 5%; n = 2) (DeMellow et al., 2020; Lee et al., 2020); cross-sectional observational studies (around 5%; n = 2) (Boehm et al., 2017; Negro et al., 2022); observational studies (around 5%; n = 2) (Balas et al., 2013; Stollings et al., 2020); mixed studies (around 5%; n = 2) (Miller et al., 2013; Stollings et al., 2019); systematic reviews with meta-analyses (around 2.5%; n = 1) (Sosnowski et al., 2023); and descriptive observational studies (around 2.5%; n = 1) (Sosnowski et al., 2018).

Table 2 - Summarized results

Authors/ Year/ Country	Objective(s)	Study Design	Findings by ABCDEF Bundle Component
Vasilevskis et al., 2010 USA	To identify the main iatrogenic risk factors for ICU-acquired delirium and weakness and assess their impact on mortality and quality of life.	NR	A. Frequent monitoring of pain, comfort, and delirium enabled early intervention. B. Reduced mechanical ventilation duration, delirium incidence, and one-year mortality; C. Benzodiazepine reduction/replacement lowered delirium risk and improved functional outcomes; D. Systematic delirium monitoring with validated tools (e.g., CAM-ICU) supported early detection and intervention; E. Decreased delirium, ICU-acquired weakness, and length of stay promoted greater post-discharge autonomy.
Morandi et al., 2011 USA	Analyze the available evidence on the management of critically ill patients subjected to IMV, with a special focus on the ABCDE bundle's.	NR	A. Adequate sedation practices were essential to ensure comfort in critically ill patients; B. SATs and SBTs reduced mechanical ventilation duration, shortened ICU and hospital stays, and decreased one-year mortality. C. Appropriate sedative selection (e.g., dexmedetomidine) reduced delirium prevalence and increased delirium- and coma-free days; D. Delirium monitoring using CAM-ICU was crucial for early detection, minimizing cognitive complications and mortality; E. Early mobilization reduced delirium duration and improved functional independence after discharge.
Desai et al., 2011 USA	To implement the ABCDEF bundle, aiming at reducing sedative exposure, decreasing mechanical ventilation length, and controlling ICU-acquired delirium and weakness; as regards the bundle's application; Identification both facilitators and obstacles.	NR	A. Effective pain control is essential to prevent physical and psychological complications. B. Avoiding excessive sedation helps early rehabilitation and reduces complications. C. Using sedatives with a lower risk of delirium and cognitive dysfunction is important; D. Early identification and control of delirium are essential to reduce neuropsychiatric effects and improve long-term outcomes. E. Early mobilization within the first 72 hours of mechanical ventilation increases the chances of independent functional recovery.

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Authors/ Year/ Country	Objective(s)	Study Design	Findings by ABCDEF Bundle Component
Balas et al., 2012 USA	To synthesize the available scientific evidence that supports the ABCDE bundle, and to characterize the bundle's individual components.	NR	A. Continuous assessment of pain, sedation, and agitation should be performed using validated scales; B. SATs and SBTs increased ventilator-free days, reduced hospital stays, and lowered one-year mortality by 14%; C. Nurse-led sedation protocols reduced exposure to benzodiazepines, which are strongly associated with delirium in ventilated patients; D. Regular delirium monitoring with validated tools, such as CAM-ICU and ICDSC, is essential to reduce complications, mortality, and cognitive impairment. E. Early mobilization within the first 72 hours increased the likelihood of discharge with independent functionality and improved functional outcomes in intubated patients.
Balas et al., 2013 USA	To explore the potential benefits of expanding the ABCDE bundle to the post-ICU context	Observational study	A. Early analgesia reduced the need for sedatives and facilitated ventilator weaning. Noise reduction, massages, and earplugs were also recommended. B. SATs and SBTs shortened mechanical ventilation duration and hospital stays, while improving one-year survival; C. Excessive sedation, especially with benzodiazepines and opioids, increased the risk of delirium and prolonged mechanical ventilation; D. Daily delirium monitoring with CAM-ICU or ICDSC was strongly recommended; E. Early mobilization reduced ICU-acquired weakness, promoted functional independence, shortened delirium duration, and reduced ventilator dependence. Dysphagia assessment after extubation was also recommended to prevent swallowing-related complications.
Davidson, 2013 USA	As regards delirium occurrence in ICU settings: 1) to analyze different preventive strategies; 2) to highlight modifiable risk factors, as well as evidence-based approaches, which allow a reduction in delirium	NR	A. Pain assessment is essential to reduce excessive sedation, prevent delirium, and improve patient comfort; B. SATs and SBTs reduced mechanical ventilation duration, shortened ICU and hospital stays, and lowered one-year mortality by 14%; C. Dexmedetomidine reduced delirium prevalence compared with midazolam and allowed earlier extubation; D. Daily monitoring with CAM-ICU or ICDSC improved early delirium detection and enabled prompt interventions. E. Early mobilization within the first 72 hours reduced delirium duration, increased independent functionality at discharge, and allowed earlier hospital discharge.
Concepcion 2013 USA	To explore the benefits of interrupting sedation on a daily basis, in mechanically ventilated ICU patients, in an attempt to minimize the adverse effects associated with continuous sedation.	NR	A. Maintaining a balance between comfort and sedation helps prevent psychological and physiological complications while avoiding oversedation. B. Daily interruption of sedation reduced mechanical ventilation duration and shortened ICU and hospital stays; C. Careful selection and management of sedatives, combined with daily sedation interruption, reduced delirium risk and improved neurological recovery; D. Daily sedation interruption improved mental status assessment, reduced deep sedation periods, and facilitated early delirium detection; E. Reducing or interrupting sedation daily promoted early mobilization, functional recovery, and shorter ventilator dependence.
Maraboto, 2013 USA	To explore safer and more effective alternatives to benzodiazepines for the sedation of mechanically ventilated ICU patients	NR	A. Balanced analgesia and sedation management is essential to ensure patient comfort and prevent neurological and musculoskeletal complications. B. Reduced sedation facilitated extubation and shortened mechanical ventilation duration; C. Alternative sedatives, such as dexmedetomidine, volatile gases, and remifentanil, reduced delirium, shortened hospital stays, and decreased neurological complications and costs; D. Careful sedative selection is essential to prevent delirium. E. Sedatives that allow rapid neurological recovery promote early mobilization and faster functional rehabilitation.
Dang, 2013 USA	To explore the benefits of early mobility in critically ill ICU patients	NR	B. Daily SATs and SBTs were essential to prepare patients for early mobilization; C. Careful selection and controlled use of sedatives helped prevent muscle weakness, facilitate early mobilization, and shorten ventilation and hospitalization periods; D. Early mobilization reduced delirium duration, increased ventilator-free days, and improved cognitive and functional outcomes; E. Early mobilization reduced ICU-acquired weakness, improved strength and functional capacity, and shortened ventilation and hospitalization periods.
Miller, 2013 USA	To identify facilitators and obstacles, as regards the bundle's application; to evaluate the extent to which the bundle's implementation was effective, sustainable, and propagable	Prospective cohort study	B. Coordinated SATs and SBTs, helped minimize sedation, and assessed patients' readiness for extubation; C. Light sedation and daily sedation interruption reduced excessive sedation and facilitated neurological assessment; D. Daily delirium monitoring with CAM-ICU improved early detection and encouraged multidisciplinary involvement; E. Early mobilization improved functional independence and was considered a safe practice despite implementation challenges.
Balas et al., 2014 USA	To evaluate the effectiveness and safety of implementing the ABCDE bundle in clinical practice	Prospective cohort study	B. SATs increased from 53% to 71% and SBTs from 71% to 84%, reducing mechanical ventilation duration by 3 days; C. After bundle implementation, daily sedation interruption increased and benzodiazepine use decreased; D. The bundle reduced delirium prevalence from 62% to 49% and shortened delirium duration; E. Patient mobilization increased from 48% to 66%, promoting faster functional recovery.
Chai & Mehl, 2015 USA	To implement the ABCDE bundle in the ICU of a rural community hospital.	Quasi-experimental study.	A. Appropriate analgesia and sedation management helped prevent complications such as delirium. B. Coordinated SATs and SBTs reduced mechanical ventilation duration by an average of 29%; C. Minimizing prolonged sedation facilitated awakening and mobilization, improving patient outcomes; D. Delirium prevalence was reduced to 19%. ICDSC was used twice daily with 92% adherence, and non-pharmacological interventions were documented in most cases; E. Early mobilization was performed in 96% of opportunities, improving functional recovery and reducing immobility periods.

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Authors/ Year/ Country	Objective(s)	Study Design	Findings by ABCDEF Bundle Component
Miller et al., 2015 USA	To assess the implementation rate of the different components included in the ABCDE bundle.	Descriptive cross-sectional study	B. Although 88% of ICUs had protocols for daily sedation interruption, only 45% performed SATs in most ventilated patients, showing partial adherence; C. Regular sedation interruption was essential to facilitate early mobilization and reduce complications. D. Only 31% of ICUs performed daily delirium assessments in most ventilated patients, highlighting gaps in systematic monitoring; E. Full bundle implementation increased the likelihood of high mobility levels by 3.5 times. However, few ICUs mobilized ventilated patients within the first 48–72 hours or before extubation.
Balas et al., 2016 USA	To identify obstacles and facilitators, as regards the implementation of the ABCDEF bundle	NR	A. Systematic pain assessment using validated scales, such as BPS and CPOT, is essential, especially in non-communicative patients. B. SATs and SBTs reduced ventilation duration and highlighted the importance of individualized and regular assessment of spontaneous ventilation capacity; C. Light sedation should be preferred, with careful use and monitoring of opioids and benzodiazepines; D. Daily delirium monitoring with validated tools, such as CAM-ICU and ICDSC, reduced delirium occurrence; E. Individualized rehabilitation protocols improved functional capacity, facilitated ventilator weaning, and supported discharge; F. Family participation, emotional support, and patient reorientation helped reduce delirium and improve psychological recovery. Interventions included extended visits, participation in rounds, and ICU diaries.
Bounds, 2016 USA	To identify the consequences of the bundle's application, with respect to delirium prevalence in ICU patients, evaluating the effectiveness of bundle implementation.	Prospective cohort study	A. Pain assessment was performed every 4 hours and whenever needed, prioritizing pain control over sedation to improve comfort and reduce complications. B. Daily SATs and SBTs showed high adherence after bundle implementation, supporting regular assessment for ventilator weaning. C. The sedation protocol was revised to include analgesia and targeted RASS score titration. D. The bundle reduced delirium prevalence (from 69% to 31%) and shortened delirium duration (from 3.8 to 1.72 days), especially in ventilated patients. E. The bundle increased patient mobilization to a sitting position and promoted early rehabilitation participation. F. The importance of family involvement was recognized, although no practical or systematic approach was described.
Collinsworth, 2016 USA	To examine the effectiveness, the implementation, and the costs of multifaceted care approaches (including bundle application) for delirium prevention and mitigation in ICU patients	Systematic review	A. Combined analgesia and sedation protocols reduced excessive sedative use and minimized delirium risk in critically ill patients. B. High adherence to SATs and SBTs increased the likelihood of early ventilator weaning. C. Targeted sedation protocols significantly decreased the use of benzodiazepines (70% versus 22% of days) and narcotics (74% versus 33% of days). D. Non-pharmacological interventions reduced delirium incidence (from 36% to 22%) and increased delirium-free days (from 21% to 53%). E. Early mobilization improved functional recovery, discharge outcomes, and patient autonomy.
Boehm et al., 2017 USA	To characterize the health care professionals' attitudes toward the ABCDE bundle, and their adherence to the latter	Descriptive cross-sectional study	B. SATs and SBTs showed high adherence and helped assess extubation readiness while reducing mechanical ventilation duration; C. Lighter sedation facilitated early mobilization and reduced delirium incidence; D. Delirium assessment and management were performed daily, ensuring prevention and early detection; E. High adherence to early mobilization improved functional recovery in both ventilated and non-ventilated patients.
Ely, 2017 USA	To evaluate the impact of the ABCDEF bundle on ICU patients	NR	A. Pain assessment, prevention, and management were considered the foundation of ICU care and should be systematically monitored with validated scales such as BPS and CPOT; B. Coordinated SATs and SBTs facilitated ventilator weaning, minimized complications, and decreased mortality; C. Keeping patients awake and avoiding deep sedation, while preferring alternatives to benzodiazepines, reduced delirium and ventilation duration; D. Daily monitoring improved the detection of hypoactive delirium and guided patient-centered interventions. E. Early mobilization, even in ventilated patients, preserved muscle strength, reduced dependence, and promoted functional recovery. F. Active family participation provided emotional support, improved patient orientation, and contributed to recovery.
Costa et al., 2017 USA	To identify and categorize the different factors that hinder bundle implementation	Systematic review	B. The bundle reduced mechanical ventilation duration and supported faster recovery; D. The bundle implementation significantly reduced delirium incidence; E. Patients receiving bundle-based care showed better physical function after ICU discharge, contributing to a more effective recovery.
Boehm et al., 2017 USA	To identify the organizational aspects that influence the professionals' perceptions regarding bundle implementation, aiming to facilitate the latter	Observational cross-sectional study	B. Mechanical ventilation duration was reduced by almost 50%, promoting faster recovery and reducing complications related to prolonged ventilation; C. Sedation duration was reduced by about 50%, decreasing complications associated with excessive sedation, such as delirium; D. Delirium monitoring and control minimized cognitive complications and highlighted the importance of systematic assessment; E. Early mobilization promoted exercise, improved physical recovery, and reduced ICU-acquired weakness.
Marra et al., 2017 USA	To analyze the available evidence on the ABCDEF bundle, exploring its key features	NR	A. Appropriate pain assessment and management reduced patient suffering, promoted faster recovery, and improved pain diagnosis in non-communicative patients; B. SATs and SBTs decreased ventilation length (by more than 2 days), ICU hospitalization periods (by 3.5 days), and one-year mortality; C. Using sedatives with a lower risk of delirium, such as dexmedetomidine, reduced delirium and facilitated early extubation; D. Delirium monitoring and treatment were considered essential; E. Early mobilization reduced delirium duration, and physical therapy was considered safe and feasible; F. Active family involvement improved understanding, reduced anxiety, and promoted shared decision making, contributing to more humanized care.

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Authors/ Year/ Country	Objective(s)	Study Design	Findings by ABCDEF Bundle Component
Morandi et al., 2017 Unspecified Origin	To evaluate ABCDEF bundle knowledge and use, as regards the implementation of PAD (Pain, Agitation, and Delirium) guidelines	Descriptive cross-sectional study.	A. Pain was assessed in 83% of ICUs using validated scales, most commonly NRS and VAS, and treated mainly with fentanyl, morphine, and paracetamol. B. SATs and SBTs were performed in, approximately, two-thirds of ICUs, but only 42% applied a coordinated protocol; C. Sedation was assessed in 89% of ICUs, mainly using RASS and RSS, and most ICUs followed minimal or zero sedation strategies while avoiding benzodiazepines; D. Delirium was monitored in 70% of ICUs, but less than half used validated tools like CAM-ICU, and most ICUs did not have a formal protocol, although many investigated causes; E. Early mobilization was prescribed in most ICUs, but few assessed ICU-acquired weakness, used formal scales, or had dedicated teams; F. Family involvement was reported in many ICUs, but full and continuous participation was limited due to restricted visiting policies and lack of dedicated teams.
Ren et al., 2017 China	To investigate the effects of the ABCDE bundle on hemodynamic indicators and prognosis, in ICU patients subjected to mechanical ventilation	Prospective cohort study	A. In the post-bundle group, an integrated sedation and analgesia strategy reduced the use and total doses of sedatives and analgesics, including sufentanil and midazolam; B. Mechanical ventilation duration and ICU length of stay were reduced in the post-bundle group, supporting improved ventilator weaning; C. Sedation was guided by continuous assessment using RASS and SAS, leading to lower sedative doses; D. Delirium incidence was lower in the post-bundle group (17.8%), when compared with the pre-bundle group (41.4%); E. An early and structured patient mobilization promoted safe physical activity, improving functional prognosis.
Costa et al., 2018 USA	To describe the team's composition, when implementing the ABCDE bundle in an ICU context	Quasi-experimental study	B. The importance of a coordinated team was emphasized to optimize test implementation. D. Delirium reduction improved long-term outcomes, patient safety, and neurological recovery. E. The bundle reduced mechanical ventilation duration, promoting early mobilization and functional recovery. F. Family involvement was only discussed conceptually, without a practical or systematic approach.
Barnes-Daly et al., 2018 USA	To facilitate the dissemination and implementation of the ABCDEF bundle	NR	A. Systematic pain monitoring using an "analgesia first" approach improved symptom control, reduced deep sedation, and prevented complications. B. SATs and SBTs reduced sedation levels and promoted early extubation. C. Light benzodiazepine-free sedation reduced delirium and promoted faster recovery, especially when adapted to individual patient needs. D. Regular delirium assessment and preventive measures significantly reduced delirium incidence. E. Early mobilization improved functionality and shortened ICU stays, especially when mobility and exercise were integrated into daily care with individualized goals. F. Family involvement improved patient outcomes and satisfaction. Effective communication and adequate family support were considered essential to increase participation in care.
Sosnowski et al., 2018 Australia	To evaluate the feasibility of conducting a large-scale randomized clinical trial aimed at comparing ABCDE bundle implementation with standard ICU care	Descriptive observational study	A. Pain was assessed every 2 hours using NRS or CPOT, allowing tailored analgesia and improved comfort, with fentanyl and/or remifentanil used to maintain target scores; B. SATs and SBTs were performed on 80% of ventilation days, promoting an early assessment for a safe ventilator weaning; C. Sedation was monitored every 4 hours using RASS, maintained between -2 and 0, with propofol and dexmedetomidine recommended and full documentation on ventilation days. D. Delirium was assessed every 12 hours with CAM-ICU on most ventilation days, with a reported incidence of 39.6%. E. Most prescribed exercise sessions were completed (90.2%), including passive and active mobilization, improving muscle function and recovery. F. Family involvement was encouraged, to enhance patient motivation and support the recovery process. Furthermore, it was considered a key element of care provision.
Hsieh et al., 2019 USA	To determine the impact of the ABCDE bundle's full implementation (on mechanical ventilation length, ICU length of stay, and hospital length of stay), by comparing it with the results of a partial implementation	Prospective cohort study	E. Early Mobility and Exercise – Early mobilization enhanced rehabilitation assessment (from 19% to 90%), reduced the percentage of bed rest days (from 95% to 37%), and allowed 65% of patients to stay in an upright position (while 54% were able to walk), thus promoting a more effective functional recovery with fewer complications. **Additional contributions:** A 22% reduction in mechanical ventilation length; A decrease in pressure ulcer prevalence (from 30% to 23%); A 4% reduction in the use of physical restraints; A 10% decrease in ICU length of stay; A 7.8% decrease in hospital length of stay; A 24% reduction in total ICU cost; A 30% reduction in total hospitalization cost.
Stollings et al., 2019 USA	To describe the eight most frequent questions arising throughout ABCDEF bundle implementation; to define practical guidelines that can be used by other institutions	Mixed-method study	A. Pain should be systematically assessed in all critically ill patients using validated scales, such as the numerical scale and CPOT for non-communicative patients; B. SBTs should only be performed in clinically stable patients, with adequate oxygenation and no contraindications; C. Light sedation (RASS -2 to -1) and an "analgesia-first" approach were recommended, while avoiding benzodiazepines whenever possible. Prolonged deep sedation was associated with longer ventilation and higher mortality; D. Delirium monitoring with CAM-ICU or ICDSC was recommended, alongside the "Stop, THINK, and Lastly Medicate" strategy. Antipsychotics should only be used for severe hyperactive delirium not controlled with non-pharmacological measures; E. Early mobilization improved muscle strength, reduced delirium, and enhanced functional independence. Functional assessment tools were recommended to monitor progress; F. Active family involvement in care plans, rounds, and bundle activities was encouraged, with electronic records suggested to document participation.

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Authors/ Year/ Country	Objective(s)	Study Design	Findings by ABCDEF Bundle Component
Pun et al., 2019 USA	To explore the connection between ABCDEF bundle implementation and patient-centered outcomes, in ICU settings	Retrospective study	A. Pain was systematically assessed, by means of appropriate tools, such as the Numeric Rating Scale (NRS), the BPS, and the CPOT. The authors considered NRS scores >3, BPS scores >5, and CPOT scores ≥3; B. SATs and SBTs reduced (by 72%) the probability of needing mechanical ventilation on the following day; C. Prioritizing analgesia and light sedation decreased coma occurrence by 65%, and reduced delirium occurrence by 40%; D. Daily delirium monitoring reduced this complication's probability of occurrence by 40%, thus enhancing neurological and functional recovery; E. Early mobilization contributed to a 63% decrease in the use of physical restraints, promoting patient autonomy and minimizing complications; F. An active family involvement decreased ICU readmissions by 46%, and increased the likelihood of discharge by 36%, while strengthening patient-centered care.
Balas et al., 2019 USA	To discuss some of the most difficult challenges faced by teams, when implementing the ABCDEF bundle, and to provide practical advice from experts on how to overcome those barriers	NR	A. Opioid use in SOS situations was permitted, with validated pain assessment scales ensuring safe and effective administration; B. SATs and SBTs significantly reduced mechanical ventilation duration and related complications; C. Minimizing sedation assessments during the night promoted healthy sleep-wake cycles and reduced delirium occurrence; D. Delirium assessment with validated tools, such as CAM-ICU and ICDSC, was considered effective in critically ill patients; E. Early mobilization within 48 hours of ICU admission improved physical function, shortened ventilation periods, and increased discharge probability; F. Family involvement in care, including through videoconferencing during ICU rounds, increased participation and satisfaction with care.
Boltey et al., 2019 USA	To explore the behaviors of ICU team members, associating their behavioral pattern with the implementation of the ABCDE bundle	Prospective cohort study	*Contributions (addressing all the components in an integrated manner):* Improved hospital survival: In critically ill patients, the bundle's implementation was associated with an increase in hospital survival rates and a decrease in brain dysfunction occurrence; Reduced complications: The bundle's application effectively minimized complications related to mechanical ventilation, such as delirium and ICAMW/ICU-AW; Increased mobility: Early mobilization practices contributed to a faster patient recovery and shorter ICU hospitalization periods; Enhanced interprofessional coordination: The bundle's implementation improved coordination among team members, which is crucial for the provision of complex care and the minimization of iatrogenic problems; Importance of the professionals' perceptions: When the professionals reported difficulties in predicting the behavior of other team members, the chances of incorporating the bundle into the daily routine significantly decreased.
DeMellow et al., 2020 USA	To identify the different factors that influence ABCDE bundle adherence, in critically ill patients subjected to mechanical ventilation, within the first 96 hours; to characterize the associated clinical outcomes	Retrospective observational study	A. Systematic pain assessment showed high adherence (93%) and was more common in patients with shorter ventilation periods and lower sedation needs; B. SATs and SBTs showed adherence rates of 81% and 73%, promoting early ventilator weaning and respiratory recovery; C. Systematic sedation assessment, with 93% adherence, and shorter sedation periods were associated with better bundle adherence and improved clinical outcomes; D. Systematic delirium assessment showed low adherence (44%), highlighting the need for greater prioritization, especially in sedated patients and minority groups; E. Early mobilization showed 44% adherence, was more frequent in less sedated patients, and improved functionality and ventilator weaning.
Bardwell et al., 2020 USA	To evaluate the effects of bundle implementation, when combined with CPOT and RASS use, as regards the shortening of mechanical ventilation and sedation periods in critically ill patients	Prospective cohort study	A. Rigorous pain assessments, by means of the CPOT, allowed differentiating pain from agitation, and adjusting analgesia; B. SATs and SBTs promoted early and safe ventilator weaning, reducing ventilation duration by almost 50%, with low reintubation and readmission rates; C. Prioritizing analgesia and using light sedation reduced sedation duration by 47.6%. D. Delirium was monitored, although no specific data on incidence or duration were provided; E. Early mobilization was partially implemented, with some patients walking or sitting in chairs.
Stollings et al., 2020 USA	To describe evidence-based practices for effectively conducting interprofessional ICU rounds, in order to improve ABCDEF bundle performance	NR	*Contributions (addressing all the components in an integrated manner):* **Improved care coordination:** Interprofessional rounds improved care organization and ensured consistent bundle application; Improved communication between team members: Communication between the members of the interprofessional team was optimized, to facilitate the understanding of patient care goals. This allowed a more efficient care plan creation, as well as better-informed decisions; Error reduction and prevention: Improvements in coordination and communication reduced error occurrence, while minimizing the associated risk. This preventive effect increased patient safety; Improved team morale: High-quality interprofessional rounds promoted an environment of mutual respect and professional collaboration, raising the team's morale and minimizing burnout occurrence; Enhanced patient and family participation: Including patients and families in ICU rounds increased satisfaction and encouraged active involvement; Reduced healthcare costs: The participation of pharmacists in ICU rounds allowed medication adjustments that improved patient outcomes and minimized costs (from the institution's point of view).

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Authors/ Year/ Country	Objective(s)	Study Design	Findings by ABCDEF Bundle Component
Lee et al., 2020 South Korea	To identify the effects of the different ABCDE bundle components on post-intensive care syndrome	Retrospective observational study	A. Validated tools, such as numerical scale and CPOT, were used to ensure accurate pain assessment and adequate pain control; B. SATs and SBTs increased the proportion of alert patients (from 58% to 72%), while reducing coma occurrence (from 45% to 29%); C. The bundle promoted light sedation (RASS -1 to +1), reducing deep sedation and supporting functional recovery; D. Delirium incidence increased due to reduced coma detection, highlighting improved identification of hypoactive states through better monitoring; E. The frequency of early mobilization rose significantly (from 11% to 54%), increasing active periods and enhancing functional recovery; F. Family participation was considered important in follow-up care and in preventing and mitigating PICS.
Sosnowski et al., 2021 Australia	To evaluate (in terms of effectiveness) the impact of the ABCDEF bundle on delirium, functional outcomes, and quality of life, in critically ill patients	Systematic review	A. Pain was assessed every 4 hours using validated scales, with a "treat pain first, then sedate" approach and opioids such as fentanyl and remifentanil; B. Daily sedation interruption or reduction was used to assess ventilator interaction and readiness for weaning; C. Sedation was monitored every 4 hours using RASS, with propofol and dexmedetomidine used to maintain light sedation and support patient involvement. D. Delirium was assessed twice daily with CAM-ICU, alongside sleep-promoting measures (night hygiene, earplugs, and anti-light blindfolds) and adjusted nighttime care to reduce incidence and duration; E. Early mobilization was applied in four progressive stages, promoting strength and functionality, while minimizing immobility-related complications; F. Family involvement was promoted through daily meetings, individualized updates, and supervised participation in care, enhancing emotional support and integration.
Negro et al., 2022 Italy	To portray the perceived facilitators and obstacles, following the implementation of the ABCDE bundle in an Italian ICU	Observational cross-sectional study	B. Most nurses (71%) described SAT and SBT protocols as easy to understand and feasible, emphasizing their practical use in facilitating ventilator weaning; C. 80% of professionals considered the RASS and CAM-ICU useful, but 48% did not use these tools in daily practice; D. Although 80% of nurses found the CAM-ICU useful, 48% did not use it, highlighting the need for training and cultural change; E. 51% of nurses were unaware of or did not use formal safety-promoting tools, revealing important barriers to implementation; F. Family involvement was highlighted as an important source of empowerment, supporting participation in care and shared decision-making rather than being limited to visitation.
Frade-Mera et al., 2022 Spain	To investigate the association between patient outcomes and adherence to ABCDE bundle components	Prospective cohort study, conducted in various Spanish adult ICUs	A. Before bundle implementation, pain was not assessed on 84% of ventilation days. After bundle application, considerable improvements were reported, mainly due to regular pain assessment practices; B. After bundle implementation, there was a reduction in the number of days under mechanical ventilation, despite the inexistence of a coordinated protocol for SATs and SBTs; C. ICUs with protocols for components "A", "B" and "C" mostly used opioids, propofol, and dexmedetomidine, administering fewer benzodiazepines. This practice promoted a lighter and safer sedation; D. While delirium was identified in 4% of ICU days, applying the bundle improved intervention coordination, shortening mechanical ventilation periods; E. Despite the predominance of immobility (around 70%), ICUs that had early mobilization protocols showed a higher bed mobility, achieving better progresses, although limited.
Sosnowski et al., 2023 Australia	To synthesize the available evidence about the impact of the ABCDEF bundle on delirium, functionality, and quality of life, in adult ICU patients, determining the effectiveness of its implementation	Systematic review and meta-analysis.	A. Bundle implementation, both aspects were considered vital, improving patient comfort and preventing complications; B. SATs and SBTs were included in the bundle, promoting an early ventilator weaning, while improving neurological and functional outcomes; C. Light sedation and adopting the "analgesia-first" approach were key aspects. This strategy minimized delirium occurrence, enhanced patient mobility, and promoted an active patient participation; D. The bundle's full application reduced delirium incidence by 43%, decreasing average delirium length by 1.4 days. This improved the patients' neurological recovery; E. The bundle's implementation significantly enhanced functional mobility, increasing the number of patients able to walk and improving mobility scores; F. The bundle's application included an active family involvement, to provide emotional support, improve patient orientation, and potentially enhance quality of life after discharge.
Guest et al., 2024 USA	To promote ICU adherence to the ABCDEF bundle, optimizing clinical records and improving patient outcomes	Quasi-experimental study	A. Pain assessment and management were prioritized to improve early detection and patient comfort, integrated into daily rounds and audits; B. SATs increased from 47% to 89%, while adherence to SBTs increased from 81% to 92%. This facilitated ventilator weaning and shortened ventilation length; C. Individualized light sedation improved safety, reduced complications, and enhanced patient participation in recovery; D. CAM-ICU adherence increased to >95%; delirium incidence initially rose due to better detection, then decreased to <40% after targeted interventions; E. Early mobilization adherence increased to >96%, with patients showing improved mobility scores and functionality; F. Family involvement was only addressed conceptually, without a structured or practical implementation.

4. DISCUSSION

By analyzing the results obtained, we were able to divide the contributions of the ABCDEF bundle into seven categories, related to the bundle's six components and their benefits.

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Assess, Prevent, and Manage Pain

Component "A" focuses on pain assessment, prevention, and management, emphasizing early detection and effective control, while acknowledging pain as a fundamental vital sign that requires systematic monitoring in critically ill patients.For patients able to communicate, the Numerical Pain Scale (0–10) is recommended (Marra et al., 2017; Stollings et al., 2019). For sedated or non-communicative patients, validated behavioural scales, such as the Behavioural Pain Scale (BPS) and the Critical-Care Pain Observation Tool (CPOT), should be used, as they enable objective and continuous pain assessment (Marra et al., 2017; Stollings et al., 2019). The routine implementation of these validated assessment tools strengthens clinical decision-making by enabling early recognition of pain, facilitating prompt intervention, and supporting more individualized pain management strategies. Systematic pain assessment is essential for early identification of discomfort and timely intervention, reducing suffering, improving prognosis, and preventing complications associated with uncontrolled pain (Barnes-Daly et al., 2018). Furthermore, consistent pain monitoring has been associated with reductions in physiological stress responses, lower risk of agitation and delirium, and improved overall patient outcomes in the intensive care setting.

In turn, pain prevention and management require a multimodal and individualized approach, combining pharmacological and non-pharmacological measures (Sosnowski et al., 2021). This approach reflects current critical care recommendations, which advocate analgesia strategies tailored not only to pain intensity but also to the patient's clinical condition, underlying pathology, and evolving therapeutic needs. Effective pain management can only be achieved by judiciously using analgesics, together with appropriate complementary strategies (e.g., alternating decubitus positions, relaxation techniques, early mobilization, and environmental control). These adjunctive interventions may reduce analgesic requirements, minimize adverse drug effects, and contribute to a more humane and patient-centered care environment, thereby promoting patient comfort and well-being (Balas et al., 2019; Sosnowski et al., 2021). Moreover, the use of range orders allows adjusting the medication according to the patient's individual characteristics (e.g., age, renal function, respiratory status, and previous opioid tolerance), thus ensuring effective pain relief while simultaneously promoting medication safety and minimizing the risk of over- or under-treatment (Balas et al., 2019). Taken together, the evidence suggests that the integration of systematic assessment, individualized pharmacological management, and supportive non-pharmacological interventions makes Component A a cornerstone for optimizing comfort, safety, and recovery in critically ill patients.

Both SATs and SBTs

Component "B" concentrates on reducing excessive sedation and promoting early functional recovery while providing care to critically ill patients**.** Accordingly, it highlights the importance of interrupting sedation daily to allow reliable neurological testing and SBTs, which are crucial for safe ventilator weaning (Boehm et al., 2017; Bardwell et al., 2020). Beyond facilitating ventilator weaning, this coordinated approach contributes to minimizing the cumulative burden of sedation, which has important implications for reducing delirium, ICU-acquired weakness, and prolonged hospitalization. These findings reinforce that sedation management should be understood not merely as symptom control, but as a therapeutic strategy directly influencing recovery trajectories in critically ill patients (Boehm et al., 2017; Bardwell et al., 2020).

When professionals systematically employ suitable assessment instruments, such as the Richmond Agitation-Sedation Scale (RASS) and the CPOT, they can continuously adjust medication to the patient's real needs, thus ensuring personalized and safe drug management (Boehm et al., 2017; Bardwell et al., 2020). However, the effectiveness of this strategy depends not only on the availability of validated tools but also on their consistent integration into daily clinical practice, which remains variable across intensive care settings. This variability suggests that organizational culture, team training, and protocol adherence are critical determinants of successful implementation (Morandi et al., 2017).

The use of established protocols (e.g., "Wake Up and Breathe", which is part of the "ICU Liberation Bundle") has been steadily increasing, although their application still varies among different contexts (Morandi et al., 2017). Furthermore, when performing SATs and SBTs, the implementation of safety screens seems to be an adequate approach to guarantee the tests' safety and effectiveness (Balas et al., 2012). In this context, safety screening may also support greater team confidence in protocolized sedation interruption, helping to balance the benefits of awakening and spontaneous breathing with the risks of clinical instability (Balas et al., 2012).

It is important to note that nurses should always participate in safety screen implementation and in the clinical decision to proceed, or not, with the SAT/SBT (Vasilevskis et al., 2010; Balas et al., 2013). Their continuous bedside presence gives them a unique perspective on patient responsiveness, tolerance to sedation reduction, and readiness for weaning, positioning nursing clinical judgement as a key factor in the safe and effective operationalization of Component B.

Choice of Analgesia and Sedation

Component "C" promotes an individualized analgesic and sedative therapy, based on frequent appraisals. Among its main contributions**,** regular pain assessment (every 2 hours), using validated scales (e.g., Numerical Pain Scale, BPS, CPOT), allows more effective pain control (Society of Critical Care Medicine, n.d.). In addition, alertness should be monitored every 4 hours using the

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RASS**,** seeking to maintain levels between -2 (light sedation) and 0 (alert and calm) (Society of Critical Care Medicine, n.d.). These practices reinforce the principle that analgesia and sedation should be dynamically adjusted according to the patient's evolving clinical status, rather than guided by standardized or overly conservative sedation targets. These interventions are associated with positive clinical effects, namely a reduction of almost 50% in total sedation time, lower delirium incidence, decreased benzodiazepine and opioid use, and improved hemodynamic parameters during the first days of hospitalization (Bardwell et al., 2020). Collectively, these findings suggest that individualized sedation strategies may contribute not only to symptom control but also to improved short-term recovery outcomes.

In the analyzed studies, dexmedetomidine and propofol were the preferred sedation agents (Morandi et al., 2011; Sosnowski et al., 2021). Furthermore, delirium assessment, recommended twice daily, was usually performed using the Confusion Assessment Method for the ICU (CAM-ICU). Most ICU professionals (89%) carried out systematic evaluations of pain, sedation, and delirium. Nevertheless, only 42% employed a validated tool to execute those appraisals (Morandi et al., 2017), highlighting a significant gap between evidence-based recommendations and their effective implementation in clinical practice. This discrepancy suggests that routine assessment alone is insufficient when not supported by validated instruments, staff training, and structured protocols that ensure consistency in clinical decision-making (Morandi et al., 2017).

Opioids (such as fentanyl and morphine), often administered through continuous infusion, form the basis of analgesic therapy due to their easy titration (Morandi et al., 2011). Although effective, reliance on opioid-based strategies further emphasizes the need for individualized management, balancing adequate symptom relief with the potential risks associated with prolonged exposure, including oversedation, respiratory depression, and delayed recovery. One of the included studies showed that personalized sedation allowed earlier extubation (on average, four days earlier), while conventional sedation was associated with longer ICU and hospital stays (Morandi et al., 2011). This finding strengthens the view that tailored sedation is not merely a pharmacological adjustment, but a clinically meaningful strategy capable of influencing recovery trajectories and resource utilization in critical care.

Delirium: Assess, Prevent, and Manage

Component "D" stresses the positive impact of systematically applying validated instruments to assess delirium, such as the CAM-ICU and the Intensive Care Delirium Screening Checklist (ICDSC). These tools, recommended within the ABCDEF bundle's context, enable a structured approach focused on continuous clinical observation by nursing staff, allowing early identification and more effective management of delirium in ICU patients (Marra et al., 2017). Beyond improving recognition, the systematic use of validated assessment tools contributes to integrating delirium monitoring into routine clinical practice, reinforcing the understanding of delirium as a preventable and manageable complication rather than an inevitable consequence of critical illness.

One of the analyzed studies demonstrated that the ABCDEF bundle's full implementation was associated with a reduction in delirium incidence of approximately 40% (Sosnowski et al., 2023). This substantial reduction highlights that delirium prevention is most effective when approached through coordinated, multidimensional interventions, rather than isolated measures. In this context, Component "D" should be interpreted not only as a screening strategy, but as part of a broader preventive framework that integrates pain control, sedation optimization, early mobilization, and family engagement, all of which influence delirium risk.

Moreover, the CAM-ICU application twice a day, as proposed in the bundle, was correlated with enhanced recognition of delirium, promoting timely and targeted interventions (Davidson, 2013; Sosnowski et al., 2023). These findings suggest that consistent delirium monitoring may improve not only early detection, but also clinical responsiveness, supporting more individualized care and potentially improving short- and long-term cognitive outcomes in critically ill patients.

Early Mobility and Exercise

Component "E" is associated with several positive outcomes, including reduced IMV duration, lower delirium incidence and duration, improved physical function, and shorter hospital stays, thus playing a key role in ICU patient recovery (Morandi et al., 2011; Balas et al., 2014; Balas et al., 2016; Boehm et al., 2017b; Sosnowski et al., 2018). These findings reinforce early mobility as a central therapeutic intervention in critical care, shifting rehabilitation from a late recovery strategy to an integral component of acute ICU management.

Regarding ICU-acquired muscle weakness prevention and mitigation, structured mobilization protocols tailored to the patient's clinical status and implemented by multidisciplinary teams are considered essential, as they support faster and more effective functional recovery (Balas et al., 2012; Barnes-Daly et al., 2018; Costa et al., 2018; Dang, 2013; Ely, 2017; Hsieh et al., 2019; Sosnowski et al., 2018; Vasilevskis et al., 2010). This highlights that the benefits of mobilization depend not only on its early initiation but also on individualized planning, interdisciplinary collaboration, and systematic integration into daily care routines.

Evidence from one included study demonstrated a substantial increase in mobilization rates following bundle implementation: prior to implementation, approximately 95% of patients remained bedridden, whereas afterwards 65% were repositioned and 54% achieved ambulation, highlighting the effectiveness of early mobilization strategies (Hsieh et al., 2019). Such changes suggest that immobility in the ICU is often more related to organizational and cultural barriers than to unavoidable clinical limitations, emphasizing the importance of protocolized approaches in changing practice.

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Current evidence supports early mobilization, ideally within the first 48 hours of ICU admission, as it is associated with improved physical function and reduced IMV duration (Balas et al., 2019). To ensure the safety and effectiveness of mobilization, daily safety screens are necessary to identify temporary contraindications, such as hemodynamic instability, hypoxemia, and deep sedation (Sosnowski et al., 2018). In this context, safety screening is crucial not as a barrier to mobilization, but as a mechanism to facilitate safe, timely, and clinically appropriate progression of activity, balancing rehabilitation goals with patient stability.

Family Engagement and Empowerment

Component "F" was mentioned in 17 studies (Balas et al., 2016; Barnes-Daly et al., 2018; Bounds et al., 2016; Ely, 2017; Frade-Mera et al., 2022; Guest et al., 2024; Hsieh et al., 2019; Lee et al., 2020; Marra et al., 2017; Morandi et al., 2017; Negro et al., 2022; Pun et al., 2019; Ren et al., 2017; Sosnowski et al., 2018; Stollings et al., 2019a; Stollings et al., 2020). The available evidence highlights the multiple advantages of active family participation in the care of critically ill patients. More broadly, these findings reinforce family engagement as a core therapeutic dimension of critical care, moving beyond a supportive role to an active contribution in patient-centered decision-making and recovery processes. Family involvement promotes the humanization of care and enhances communication between healthcare professionals and families, ultimately improving patients' clinical and emotional outcomes.

This perspective appears in a variety of studies, which report several benefits of family involvement, such as enhanced communication between the multidisciplinary team and the patient's family, reduced anxiety levels, greater satisfaction with the provided care, and, in some cases, improved clinical outcomes, namely lower delirium incidence (Collinsworth et al., 2016; Guest et al., 2024; Marra et al., 2017; Sosnowski et al., 2018; Stollings et al., 2020). These findings suggest that family engagement may influence outcomes not only through emotional support but also by contributing to orientation, reassurance, and continuity in the patient's relational environment, factors that may be particularly relevant in delirium prevention and psychological recovery. When included in daily multidisciplinary rounds, either in person or via video call, active family participation has proven to be an effective and recommended strategy (Balas et al., 2019; Guest et al., 2024). Such practices facilitate alignment between therapeutic goals and patient and family preferences, thereby preventing conflicts, strengthening trust, and promoting adherence to the care plan (Sosnowski et al., 2023). Importantly, integrating families into routine ICU care also reflects a cultural shift toward more transparent, collaborative, and person-centered models of care, in which families are recognized as meaningful partners in the therapeutic process rather than passive observers.

Benefits of Implementing the ABCDEF Bundle

The application of the ABCDEF bundle seems to have a positive impact on clinical outcomes and long-term quality of life, while reducing iatrogenic risks across all included studies. Taken together, these findings suggest that the ABCDEF bundle should be understood not merely as a set of isolated evidence-based interventions but as an integrated care model capable of transforming the quality and safety of critical care delivery.

One of the analyzed studies reported that bundle implementation contributed to reduced hospital costs, including a 27.3% decrease in laboratory costs, a 24.2% decrease in ICU costs, and up to a 30.2% reduction in total hospital costs (Hsieh et al., 2019). These results indicate that improving patient-centered care does not necessarily increase healthcare expenditure; rather, by preventing complications, shortening ICU stays, and optimizing resource utilization, bundle implementation may simultaneously enhance efficiency and clinical outcomes. From an organizational perspective, it also promoted multidisciplinary collaboration, optimized human resource management, and improved staff satisfaction (Barnes-Daly et al., 2018; Boltey et al., 2019; Stollings et al., 2019a). This organizational impact highlights that the benefits of the bundle extend beyond patient-level outcomes, influencing team dynamics, workflow efficiency, and the overall culture of care in intensive care settings.

Further reported benefits include a 22% reduction in nurse burnout and a 30% decrease in readmission rates, particularly associated with early mobilization (Guest et al., 2024). Additionally, interprofessional collaboration appears to be crucial in reducing mortality and hospital-acquired infections, while improving quality of care (Guest et al., 2024; Marra et al., 2017). These findings reinforce the idea that the ABCDEF bundle derives much of its effectiveness from its interdisciplinary nature, as coordinated teamwork appears to be a key mechanism through which clinical, organizational, and economic gains are achieved.

These findings have important implications for clinical practice, particularly in supporting the structured implementation of the ABCDEF bundle, strengthening interdisciplinary collaboration, and reinforcing the role of nurses in coordinating care. Additionally, promoting family engagement emerges as a key strategy for enhancing patient-centred care. From a research perspective, further studies are needed to explore implementation processes, contextual adaptation, and long-term sustainability of the bundle across different ICU settings.

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CONCLUSION

The present scoping review demonstrated that the ABCDEF bundle improves the quality of care provided to ICU patients, namely by reducing IMV duration, decreasing delirium and excessive sedation, promoting early mobilization, lowering readmission rates, and increasing overall satisfaction.

The included studies reported numerous contributions across the six bundle components: A) it is highlighted the importance of a strict analgesic control, which promotes comfort and facilitates the patient's participation in the recovery process; B) reducing sedation and IMV length, to allow a faster respiratory and neurological recovery, while ensuring patient safety; C) it is emphasized the importance of employing analgesia and sedation in a cautious and individualized manner, to achieve an adequate balance between comfort and safety; D) it is shown that systematic assessment and preventive interventions are crucial to minimize neurological/cognitive complications; E) it is demonstrated that early mobilization preserve muscle function, reduces immobility-related complications and enhances functional capacity; F) it is stressed that, to promote an effective communication and the humanization of the provided care, the patient's family should be actively involved in the recovery process.

Nonetheless, with respect to the bundle's implementation, there are still some hindrances, related to structural conditions, organizational resistance, and a lack of specific training, especially in contexts where care is less standardized.

Addressing these barriers requires not only institutional commitment but also the development of structured implementation strategies tailored to local organizational realities, available resources, and team dynamics. In clinical practice, priority should be given to strengthening interdisciplinary collaboration, implementing standardized institutional protocols, investing in continuous professional education, and recognizing nurses as key leaders in the operationalization and sustainability of bundle-based care. Additionally, strategies that facilitate family participation should be systematically incorporated into ICU routines, reinforcing person- and family-centered care models.

Future research should move beyond evaluating bundle effectiveness alone and focus on implementation processes, contextual adaptation, and long-term sustainability in diverse ICU settings. In particular, qualitative and mixed-methods studies exploring healthcare professionals' perceptions of barriers, facilitators, and organizational readiness for change may provide valuable insights to support successful implementation. Further investigation into the impact of individual bundle components, as well as the mechanisms underlying their synergistic effects, may also contribute to refining implementation strategies and consolidating evidence-based critical care practices.

AUTHORS' CONTRIBUTION

Conceptualization, A.M., A.C., J.M. and M.B.; data curation, A.M., A.C., J.M., M.B. and R.M.; formal analysis, A.M., A.C., J.M., M.B., R.M. and L.S.; investigation, A.M., A.C., J.M. and M.B.; methodology, A.M., A.C., J.M. and M.B.; supervision, R.M. and L.S.; writing – original draft, A.M., A.C., J.M. and M.B.; writing – review & editing, A.M., A.C., J.M., M.B., R.M. and L.S.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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