



Assessment of Delirium in the Intensive Care Unit Using the CAM-ICU Tool: The Role of Nurses in Recognition and Care Provision

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Abstract

Introduction: Delirium is a common neuropsychiatric syndrome in intensive care units, with a prevalence ranging from 20% to 80%. It is associated with prolonged hospital stay, increased mortality, and long-term cognitive impairment. Due to its fluctuating clinical presentation, early recognition remains challenging, which makes the use of validated assessment tools essential. The Confusion Assessment Method for the Intensive Care Unit, CAM-ICU, is one of the most widely used instruments. Nurses, due to their continuous presence at the bedside, play a key role in screening and initiating timely interventions.

Methods: A systematic literature review was conducted using PubMed, Web of Science, and Scopus in September 2025, covering studies published between 2015 and 2025. In accordance with PRISMA guidelines, randomized controlled trials, clinical and observational studies, educational interventions, quality improvement projects,

and review articles were included. Due to heterogeneity in study designs, results were synthesized narratively.

Results: Ten studies met the inclusion criteria. The CAM-ICU tool demonstrated high diagnostic accuracy, with sensitivity ranging from 74% to 90% and specificity from 92% to 98%, along with good feasibility in routine nursing practice. Educational interventions improved nurses' knowledge, confidence, and documentation rates, while quality improvement projects reported increased screening frequency and reduced benzodiazepine use. The most commonly reported barriers included lack of formal education, challenges in differential diagnosis, limited assessment in sedated and mechanically ventilated patients, and lower assessment frequency during night shifts.

Conclusion: CAM-ICU is a reliable and practical instrument for the early detection of delirium in intensive care units. Regular use supported by structured education and institutional protocols improves assessment consistency and contributes to safer clinical practice. Further development of national guidelines and systematic implementation within the Croatian healthcare system may improve patient safety and clinical outcomes.

Keywords: delirium, intensive care unit, CAM-ICU, nurses

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Introduction

Delirium is an acute neuropsychiatric syndrome characterized by disturbances of consciousness, attention, and cognition. In intensive care units, it occurs in 20% to 80% of patients, depending on the population and the applied measurement criteria (1,2). It is particularly common in older patients, in mechanically ventilated patients, and after major surgical procedures. It is associated with longer intensive care unit stays, increased mortality, and more persistent cognitive consequences (3).

Despite its serious outcomes, delirium is often not recognised promptly due to its fluctuating clinical presentation and overlap with related conditions. For this reason, systematic screening using validated instruments is recommended in clinical practice. Among these tools, the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) is recognised in international recommendations as one of the most widely used and well-validated instruments for delirium assessment in intensive care practice (3).

At the same time, contemporary nursing approaches emphasise that the prevention and early detection of delirium should be operationalised within nursing care and based on clear theoretical models. Within such frameworks, for example, the Roy adaptation model, CAM-ICU also functions as an empirical indicator for early recognition and for guiding targeted interventions, particularly in older patients (4).

At the implementation level, brief two-phase protocols have been introduced, such as ultrashort screening followed by CAM-ICU assessment in positive cases. Studies show that staff attitudes and organisational context are decisive for successful implementation. This is especially important because, in clinical practice, screening is often performed by nurses (5). Due to their continuous presence at the bedside and ongoing patient monitoring, nurses therefore have a crucial role in the early recognition of delirium using the CAM-ICU tool, as well as in the implementation of non-pharmacological interventions and in coordinating multidisciplinary care (3–5).

This paper aims to present the importance of using the CAM-ICU tool in detecting delirium in intensive care patients and to emphasize the role of nurses in recognising and managing delirium. Although several

review articles have addressed the epidemiology, risk factors, and general management of delirium in intensive care units, fewer studies have specifically analysed the role of nurses in structured delirium screening and the practical implementation of the CAM-ICU tool in everyday clinical practice. This review focuses on the integration of CAM-ICU assessment into nursing practice, the impact of educational interventions, and organisational factors influencing routine screening. Particular attention is given to implications for patient safety and applicability in the Croatian healthcare context.

Methods

A systematic literature search was conducted in September 2025 using PubMed, Web of Science, and Scopus databases. Scientific articles published between 2015 and 2025 were included. In accordance with PRISMA guidelines, the following study designs were eligible for inclusion: randomised controlled trials, controlled clinical trials, multicentre studies, prospective and retrospective observational studies, quasi-experimental educational interventions, quality improvement projects, and systematic and narrative reviews and meta-analyses.

The inclusion criteria comprised studies that assessed delirium in intensive care units using the CAM-ICU tool, with a specific focus on the role of nurses in the recognition, documentation, and interpretation of findings. The search was performed using the predefined key terms "delirium", "intensive care unit", "CAM-ICU", and "nursing role". These terms were required to appear in the title, abstract, or keywords. Studies were excluded if they were conducted outside intensive care settings, did not use CAM-ICU as a primary assessment tool, or did not address the role of nurses.

Studies published between 2015 and 2025 were included, because this period reflects recent advances in CAM-ICU validation, standardisation of nursing practice, and the development of educational interventions. Studies published before 2015 were excluded as they do not reflect current clinical standards. The search objectives and the inclusion and exclusion criteria were defined in advance and are presented in Table 1. The search was

further limited to articles published in English or Croatian with an available abstract or full text.

After removal of duplicates (n = 7), 55 records were screened. Of these, 45 studies were excluded because they did not meet the eligibility criteria, most commonly due to the absence of CAM-ICU as the primary tool or lack of focus on the nursing role. Ultimately, 10 studies met all inclusion criteria and formed the basis of the present analysis (Figure 1).

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Studies published between January 2015 and September 2025	Studies published before January 2015
Original research and review articles available in English or Croatian, with an abstract or full text available (open access or via database access)	Articles in languages other than English and Croatian; conference abstracts, editorials, letters to the editor, books, and book chapters
Study designs: randomised controlled trials, controlled clinical trials, quasi-experimental studies and educational interventions, quality improvement projects, multicentre studies, prospective and retrospective observational studies, systematic and narrative reviews, meta-analyses	Case reports, study protocols, non-peer-reviewed materials, animal studies, studies without available abstract or full text
Studies conducted in intensive care units using CAM-ICU as the primary tool for delirium assessment	Studies conducted outside intensive care units, studies in which CAM-ICU is not the primary or key delirium assessment tool
Studies including nurses through their role in CAM-ICU application, documentation, interpretation, or education	Studies that do not address the role of nurses in CAM-ICU application or interpretation
Studies reporting outcomes related to delirium prevalence, CAM-ICU validation, diagnostic accuracy and reliability, nurses' perception and knowledge, and barriers and facilitators of implementation	—

Results

The included studies evaluated the use of CAM-ICU in detecting delirium in critically ill patients. Particular focus was placed on the role of nurses in its application, interpretation, and educational implementation. The PRISMA flow diagram (Figure 1) presents the study selection process, while Table 2 provides a detailed overview of the included studies, including authors, year of publication, objectives, study design, country of origin, and key findings.

Most of the studies were conducted in the United States of America (n = 4), while the remaining studies originated from Denmark (n = 1), France (n = 1), Saudi Arabia (n = 1), Brazil (n = 2), and Jordan (n = 1). According to study design, the following types of research were included: four educational intervention studies (a video series, an educational manual and playbook, a quasi-experimental programme and a training programme with monitoring of tool adoption), two CAM-ICU validation studies (validation of an Arabic version and a multicentre prospective study of diagnostic accuracy in assessments performed by nurses and technicians), one quality improvement project, one retrospective analysis, one cross-sectional survey, and one qualitative study. Overall, the included studies consistently demonstrated that CAM-ICU is a reliable and feasible tool in routine intensive care practice, and that structured education and organisational support are key factors influencing the quality and frequency of delirium assessment.

The studies analysed in Table 2 identified key benefits and challenges related to the implementation of the CAM-ICU tool in intensive care units. Educational interventions (6–8) a prevalent neurocognitive disorder, frequently affects critically ill patients hospitalized in intensive care units (ICUs demonstrated that structured training programmes, including video materials, the CAM-ICU Playbook, and quasi-experimental programmes, significantly increase nurses' knowledge, self-confidence, and competencies in the application of the CAM-ICU tool.

Validation studies (9,10) the validity and reliability of the Arabic version of the CAM-ICU has not been investigated. Here, we test the validity and reliability of the Arabic CAM-ICU. Methods: We conducted a psychometric study at ICUs in a tertiary-care hospital in Saudi Arabia. We recruited consecutive adult Arabic-speaking patients,

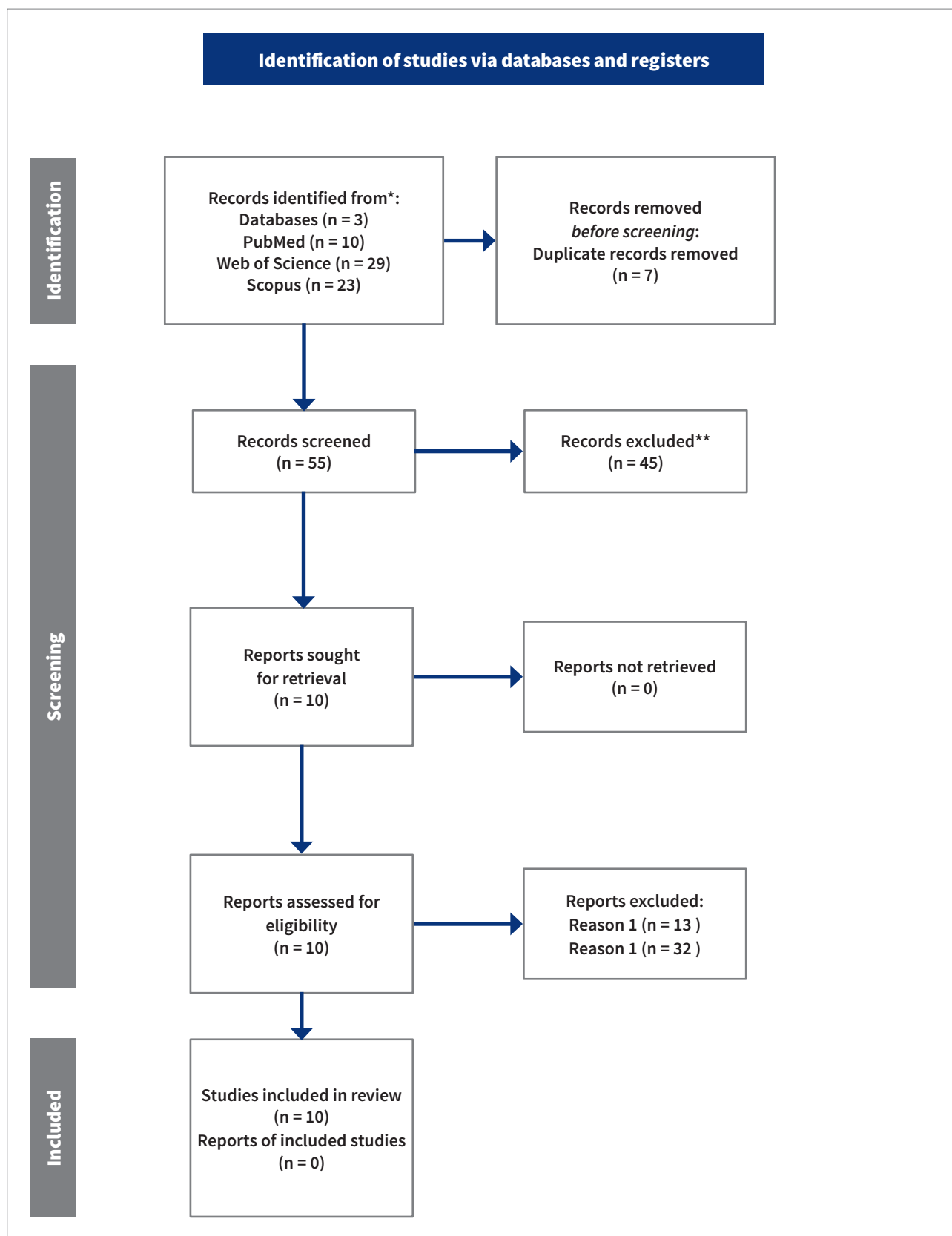


Figure 1. PRISMA flow diagram

who had stayed in the ICU for at least 24 hours, and had a Richmond Agitation-Sedation Scale (RASS) confirmed the high sensitivity (74% to 90%) and specificity (92% to 98%) of the CAM-ICU tool, comparable to physician assessments, supporting its reliability in routine nursing practice. Quality improvement projects and retrospective analyses (11,12) standard-of-care detection and prevention practices in real-world intensive care unit (ICU) further highlighted that education and institutional support significantly increased CAM-ICU screening documentation rates and reduced the use of high-risk sedatives. However, challenges were identified, including lower assessment rates during night shifts and limited assessment in sedated and mechanically ventilated patients.

Qualitative and survey studies (13,14) highlighted barriers to implementation, including the lack of formal education, difficulties in differentiating delirium from related conditions, and the need for improved organisational structure and institutional support. Furthermore, the description of an educational programme with monitoring of tool adoption (15) demonstrated that continuous education can lead to standardised and regular use of the CAM-ICU tool in everyday clinical practice.

In conclusion, the findings confirm that the CAM-ICU represents a reliable and practical tool for the early detection of delirium. Nurses, through their continuous presence at the bedside and ongoing educational support, play a key role in its successful implementation.

Discussion

The understanding of delirium in intensive care units can be considered within existing nursing theoretical models. According to Roy's adaptation model, the patient is viewed as a system that strives to achieve balance between the self and the environment, and delirium in this context may be interpreted as a state of impaired adaptation to the stressors of the intensive care environment. Hamzehpour et al. (2018) demonstrated that the implementation of a nursing care plan based on the Roy adaptation model significantly reduced the incidence and severity of delirium in critically ill patients (16).

Roy emphasises that promoting adaptation in the areas of physiological function, self-concept, role function, and interdependence contributes to improved overall patient condition and a reduction in disease-related complications (17). The theoretical implication is that structured nursing interventions, including routine delirium screening using the CAM-ICU tool, support patient adaptation in intensive care settings.

Synthesis of findings and implications

The analysis of ten studies shows that delirium in intensive care units is frequent and associated with adverse patient outcomes. Clinical guidelines emphasise that delirium should be actively detected using validated instruments such as CAM-ICU (20), since early identification may shorten the length of hospital stay and improve patients' cognitive recovery.

Regular delirium monitoring is an integral part of standard nursing care, and in clinical practice, the CAM-ICU tool is most often applied by nurses during routine assessments. The analysed studies demonstrate that education significantly improves nurses' competencies in CAM-ICU application (6–8, 11, 15, 18, 30).

In contrast, insufficient knowledge and a lack of formal training result in many nurses being unable to recognise delirium risk factors and communicate effectively with delirious patients (14). These findings indicate the need for systematic education and implementation of care protocols (18), which is consistent with earlier studies validating CAM-ICU and confirming its value in the early detection of delirium and timely intervention (19). By applying the CAM-ICU tool, nursing care can facilitate early intervention. Within Roy's adaptation model, delirium is understood as impaired adaptation to intensive care stressors; therefore, nursing care aims to promote adaptation and stabilisation of the patient to prevent complications and improve outcomes (4).

International guidelines and multicentre studies

International guidelines (PADIS/SCCM 2018) recommend routine delirium monitoring using a validated instrument such as CAM-ICU (20). A key recommendation is the implementation of multicomponent non-pharmacological interventions aimed at reducing risk factors. These include patient reorientation, noise reduction, promotion of nighttime sleep, early mobilisation, and the use of hearing and visual aids. The results

Table 2. Summary of included studies on the use of the CAM-ICU tool in the intensive care unit and the role of nurses

Authors (year)	Study design	Aim	Country	Key findings
Qaddumi et al. (2025) (6)	Quasi-experimental study	To assess the effect of an educational programme on nurses' knowledge of delirium and CAM-ICU application	Jordan	Education significantly increased nurses' knowledge and competencies in delirium recognition using CAM-ICU.
Nielsen et al. (2023) (13)	Cross-sectional survey (DELIS 3)	To examine nurses' perceptions of CAM-ICU, CAM-ICU 7, and ICDSC tools	Denmark	CAM-ICU was rated as the fastest and easiest tool, but less informative; CAM-ICU 7 and ICDSC provided more detailed delirium assessment.
Makhija et al. (2025) (11)	Quality improvement project	To increase delirium awareness and screening in ICU using CAM-ICU	USA	Following the education and introduction of CAM-ICU pocket cards, documentation increased from <1 percent to >70 percent, and benzodiazepine use decreased.
Makhija et al. (2023) (7)	Educational intervention (Playbook)	To develop an educational manual for healthcare professionals on delirium and CAM-ICU	USA	The Playbook improved staff knowledge and skills and was presented as a sustainable delirium education tool.
Kamdar et al. (2022) (8)	Educational intervention (video series)	To evaluate the effectiveness of video-based education on delirium and CAM-ICU among nurses	USA	After education, nurses' knowledge and confidence in CAM-ICU application significantly increased, and it was accepted as a sustainable educational method.
dos Santos et al. (2022) (14)	Qualitative study	To explore difficulties faced by nurses in CAM-ICU use in the ICU	Brazil	Identified barriers included lack of knowledge and training, difficulties in differential diagnosis, and limited patient cooperation.
da Silva Souza et al. (2017) (15)	Experiential report / educational intervention	To describe the process of educating nurses for systematic CAM-ICU use	Brazil	Education resulted in high CAM-ICU adoption among nurses and integration into daily practice.
Awan et al. (2021) (12)	Retrospective EHR analysis	To identify factors influencing CAM-ICU documentation and frequent "unable to assess" entries	USA	Documentation was lower during night shifts, and assessment quality was poorer in older and intubated patients and in those receiving sedatives.
Aljuaid et al. (2018) (9)	Psychometric validation study	To validate the Arabic version of CAM-ICU and assess inter-rater reliability between nurses and physicians	Saudi Arabia	CAM-ICU showed high specificity 98% for nurses and 92% for physicians and satisfactory interrater reliability confirming clinical applicability.
Alaterre et al. (2023) (10)	Multicentre prospective study	To evaluate diagnostic accuracy of CAM-ICU when applied by nurses and technicians	France	Nurses and technicians demonstrated high sensitivity 88% to 90% and specificity 92% to 98% with performance comparable to physicians.

of large studies confirm the effectiveness of such measures. Meta-analyses and bundle studies, such as those on the ABCDEF bundle, show that more consistent implementation of these protocols significantly reduces the incidence of delirium and, according to multicentre research, is associated with lower hospital mortality and a greater number of coma and delirium-free days (22–24).

On the other hand, the large randomised controlled trial MIND USA did not demonstrate that haloperidol or ziprasidone reduces the duration of delirium, which is consistent with the PADIS and SCCM guidelines that do not recommend the routine use of antipsychotics for the prevention or treatment of delirium. The only exception is the short-term management of severe, safety-threatening agitation (25,26). These recommendations are further supported by a recent systematic review and meta-analysis by Zhang et al., which confirmed the high sensitivity and specificity of the CAM-ICU tool across diverse intensive care populations (27). All of the above indicates that the focus should be placed on active delirium monitoring and prevention through nursing interventions rather than on a passive medication-based approach.

The role and challenges of nurses

Nurses in intensive care units play a crucial role in performing CAM-ICU assessments and in the early detection of delirium (6,10) a prevalent neurocognitive disorder, frequently affects critically ill patients hospitalized in intensive care units (ICUs). They continuously monitor patients' conditions and, based on their assessments, can initiate care adjustment protocols. However, studies highlight significant challenges, as formal education on delirium and training in using the CAM-ICU tool are often lacking (13,14,28). Education is considered essential, with insufficient knowledge among healthcare professionals and a lack of appropriate training identified as major barriers to CAM-ICU implementation (13,14,18,28).

An additional challenge is patient cooperation, as mechanically ventilated or deeply sedated patients complicate assessment and require particular attention from nurses (12,14,28) but such detection is frequently hampered by poor documentation and inappropriate "unable to assess" responses (in non-comatose patients, especially in critically ill postoperative patients who exhibit a high incidence of delirium (29). Nevertheless, studies show that structured educational programmes can overcome these barriers. Fol-

lowing education, nurses demonstrated significantly improved self-confidence and assessment accuracy (6–8,15,18,30). Therefore, the role of nurses is indispensable, since their effectiveness in identifying delirium and implementing non-pharmacological measures directly contributes to better patient outcomes.

These findings indicate that regular CAM-ICU screening should be integrated into daily nursing workflows, supported by clear institutional protocols, defined responsibilities, and continuous education, in order to ensure consistent delirium monitoring in intensive care units.

Delirium prevention and the contribution of nursing care

Nurses implement daily patient reorientation measures, such as asking about time and place and using visual cues. In addition, they promote early mobilisation and ensure conditions for adequate sleep by reducing noise and light levels (8,14,15,21,31,32). They also actively involve family members in care and check the use of hearing aids and glasses, thereby eliminating sensory risk factors. This is also supported by earlier but still significant research, such as the Hospital Elder Life Program (HELP) developed by Inouye et al. (1999), which demonstrated that multicomponent non-pharmacological interventions, including orientation, mobilisation, sleep optimisation, and correction of sensory deficits, significantly reduce the incidence of delirium in hospitalised patients (32).

Further research has shown that comprehensive care bundles reduce the incidence of delirium, shorten delirium episodes and intensive care stay, and improve treatment outcomes. Similar results have been reported in more recent systematic analyses of ABCDE and ABCDEF bundle implementation, demonstrating that this model reduces delirium incidence, duration of mechanical ventilation, length of stay in intensive care and hospital stay, as well as mortality (33).

The implementation of the extended ABCDEF bundle, together with regular delirium monitoring, is associated with an increased number of coma-free and delirium-free days and a statistically significant reduction in patient mortality (22). At the theoretical level, a care model based on Roy's adaptation approach implies that nursing interventions should be directed towards supporting patients' adaptation to the physiological and cognitive stressors of intensive care, which in practice means the consistent implementation of these measures aimed at improving patient adaptation.

Context of the Croatian healthcare system

In the Croatian healthcare setting, the issue of active delirium assessment is only recently gaining attention within professional practice. Goranović et al. (2012) pointed out that the subjective clinical assessment of patients by nurses in intensive care units is often insufficient for the early recognition of delirium, which led to the development of objective scales such as CAM-ICU (34). Current challenges include limited ICU resources, a relatively high patient-to-nurse ratio, and a lack of local research in this field. This hinders the proper evaluation of implementation success and adaptation of international recommendations to the Croatian context.

Nevertheless, there are examples of national studies that confirm the feasibility of introducing standardised assessment instruments. In a prospective study conducted at the University Hospital Centre Split in a population of 61 cardiac surgery patients, Ivanda (2017) demonstrated that the use of CAM-ICU and ICDSC questionnaires enables the assessment of postoperative delirium incidence, which was 8% according to CAM-ICU and 9.8% according to ICDSC. The study also identified risk factors such as longer duration of surgical procedures, age above 65 years, the use of extracorporeal circulation, and prolonged mechanical ventilation (35).

Although the reported incidence was lower than that described in international literature, the authors concluded that further research is necessary to better understand these findings and to improve the routine implementation of diagnostic instruments in Croatian intensive care units.

Limitations of the systematic review

This review has several limitations. The number of included studies was relatively small ($n = 10$), and the heterogeneity of study designs and outcome measures limited direct comparability, meaning that the synthesis was primarily narrative. In addition, national data are scarce, with a lack of recent multicentre and prospective studies on CAM-ICU implementation in Croatian intensive care units. The search was completed in September 2025, and therefore more recent studies may not have been captured.

Conclusion

This systematic review highlights the clinical relevance of delirium in intensive care units and confirms the importance of timely recognition to support improved patient outcomes. The included studies indicate that CAM-ICU is a reliable and feasible tool for routine delirium assessment, particularly when integrated into standard nursing workflows. Nurses play a key role in screening, documentation, interpretation of findings, and implementation of non-pharmacological interventions.

The evidence further suggests that structured education improves the accuracy and consistency of CAM-ICU use and supports multidisciplinary communication. Nevertheless, barriers such as limited training, challenges in assessing sedated and mechanically ventilated patients, and insufficient institutional support may reduce screening frequency and quality.

In the Croatian healthcare context, more consistent implementation of CAM-ICU, supported by education and locally adapted protocols, may strengthen the standardisation of delirium monitoring and contribute to patient safety and quality of care. Future national studies, including multicentre prospective designs, are warranted to evaluate implementation outcomes and support the development of recommendations for routine practice.

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PROCJENA DELIRIJA U JEDINICI INTENZIVNOG LIJEČENJA PRIMJENOM ALATA CAM-ICU: ULOGA MEDICINSKIH SESTARA U PREPOZNAVANJU I SKRBI

Sažetak

Uvod: Delirij je čest neuropsihijatrijski sindrom u jedinicama intenzivnog liječenja, s prevalencijom od 20 do 80 %. Povezan je s produljenim boravkom, povećanom smrtnošću i dugoročnim kognitivnim oštećenjima. Zbog fluktuirajuće kliničke slike, rano je prepoznavanje otežano, zbog čega je nužna primjena validiranih instrumenata. Confusion Assessment Method for the Intensive Care Unit, CAM-ICU, jedan je od najčešće korištenih alata. Medicinske sestre, zbog stalne prisutnosti uz bolesnika, imaju ključnu ulogu u probiru i pravodobnom započinjanju intervencija.

Metode: U rujnu 2025. proveden je sustavni pregled literature u bazama PubMed, Web of Science i Scopus za razdoblje od 2015. do 2025. U skladu sa smjernicama PRISMA, uključeni su randomizirani kontrolirani pokusi, klinička i opservacijska istraživanja, edukacijske intervencije, projekti poboljšanja kvalitete te pregledni radovi. Zbog heterogenosti dizajna studija provedena je narativna sinteza rezultata.

Rezultati: Uključeno je deset studija. CAM-ICU pokazao je visoku dijagnostičku točnost, s osjetljivošću od 74 do 90 % i specifičnošću od 92 do 98 %, uz dobru provedivost u svakodnevnoj sestrijskoj praksi. Edukacijske intervencije povećale su znanje, samopouzdanje i stopu dokumentiranja, a projekti poboljšanja kvalitete pokazali veću učestalost probira i smanjenu uporabu benzodiazepina. Najčešće prepreke bile su nedostatak formalne edukacije, teškoće u diferencijalnoj dijagnostici, ograničena procjena kod sediranih i mehanički ventiliranih bolesnika te niža učestalost procjene tijekom noći.

Zaključak: CAM-ICU pouzdan je i praktičan alat za rano prepoznavanje delirija u jedinicama intenzivnog liječenja. Redovita primjena uz strukturiranu edukaciju i institucionalne protokole poboljšava dosljednost procjene i pridonosi sigurnijoj kliničkoj praksi. Sustavna primjena alata u hrvatskom zdravstvenom sustavu može unaprijediti sigurnost bolesnika i ishode liječenja.

Ključne riječi: delirij, jedinica intenzivnog liječenja, CAM-ICU, medicinske sestre
