Journal of The Cardiovascular Thoracic Anaesthesia and Intensive Care Society

GKDA Derg 2025;31(4):158-166
Doi: 10.14744/GKDAD.2025.49091

RESEARCH ARTICLE

Prevalence of Delirium and Its Association with Risk Factors in Intensive Care Unit Patients

Fethi Gül,[1] Ahmet Anıl Çiftçi,[2] Emin Emre Balkaya,[2] Eyüp Can Yılmaz,[2] Fırat Kaya,[2] Mehmet Eren Erten,[2] Esra Tekin,[3] Umut Sabri Kasapoğlu[4]

[1]Division of Critical Care Medicine, Department of Anesthesiology and Reanimation, Marmara University Faculty of Medicine, İstanbul, Türkiye
[2]Marmara University Faculty of Medicine, İstanbul, Türkiye
[3]Department of Intensive Care, Marmara University Pendik Training and Research Hospital, İstanbul, Türkiye
[4]Division of Intensive Care Medicine, Department of Chest Diseases, Marmara University Faculty of Medicine, İstanbul, Türkiye

ABSTRACT

Objectives: Delirium is a common acute brain dysfunction in critically ill patients and is associated with poor short- and long-term outcomes, yet it often remains under-recognized. This study aimed to determine the prevalence of delirium in adult ICU patients and to examine its association with clinical and laboratory risk factors.

Methods: In this prospective observational study, we evaluated 60 consecutive adults (≥18 years) admitted to a tertiary ICU with a Richmond Agitation–Sedation Scale (RASS) score between −3 and +4. Sedation was assessed using RASS; delirium using the Confusion Assessment Method for the ICU (CAM-ICU) and the Delirium Rating Scale–Revised-98 (DRS-R-98); organ dysfunction using the Sequential Organ Failure Assessment (SOFA); and illness severity using APACHE II. Demographics, comorbidities, basic laboratory tests, and sedative and analgesic drug use were obtained from medical records.

Results: The mean age was 65±18 years, and 59.4% of the patients were male. Delirium was diagnosed by CAM-ICU in 28 patients (46.7%). Compared with non-delirious patients, those with delirium were older (70±15 vs. 60±19 years) and had higher DRS-R-98, C-reactive protein, APACHE II, and SOFA scores, as well as lower platelet count, Glasgow Coma Scale (GCS), and RASS scores (all $p<0.05$).

Conclusion: Delirium is frequent among ICU patients and is associated with advanced age, greater disease severity, organ dysfunction, deeper sedation, and adverse inflammatory and hematological profiles. The combined use of CAM-ICU and DRS-R-98 appears reliable for identifying delirium and monitoring its severity in the ICU.

Keywords: CAM-ICU, delirium; DRS-R-98, intensive care unit, risk factors

Please cite this article as: "Gül F, Çiftçi AA, Balkaya EE, Yılmaz EC, Kaya F, Erten ME, et al. Prevalence of Delirium and Its Association with Risk Factors in Intensive Care Unit Patients. GKDA Derg 2025;31(4):158-166".

Introduction

Delirium is regarded as a potentially reversible form of acute brain dysfunction characterized by an abrupt onset and a fluctuating course of disturbances in attention, awareness, and cognitive functions. In critically ill patients, delirium is common and is associated with a prolonged duration of mechanical ventilation, increased ICU and hospital length of stay, and higher morbidity and mortality. In addition, it may lead to long-term cognitive impairment, reduced functional independence, and a marked decline in quality of life after discharge. However, due to the heterogeneous clinical presentation, the presence of severe underlying systemic illnesses, and the effects of sedation practices, delirium is often recognized late or missed entirely without ever being diagnosed.[1–4]

Address for correspondence: Fethi Gül, MD. Marmara Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon Anabilim Dalı, Yoğun Bakım Bilim Dalı, İstanbul, Türkiye

Phone: +90 505 600 03 85 **E-mail:** gulfethi@gmail.com

Submitted: December 11, 2025 **Revised:** December 15, 2025 **Accepted:** December 19, 2025 **Available Online:** December 29, 2025

The Cardiovascular Thoracic Anaesthesia and Intensive Care - Available online at www.gkdaybd.org

OPEN ACCESS This is an open access article under the CC BY-NC license (http://creativecommons.org/licenses/by-nc/4.0/).

Relying solely on informal observation for the detection of delirium results in an underestimation of its true prevalence and delays the timely implementation of appropriate preventive and therapeutic strategies. In the geriatric population, delirium has been reported to affect up to approximately 40% of hospitalized older patients, making it a major public health problem.[3] For this reason, international guidelines recommend routine and structured screening for delirium in all ICU patients, to be repeated at least once or twice daily.[5,6] For this purpose, the Richmond Agitation–Sedation Scale (RASS) is widely used to assess the level of consciousness and arousal, the Confusion Assessment Method for the ICU (CAM-ICU) for delirium screening, and the Delirium Rating Scale–Revised-98 (DRS-R-98) for a detailed assessment of delirium severity.[1,4,7–9]

Nevertheless, in Türkiye, the number of studies investigating the prevalence of delirium in critically ill patients, its relationship with clinical and laboratory risk factors, and the real-life performance of different assessment tools remains limited. Existing data mostly focus on selected patient populations and rely on a single screening instrument; therefore, they may not fully reflect the true burden of delirium and its associated factors.[1,4] This knowledge gap indicates a need for new data to improve recognition and management of delirium in everyday intensive care practice.

In this study, we aimed to determine the prevalence of delirium in adult critically ill patients and to examine the relationship between delirium and potential risk factors such as disease severity, organ dysfunction, level of sedation, and laboratory parameters. Additionally, we sought to demonstrate the clinical applicability of the combined use of CAM-ICU and DRS-R-98 and, by strengthening national data, to provide a scientific basis for the development of targeted strategies for the prevention and management of delirium.

Methods

Study Design and Setting

This study was designed as a prospective, cross-sectional, observational study conducted in the Anesthesiology and Reanimation Intensive Care Unit of Marmara University Pendik Training and Research Hospital, a tertiary care center. The unit provides multidisciplinary care for critically ill medical and surgical patients with diverse clinical profiles and high illness severity.

Ethical Considerations

The study was approved by the Marmara University Clinical Research Ethics Committee (09.2025-25-0057). The protocol adhered to national regulations on clinical research and to the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants or their legally authorized representatives in accordance with ICU practice and local regulations. All collected data were anonymized and stored securely, and no procedures beyond the standard of care were performed solely for research purposes.

Participants and Eligibility Criteria

The target population consisted of adult patients admitted to the ICU. Patients were recruited using a consecutive sampling strategy during routine clinical practice. All patients aged ≥18 years who were hospitalized in the ICU and met the predefined mental status criteria were screened for eligibility.

To be included in the study, patients had to fulfill the following criteria: age ≥18 years; current admission to the ICU; a RASS score between −3 and +4 at the time of assessment; the ability to generate a response to verbal or physical stimulation sufficient to allow valid delirium assessment; and provision of informed consent to participate (by the patient or legal representative, in accordance with local regulations).

Patients were excluded if they had any of the following: deep sedation or unresponsiveness defined as RASS ≤−4; severe neurological deficits precluding communication or cognitive assessment; pre-existing severe cognitive impairment that rendered the application or interpretation of delirium assessment scales impossible; inability to understand Turkish; coma; or any other clinical condition that prevented the safe or feasible administration of delirium assessment tools.

During the data collection period, a total of 60 ICU patients who satisfied the RASS eligibility window and other inclusion criteria were successfully evaluated face to face and included in the final analysis set.

Data Collection Procedures

Data were collected at the bedside using a standardized case report form developed by the investigators based on the study protocol and relevant literature. All assessments were performed via face-to-face evaluation during routine ICU care.

Each patient underwent a structured sequence of assessments in the same order to minimize variability: first, RASS was applied to determine the level of sedation and agitation and to confirm eligibility for delirium assessment; second, the CAM-ICU was used to screen for delirium; third, the DRS-R-98 was administered to grade delirium severity and phenomenology; fourth, the SOFA score was calculated to quantify acute organ dysfunction; finally, demographic and clinical parameters were recorded on the standardized form.

All scales were administered in accordance with the standardized procedures described in the original validation studies and subsequent literature by investigators trained in the use of these instruments.

Delirium and Sedation Assessment Scales

Richmond Agitation–Sedation Scale (RASS)

RASS was used as the primary tool to determine the level of arousal and to decide whether formal delirium assessment was feasible. RASS is a 10-point ordinal scale ranging from −5 to +4, where positive scores indicate increasing agitation, 0 denotes a calm and alert state, and negative scores indicate increasing depth of sedation. On this scale, +1 to +4 reflect escalating agitation (from restless to combative), 0 indicates "alert and calm," −1 to −3 represent light to moderate sedation with preserved response to verbal stimuli, and −4 to −5 correspond to deep sedation or unresponsiveness, with absent response to verbal stimuli and absent or minimal response to physical stimulation.

For the purposes of this study, delirium assessment was only performed in patients with a RASS score between −3 and +4, reflecting a state in which the patient could provide at least minimal behavioral responses necessary for reliable cognitive testing. Patients with deep sedation or coma (RASS −4 or −5) were not assessed for delirium on that occasion and were excluded from the analytic sample.[10]

RASS scores were recorded as an ordinal variable and were used both as an inclusion criterion and as a descriptor of the sedation–agitation profile in the study cohort.

Confusion Assessment Method for the ICU (CAM-ICU)

Delirium screening was performed using the CAM-ICU, a widely used diagnostic algorithm for critically ill patients. CAM-ICU operationalizes delirium based on four core features: acute onset or fluctuating course of mental status, inattention assessed with a structured auditory or visual attention test, disorganized thinking, and altered level of consciousness, typically defined as any RASS score different from 0.

In line with the original algorithm, a CAM-ICU result was considered positive (indicating the presence of delirium) when the patient demonstrated both feature 1 (acute or fluctuating change in mental status) and feature 2 (inattention), plus either feature 3 (disorganized thinking) or feature 4 (altered level of consciousness).

The attention component was evaluated with a standardized letter-recognition task, in which patients were instructed to respond (e.g., by squeezing the examiner's hand) whenever a predefined target letter ("A") was heard within a sequence of letters read at one-second intervals. Errors in detection or inappropriate responses were counted to quantify inattention. Disorganized thinking was assessed through a combination of simple orientation questions and command-following tasks. CAM-ICU was only applied when RASS was between −3 and +4, i.e., when the patient could be aroused to voice without the need for vigorous physical stimulation.[11]

Delirium Rating Scale–Revised–98 (DRS-R-98)

Delirium severity and phenomenology were assessed using the DRS-R-98. This scale consists of 13 symptom items, each scored from 0 to 3, where 0 indicates absence of the symptom and 3 indicates a clear and prominent manifestation. The domains assessed include sleep–wake cycle disturbance, perceptual disturbances and hallucinations, delusions, emotional lability, language, thought process, increased motor activity, decreased motor activity, orientation, attention, short-term memory, long-term memory, and visuospatial ability.

The total symptom score ranges from 0 to 39. In accordance with the standard interpretation of the scale, a DRS-R-98 symptom score ≥15 was considered indicative of delirium, whereas lower scores suggested either absence of delirium or subsyndromal forms. In this study, DRS-R-98 was used both as a continuous measure of delirium severity and, where appropriate, as a categorical variable based on the ≥15 cutoff.[11]

Measurements and Collected Variables

For each enrolled patient, a comprehensive set of demographic, clinical, and laboratory variables was recorded on the standardized data collection form. Demographic characteristics included age, sex, and body mass index (BMI). Baseline clinical information comprised the primary reason for ICU admission, medical versus surgical admission status, and the presence and type of comorbidities (e.g., cardiovascular, respiratory, metabolic, renal, or neurological diseases).

Critical illness and support variables included the need for and status of invasive mechanical ventilation at the time of assessment, use of vasoactive agents, and other major organ support modalities where applicable. Severity of illness was quantified with the Acute Physiology and Chronic Health Evaluation II (APACHE II) score at ICU admission and the SOFA score at the time of delirium assessment.[12,13]

Physiological parameters (vital signs such as heart rate, blood pressure, respiratory rate, temperature, and peripheral oxygen saturation) were obtained from routine monitoring closest to the time of neuropsychiatric assessment.

Table 1. General characteristics of the study population

Variable	All patients (n=60) n	%	Variable	All patients (n=60)
Demographic characteristics			CRP, median (IQR) (mg/L)	96 (28–185)
Age (mean±SD) (years)	64.8±18.0		PCT, median (IQR) (ng/mL)	0.72 (0.18–2.95)
BMI (mean±SD) (kg/m^2)	23.35±4.07		Creatinine, median (IQR) (mg/dL)	0.85 (0.59–1.07)
ICU LOS, median (IQR) (days)	7 (4–13)		Na, median (IQR) (mmol/L)	139 (136–141)
Coexisting comorbidities			Ca, median (IQR) (mg/dL)	8.1 (7.5–8.5)
HT	30	50	Mg, median (IQR) (mg/dL)	1.8 (1.6–2.0)
DM	13	21.7	K (mean±SD) (mmol/L)	3.7±0.7
COPD	9	15	Hemodynamic variables	
Malignancy	9	15	SBP, median (IQR) (mmHg)	125 (110–140)
IHD	9	15	DBP, median (IQR) (mmHg)	69 (57–71)
CVD	7	11.7	HR (mean±SD) (beats/min)	91±15
Arrhythmia	6	10	RR, median (IQR) (breaths/min)	17 (14–20)
Alzheimer's disease	2	3.3	Clinical scoring systems	
Laboratory variables			APACHE–II, median (IQR)	15 (10–18)
WBC, median (IQR) (×10^3/μL)	9.9 (7.4–14.3)		GCS, median (IQR)	12 (10–14)
HGB (mean±SD) (g/dL)	9.21±1.67		SOFA, median (IQR)	5 (3–7)
HCT (mean±SD) (%)	28.1±4.8		RASS, median (IQR)	0 (-1–0)
PLT (mean±SD) (×10^3/μL)	221±116		DRSR-98, median (IQR)	14 (6–25)
Lactate, median (IQR) (mmol/L)	1.7 (1.3–2.2)			

BMI: Body mass index; ICU LOS: Intensive care unit length of stay; HT: Hypertension; DM: Diabetes mellitus; COPD: Chronic obstructive pulmonary disease; IHD: Ishemic heart disease; CVD: Cerebrovascular diseases; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HR: Heart rate; RR: Respiratory rate; GCS: Glasgow coma scale; SOFA: Sequential organ failure assessment; APACHE-II: Acute physiology and chronic health evaluation II; RASS: Richmond agitation-sedation scale; DRSR-98: Delirium rating scale–revised-98; CRP: C- reactive protein; PCT: Procalcitonin; WBC: White blood cell; HGB: Hemoglobin; HCT: Haematocrit, platelet.

Laboratory parameters included serum electrolytes, lactate, C-reactive protein (CRP), procalcitonin, hemoglobin level, platelet count, and markers of renal function, as available in routine clinical practice. Pharmacological treatments recorded included sedative and analgesic medications (e.g., benzodiazepines, propofol, opioids), antipsychotics, antibiotics, anticoagulants, and other major drug classes deemed potentially relevant to delirium risk. Finally, ICU length of stay was recorded as an outcome variable.

Delirium presence and severity were operationalized using CAM-ICU status (positive vs. negative) and DRS-R-98 symptom scores, respectively, while global organ dysfunction and illness severity were captured by SOFA and APACHE II scores. All RASS, CAM-ICU, and DRS-R-98 assessments were performed by investigators who had received specific training on the use of these instruments prior to study initiation, and inter-rater agreement was ensured through supervised pilot assessments before formal data collection.

Statistical Analysis

All data obtained in the study were retrieved from the hospital database, organized, and transferred into Microsoft Excel spreadsheets, which were prepared for subsequent statistical analyses. Statistical evaluations were performed using SPSS (Statistical Package for the Social Sciences) for Windows, version 23.0 (IBM Corp., Armonk, NY, USA). A p-value<0.05 was considered statistically significant in all analyses, and results were reported with 95% confidence intervals (95% CI).

The distributional characteristics of continuous variables were assessed using the Shapiro–Wilk test. Categorical variables were summarized as counts (n) and percentages (%). Continuous variables with a normal distribution were reported as mean±standard deviation, whereas non-normally distributed continuous variables were presented as median (interquartile range [IQR]). For comparisons of continuous variables between two groups, the independent-samples t-test was used when distributional assumptions were met, and the Mann–Whitney U test was used when these assumptions were not satisfied. To evaluate associations between categorical variables, the chi-square test was applied; when the assumptions of the chi-square test were violated, Fisher's exact test was used instead.

Table 2. Baseline demographic characteristics, comorbidities, and treatment modalities according to CAM-ICU status

Variable	CAM-ICU negative (32; %53.3)		CAM-ICU positive (28; %46.7)		p
	n	%	n	%	
Demographic characteristics					
Age (mean±SD) (years)	59.8±19.4		70.4±14.8		**0.023**
BMI (mean±SD) (kg/m^2)	23.38±4.57		23.32±3.48		0.959
ICU LOS, median (IQR) (days)	5 (3–11)		10 (5–17)		0.090
Coexisting comorbidities					
HT	13	40.6	17	60.7	0.121
DM	6	18.8	7	25.0	0.558
COPD	5	15.6	4	14.3	0.588
Malignancy	5	15.6	4	14.3	0.588
IHD	3	9.4	6	21.4	0.173
CVD	5	15.6	2	7.1	0.272
Arrhythmia	2	6.3	4	14.3	0.273
Alzheimer's disease	0	0	2	7.1	0.214
Treatment modalities					
Antibiotic use	20	62.5	16	57.1	0.673
Anticoagulant use	13	40.6	13	46.4	0.651
Sedative/narcotic use	3	9.4	9	32.1	**0.030**
Analgesic use	7	21.9	4	14.3	0.338
Antiepileptic use	1	3.1	5	17.9	0.070
Diuretic use	4	12.5	4	14.3	0.567
Bronchodilator use	9	28.1	5	17.9	0.348
Antiarrhythmic use	3	9.4	4	14.3	0.423
Other	12	37.5	8	28.6	0.464

BMI: Body mass index; ICU LOS: Intensive care unit length of stay; HT: Hypertension; DM: Diabetes mellitus; COPD: Chronic obstructive pulmonary disease; IHD: Ishemic heart disease; CVD: Cerebrovascular diseases.

Results

General Patient Characteristics

A total of 60 adult patients followed in the ICU were included in the study. The mean age of the patients was 64.8±18.0 years, and the mean BMI was 23.35±4.07 kg/m^2. The most common comorbidities were hypertension (50.0%) and diabetes mellitus (21.7%).

Evaluation of laboratory and clinical parameters showed that leukocyte, CRP, and procalcitonin levels were consistent with systemic inflammation or infection; hemoglobin levels were relatively low, while creatinine values, as an indicator of renal function, were generally preserved. Hemodynamically, the patients were within stable ranges, and the median length of ICU stay was 7 (4–13) days. In terms of disease severity and neurological status scores, the median APACHE II score was 15, SOFA score was 5, GCS score was 12, and RASS score was 0; the median DRS-R-98 score was 14 (Table 1).

Clinical and Laboratory Factors Associated with Delirium

The study population was divided into two groups according to CAM-ICU status: CAM-ICU negative (n=32; 53.3%) and CAM-ICU positive (n=28; 46.7%). When the groups were compared, patients with delirium were found to be older (70.4±14.8 vs. 59.8±19.4 years; p=0.023). The distribution of major comorbidities was similar between the groups (all p>0.05). Although ICU length of stay was longer in the CAM-ICU–positive group (10 [IQR 5–17] vs. 5 [IQR 3–11] days), the difference was not statistically significant (p=0.090). The use of sedative or narcotic medications was more frequent in the delirium group (32.1% vs. 9.4%; p=0.030), while no significant differences were observed for the other drug classes (Table 2).

In terms of laboratory parameters, the CAM-ICU–positive group had higher CRP levels (119 [IQR 42–247] vs. 62 [IQR 13–140] mg/L; p=0.035) and lower platelet counts (185±99 vs. 253±122×10^3/µL; p=0.024). Serum sodium levels were

Table 3. Comparison of laboratory, hemodynamic, and clinical scoring parameters according to CAM-ICU status

Variable	CAM-ICU negative (32; %53.3)	CAM-ICU positive (28; %46.7)	p
Laboratory variables			
WBC, median (IQR) ($\times10^3/\mu L$)	10.7 (7.2–13.3)	9.7 (7.4–15.3)	0.819
HGB (mean±SD) (g/dL)	9.44±1.72	8.94±1.61	0.258
HCT (mean±SD) (%)	28.5±4.9	27.6±4.7	0.468
PLT (mean±SD) ($\times10^3/\mu L$)	253±122	185±99	**0.024**
Lactate, median (IQR) (mmol/L)	1.5 (1.2–2.0)	2 (1.6–2.5)	0.074
CRP, median (IQR) (mg/L)	62 (13–140)	119 (42–247)	**0.035**
PCT, median (IQR) (ng/mL)	0.52 (0.17–2.13)	1.07 (0.2–4.4)	0.197
Creatinin, median (IQR) (mg/dL)	0.85 (0.64–1.03)	0.85 (0.51–1.13)	0.711
Sodium, median (IQR) (mmol/L)	138 (136–140)	141 (137–145)	**0.016**
Calcium, median (IQR) (mg/dL)	8.1 (7.5–8.5)	8.09 (7.37–8.57)	0.795
Magnesium, median (IQR) (mg/dL)	1.8 (1.7–2.0)	1.8 (1.6–2.0)	0.346
Potassium (mean±SD) (mmol/L)	3.9±0.5	3.5±0.7	**0.009**
Hemodynamic variables			
SBP, median (IQR) (mmHg)	121 (114–131)	130 (104–150)	0.484
DBP, median (IQR) (mmHg)	69 (60–72)	67 (57–70)	0.607
HR (mean±SD) (beats/min)	88±15	93±15	0.229
RR, median (IQR) (breaths/min)	20 (16–21)	15 (13–20)	0.116
Clinical scoring systems			
APACHE-II, median (IQR)	11 (10–15)	19 (14–22)	**<0.001**
GCS, median (IQR)	14 (12–15)	9 (8–11)	**<0.001**
SOFA, median (IQR)	4 (2–5)	6 (4–8)	**<0.001**
RASS, median (IQR)	0 (0–0)	-1 (-2–0)	**0.014**
DRSR-98, median (IQR)	6 (3–10)	25 (21–30)	**<0.001**

SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HR: Heart rate; RR: Respiratory rate; GKS: Glasgow coma scale; SOFA: Sequential organ failure assessment; APACHE-II: Acute physiology and chronic health evaluation II; RASS: Richmond agitation-sedation scale; DRSR-98: Delirium rating scale–revised-98; CRP: C- reactive protein; PCT: Procalcitonin; WBC: White blood cell; HGB: Hemoglobin; HCT: Haematocrit, platelet count.

higher (141 [IQR 137–145] vs. 138 [IQR 136–140] mmol/L; p=0.016), whereas potassium levels were lower (3.5±0.7 vs. 3.9±0.5 mmol/L; p=0.009) in the CAM-ICU–positive group.

When hemodynamic parameters were evaluated, no significant differences were observed between the two groups. The CAM-ICU–negative and CAM-ICU–positive groups had comparable systolic blood pressure (121 [IQR 114–131] vs. 130 [IQR 104–150] mmHg; p=0.484), diastolic blood pressure (69 [IQR 60–72] vs. 67 [IQR 57–70] mmHg; p=0.607), heart rate (88±15 vs. 93±15 beats/min; p=0.229), and respiratory rate (20 [IQR 16–21] vs. 15 [IQR 13–20]/min; p=0.116).

Disease severity and neurologic status scores were markedly worse in the delirium group. In CAM-ICU–positive patients, median APACHE II and SOFA scores were 19 (IQR 14–22) and 6 (IQR 4–8), respectively, compared with 11 (IQR 10–15) and 4 (IQR 2–5) in the CAM-ICU–negative group (p<0.001 for both). The median GCS score was lower in the delirium group (9 [IQR 8–11] vs. 14 [IQR 12–15]; p<0.001), and the level of sedation was deeper (RASS –1 [IQR –2–0] vs. 0 [IQR 0–0]; p=0.014). DRS-R-98 scores were also significantly higher in the CAM-ICU–positive group (25 [IQR 21–30] vs. 6 [IQR 3–10]; p<0.001) (Table 3).

Discussion

In this prospective observational study, we evaluated the frequency of delirium and its relationship with clinical and laboratory variables in adult patients followed in a tertiary-level anesthesiology ICU. The prevalence of delirium detected using the CAM-ICU was 46.7%, which is consistent with the wide prevalence range reported particularly in elderly and frail patients and supports the view that delirium is a common component of the critical illness trajectory. Conceptualizing delirium not merely as a psychiatric diagnosis but as acute brain dysfunction or acute brain organ failure helps to explain its close association with systemic disease burden and multiple organ dysfunction.[1–3,14]

In our study, CAM-ICU–positive patients were older, in line with robust epidemiological evidence identifying age as one of the main predisposing factors for delirium. In particular, the work of Inouye et al.,[2] which highlights the effects of delirium on both in-hospital and long-term outcomes, shows that reduced cognitive reserve and increased brain frailty in older patients lower the threshold for delirium in the face of metabolic, infectious, or hemodynamic stressors.[2,14–17] Studies from Türkiye also support that delirium is common in older critically ill patients and adversely affects clinical outcomes.[18,19]

With respect to disease severity and organ dysfunction scores, significantly higher APACHE II and SOFA scores and markedly lower GCS scores in patients with delirium indicate a close relationship between delirium, severe systemic illness, and multiple organ failure.[3,15] Scoring systems such as APACHE II and SOFA quantitatively reflect the global burden of physiological derangement and organ dysfunction, and our findings suggest that as this burden increases, the likelihood of developing acute brain dysfunction also rises. This is consistent with the broader literature supporting the notion that delirium should be regarded not as an accompanying symptom but as an independent clinical syndrome associated with prognosis.[2,3,14,20]

Regarding the scales used for delirium assessment, delirium screening in our study was performed with the CAM-ICU, while delirium severity was graded with the DRS-R-98. The CAM-ICU is the most widely used and well-validated screening tool for diagnosing delirium in critically ill patients, including those on mechanical ventilation.[4,7,8] The DRS-R-98 is a psychometric instrument that provides a more detailed assessment of the phenomenology and severity of delirium, and both an original validation study and a Turkish validity–reliability study are available.[11] The strong concordance observed between CAM-ICU positivity and markedly higher DRS-R-98 scores in our study suggests that these two tools can be used in a complementary manner in ICU practice.

From the perspective of sedation profile and treatment practices, the more frequent use of sedative or narcotic medications and more negative RASS scores in the CAM-ICU–positive group support the association between deep sedation, increased sedative load, and delirium. The RASS is a valid and reliable scale for assessing the level of sedation and agitation and is recommended to standardize the patient's level of arousal before delirium screening.[10] The ABCDEF bundle and contemporary intensive care approaches define light sedation targets, avoidance of unnecessary benzodiazepine use, implementation of analgesia-first strategies, and early mobilization as key elements in preventing delirium and shortening its duration.[5,6,21]

In terms of laboratory parameters, higher CRP levels, lower platelet counts, and disturbed serum sodium–potassium balance in the delirium group support the role of systemic inflammation, coagulation changes, and metabolic disturbances in the pathophysiology of delirium. Systemic inflammatory responses have been shown to disrupt blood–brain barrier integrity via cytokines, alter neurotransmitter balance, and trigger acute brain dysfunction.[22,23] Electrolyte imbalances and metabolic disturbances, particularly in elderly and frail populations, have been reported to adversely affect neuronal membrane stability and synaptic transmission, manifesting clinically as altered consciousness and delirium.[15,23,24] Differences in these routinely obtainable clinical parameters may serve as practical indicators to help identify patients at high risk for delirium.

Given the short- and long-term consequences of delirium, the literature describes delirium as a powerful prognostic marker for both mortality and functional outcomes. Delirium has been associated with increased hospital and ICU mortality, prolonged length of stay, longer duration of mechanical ventilation, higher readmission rates, and a greater need for institutional care after discharge. Furthermore, the experience of delirium imposes a substantial psychosocial burden on both patients and caregivers and has been linked to anxiety, depression, and trauma-like symptoms among family members.[2,7,14,16,19]

In light of these data, delirium rates and adherence to delirium screening should be monitored as important indicators of ICU quality. Both clinical updates and quality improvement programs identify early recognition of delirium, routine use of standardized screening tools (CAM-ICU, DRS-R-98, RASS), and implementation of the ABCDEF bundle as integral components of high-quality ICU care. Structured protocols for the prevention, early diagnosis, and multidisciplinary management of delirium should be developed and supported through educational programs and regular audits.[4–6,21,23]

Our study has several limitations. First, being a single-center study with a relatively small sample size (n=60) limits the generalizability of the findings. Second, by design, a cross-sectional assessment was performed; RASS, CAM-ICU, and DRS-R-98 were all applied once on the same day. Therefore, the true duration of delirium, its fluctuating course, and possible subsyndromal presentations could not be fully characterized. Third, many well-known risk factors—such as the type, cumulative dose, and duration of sedative or narcotic therapy; duration of mechanical ventilation; environmental factors; and pre-existing cognitive status—were not evaluated in detail, making the presence of residual confounding likely. Finally, this study examined a heterogeneous cohort from a single-center, consisting predominantly of anesthesiology ICU patients, and separate analyses could not be performed for distinct subpopulations such as cardiac surgery, neurological ICU, or medical ICU patients.

Conclusion

In conclusion, the combined use of CAM-ICU and DRS-R-98 offers a practical and reliable approach for the detection of delirium and monitoring of its severity in ICU patients, while simultaneously underscoring the need to develop targeted preventive strategies focusing on modifiable risk factors such as depth of sedation, medication exposure, and metabolic or inflammatory imbalances. However, larger, multi-center, longitudinal studies represent the next critical step to elucidate the causal roles of these risk factors and to design targeted intervention bundles for delirium.

Disclosures

Ethics Committee Approval: The study was approved by the Marmara University Clinical Research Ethics Committee (no: 09.2025-25-0057, date: 31/01/2025).

Informed Consent: Written informed consent was obtained from all participants (or their legally authorized representatives) prior to enrolment in the study.

Conflict of Interest Statement: The authors declare that there is no conflict of interest.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Use of AI for Writing Assistance: Artificial intelligence–based tools were used only for language editing and style refinement after the scientific content and analyses had been finalized.

Authorship Contributions: Concept – F.G., E.T., A.A.Ç.; Design – F.G., E.T., A.A.Ç.; Supervision – F.G., E.T.; Fundings – F.G., E.T., U.S.K.; Materials – A.A.Ç., E.E.B., E.C.Y., F.K., M.E.E.; Data collection and/or processing – A.A.Ç., E.E.B., E.C.Y., F.K., M.E.E.; Analysis and/or interpretation – F.G., E.T., U.S.K.; Literature search – F.G., E.T., U.S.K., A.A.Ç., E.E.B., E.C.Y., F.K., M.E.E.; Writing – U.S.K., F.G., A.A.Ç., E.E.B., E.C.Y., F.K., M.E.E.; Critical review – F.G., U.S.K.

Peer-review: Externally peer-reviewed.

References

1. Mattoo SK, Grover S, Gupta N. Delirium in general practice. Indian J Med Res 2010;131:387–98.
2. Inouye SK, Westendorp RG, Saczynski JS. Delirium in elderly people. Lancet 2014;383:911–22.
3. Marcantonio ER. Delirium in hospitalized older adults. N Engl J Med 2017;377:1456–66.
4. Grover S, Kate N. Assessment scales for delirium: A review. World J Psychiatry 2012;2:58–70.
5. Marra A, Ely EW, Pandharipande PP, Patel MB. The ABCDEF bundle in critical care. Crit Care Clin 2017;33:225–43.
6. Pun BT, Balas MC, Barnes-Daly MA, Thompson JL, Aldrich JM, Barr J, et al. Caring for critically Ill patients with the ABCDEF bundle: results of the ICU liberation collaborative in over 15,000 adults. Crit Care Med 2019;47:3–14.
7. Ely EW, Inouye SK, Bernard GR, Gordon S, Francis J, May L, et al. Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). JAMA 2001;286:2703–10.
8. Guenther U, Popp J, Koecher L, Muders T, Wrigge H, Ely EW, et al. Validity and reliability of the CAM-ICU Flowsheet to diagnose delirium in surgical ICU patients. J Crit Care 2010;25:144–51
9. Trzepacz PT, Mittal D, Torres R, Kanary K, Norton J, Jimerson N. Validation of the Delirium Rating Scale-revised-98: comparison with the delirium rating scale and the cognitive test for delirium. J Neuropsychiatry Clin Neurosci 2001;13:229–42. Erratum in: J Neuropsychiatry Clin Neurosci 2001;13:433.
10. Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal PV, Keane KA, et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. Am J Respir Crit Care Med 2002;166:1338–44.
11. Cinar MA, Ozmenler KN, Ozsahin A, Trzepacz PT. Reliability and Validity of the Turkish translation of the delirium rating scale-revised-98. Dusunen Adam J Psychiatr Neurol Sci 2014;27:186–93.
12. Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Crit Care Med 1985;13:818–29.
13. Vincent JL, Moreno R, Takala J, Willatts S, De Mendonça A, Bruining H, et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. On behalf of the working group on sepsis-related problems of the European society of ıntensive care medicine. Intensive Care Med 1996;22:707–10.
14. Siddiqi N, House AO, Holmes JD. Occurrence and outcome of delirium in medical in-patients: a systematic literature review. Age Ageing 2006;35:350–64.
15. Inouye SK. Delirium in hospitalized older patients. Clin Geriatr Med 1998;14:745–64.
16. Martins S, Fernandes L. Delirium in elderly people: a review. Front Neurol 2012;3:101.
17. Johansson YA, Bergh I, Ericsson I, Sarenmalm EK. Delirium in older hospitalized patients-signs and actions: a retrospective patient record review. BMC Geriatr 2018;18:43.
18. Bölüktaş RP. Assessment, prevention, and management strategies of delirium in eldery patients in intensive care units. Yoğun Bakım Hemşireliği Derg 2015;19:68–79. [Article in Turkish]
19. Kuşçu MK, Topçuoğlu V, Altunel Ö, Bez Y. Clinical presentations and follow up outcomes of the delirium patients. Alpha Psychiatr 2004;5:16–21.
20. Ely EW, Gautam S, Margolin R, Francis J, May L, Speroff T, et al. The impact of delirium in the intensive care unit on hospital length of stay. Intensive Care Med 2001;27:1892–900.

21. Angel C, Brooks K, Fourie J. Standardizing management of adults with delirium hospitalized on medical-surgical units. Perm J 2016;20:16–002.
22. Heymann A, Sander M, Krahne D, Deja M, Weber-Carstens S, MacGuill M, et al. Hyperactive delirium and blood glucose control in critically ill patients. J Int Med Res 2007;35:666–77.
23. Cerejeira J, Mukaetova-Ladinska EB. A clinical update on delirium: from early recognition to effective management. Nurs Res Pract 2011;2011:875196.
24. Tieges Z, Evans JJ, Neufeld KJ, MacLullich AMJ. The neuropsychology of delirium: advancing the science of delirium assessment. Int J Geriatr Psychiatry 2018;33:1501–11.