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Original Research Article

Risk Factors and Clinical Outcomes of Delirium Among Hospitalized Geriatric Patients: A Retrospective Study

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Abstract:

Background: Delirium is a common and clinically important neurocognitive syndrome among hospitalized older adults. It is characterized by an acute disturbance in attention, awareness, and cognition, with symptoms typically developing over a short period and fluctuating during the course of illness. Older adults are particularly vulnerable because of multimorbidity, functional impairment, polypharmacy, sensory deficits, acute illness, and reduced physiological reserve. Delirium is clinically consequential and has been associated with prolonged hospitalization, functional deterioration, institutionalization, and increased mortality.

Aim: To determine the prevalence of delirium among hospitalized geriatric patients, identify factors independently associated with its occurrence, and evaluate its relationship with short-term clinical outcomes.

Methods: A retrospective observational study was conducted among 320 hospitalized patients aged ≥65 years. Demographic characteristics, comorbid illnesses, medication burden, baseline cognitive and functional status, sensory impairment, laboratory abnormalities, acute clinical conditions, and hospitalization-related variables were obtained from medical records. Delirium was identified using the Confusion Assessment Method (CAM). Patients were categorized into delirium and non-delirium groups. Factors associated with delirium were evaluated using univariable analysis followed by multivariable binary logistic regression. Clinical outcomes included duration of hospitalization, inpatient complications, intensive care unit transfer, discharge disposition, and in-hospital mortality.

Results: Among 320 hospitalized geriatric patients, delirium was identified in 86 patients (26.9%). The mean age of patients with delirium was 76.1 ± 7.8 years compared with 71.6 ± 6.6 years among those without delirium ($p<0.001$). Delirium was more frequent among patients aged ≥75 years, those with ≥3 comorbidities, pre-existing cognitive impairment, functional dependence, polypharmacy, acute infection, electrolyte abnormalities, hypoxia, and psychoactive medication exposure. In multivariable analysis, age ≥75 years (adjusted odds ratio [aOR] 2.14; 95% confidence interval [CI], 1.24–3.69; $p=0.006$), pre-existing cognitive impairment (aOR 2.87; 95% CI, 1.52–5.42; $p=0.001$), acute infection (aOR 2.61; 95% CI, 1.50–4.53; $p=0.001$), polypharmacy (aOR 2.08; 95% CI, 1.18–3.67; $p=0.011$), and electrolyte abnormalities (aOR 1.94; 95% CI, 1.10–3.43; $p=0.022$) remained independently associated with delirium. Patients with delirium had a longer hospital stay than those without delirium (10.8 ± 5.6 vs. 6.9 ± 3.7 days; $p<0.001$). ICU transfer (22.1% vs. 8.5%; $p=0.001$), inpatient complications (36.0% vs. 16.7%; $p<0.001$), institutional or high-dependency discharge (20.9% vs. 7.3%; $p<0.001$), and in-hospital mortality (12.8% vs. 3.0%; $p=0.002$) were significantly more common among patients with delirium.

Conclusion: Delirium affected approximately one in four hospitalized geriatric patients and was independently associated with advanced age, pre-existing cognitive impairment, acute infection, polypharmacy, and electrolyte abnormalities. Delirium was also associated with prolonged hospitalization, increased inpatient complications, and higher in-hospital mortality. Early recognition of vulnerable patients and identification of potentially modifiable precipitating factors may support targeted delirium prevention and management strategies.

Keywords: Delirium; Geriatric Medicine; Older Adults; Hospitalization; Risk Factors; Mortality; Polypharmacy; Cognitive Impairment.

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Introduction

Delirium is an acute neurocognitive syndrome characterized by disturbances in attention and awareness accompanied by an alteration in cognition. It generally develops over a relatively

short period and exhibits a fluctuating course, distinguishing it from chronic neurocognitive disorders. Clinical manifestations may include inattention, disorganized thinking, altered level of consciousness, perceptual disturbances, and disruption of the sleep–wake cycle. [1]

Hospitalized older adults represent a particularly vulnerable population. Advanced age is frequently accompanied by reduced physiological reserve, multimorbidity, functional impairment, sensory deficits, and exposure to multiple medications, all of which can increase susceptibility to acute cerebral dysfunction. [2,3]

The pathogenesis of delirium is multifactorial and is commonly conceptualized as an interaction between predisposing vulnerability and acute precipitating factors. Cognitive impairment, frailty, sensory impairment, functional dependence, and advanced age may increase baseline vulnerability, whereas infection, metabolic abnormalities, dehydration, hypoxia, pain, urinary catheterization, and medication exposure may act as acute precipitants. [4,5]

The development of delirium during hospitalization has important clinical implications. Delirium has been associated with prolonged hospitalization, functional deterioration, institutionalization, increased healthcare utilization, and adverse short- and long-term outcomes, including mortality. [6-8] In addition to its prognostic implications, delirium may complicate routine medical care because affected patients may have difficulty communicating symptoms, cooperating with treatment, maintaining mobility, and participating in rehabilitation.

Medication exposure represents a potentially modifiable component of delirium risk. Older adults commonly receive multiple medications because of multimorbidity, and certain pharmacological agents, particularly benzodiazepines, opioids, and some antihistamines, have been associated with increased delirium risk. [9] Polypharmacy may further increase susceptibility through drug–drug interactions, cumulative adverse effects, altered pharmacokinetics, and exposure to centrally acting medications.

Despite its clinical importance, delirium may remain underrecognized, particularly when the presentation is hypoactive. Patients with hypoactive delirium may appear withdrawn, lethargic, or less communicative, potentially leading to misclassification as fatigue or progression of an underlying illness. [1,5] Systematic assessment of mental status and identification of patients at increased risk may therefore facilitate earlier diagnosis and intervention.

The present study was undertaken to determine the prevalence of delirium among hospitalized geriatric patients, identify demographic and clinical factors independently associated with delirium, and evaluate its relationship with short-term hospitalization outcomes.

Materials and Methods

Study Design and Setting: This retrospective observational study was conducted. Medical records of hospitalized patients aged ≥65 years were reviewed to obtain demographic characteristics, comorbidities, medication exposure, cognitive and functional status, clinical variables, delirium status, and hospitalization outcomes.

Study Population: A total of 320 hospitalized geriatric patients aged ≥65 years who fulfilled the predefined eligibility criteria were included in the study.

Inclusion Criteria

Patients were eligible for inclusion if they:

1. were aged ≥65 years;
2. were admitted to a medical or geriatric inpatient unit;
3. had adequate medical records for assessment of baseline characteristics and hospitalization outcomes; and
4. had sufficient documentation regarding mental status during hospitalization.

Exclusion Criteria

Patients were excluded if they:

- had substantially incomplete medical records;
- had a documented acute psychiatric condition that could independently explain altered behavior or cognition;
- were admitted exclusively for end-of-life care at admission; or
- had insufficient clinical information to determine delirium status.

Assessment of Delirium: Delirium was assessed using the Confusion Assessment Method (CAM), a validated clinical instrument developed for rapid identification of delirium in hospitalized patients. [10] The CAM algorithm evaluates four core features: acute onset and fluctuating course, inattention, disorganized thinking, and altered level of consciousness. Delirium was considered present when acute onset or fluctuating course and inattention were accompanied by either disorganized thinking or an altered level of consciousness. [10]

Patients who fulfilled the CAM criteria at any point during hospitalization were classified as having delirium. Patients without documented delirium

during hospitalization were categorized as the non-delirium group.

Variables Studied: The following variables were extracted from medical records:

- age;
- sex;
- baseline cognitive status;
- functional dependence;
- visual impairment;
- hearing impairment;
- hypertension;
- diabetes mellitus;
- chronic kidney disease;
- cerebrovascular disease;
- heart failure;
- number of comorbidities;
- medication burden;
- polypharmacy;
- psychoactive medication exposure;
- acute infection;
- electrolyte abnormalities;
- anemia;
- hypoxia;
- urinary catheterization;
- intensive care unit transfer;
- length of hospital stay;
- inpatient complications;
- discharge disposition; and
- in-hospital mortality.

Polypharmacy was defined as the use of ≥5 medications during hospitalization.

Clinical Outcomes

The primary outcome was the occurrence of delirium during hospitalization.

Secondary outcomes included:

1. duration of hospital stay;
2. hospital stay ≥7 days;
3. intensive care unit transfer;
4. inpatient complications;
5. falls;
6. aspiration-related events;
7. discharge to a higher level of care or institutional facility; and
8. in-hospital mortality.

Statistical Analysis: Continuous variables were summarized using mean ± standard deviation, whereas categorical variables were expressed as frequencies and percentages. Continuous variables were compared using the independent-samples t-test where appropriate. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate.

Univariable analyses were performed to evaluate associations between demographic and clinical variables and delirium. Variables considered clinically relevant and/or demonstrating an association with delirium were entered into a multivariable binary logistic regression model. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were reported. A two-sided p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted following approval from the Institutional Ethics Committee. As this was a retrospective review of existing medical records, the requirement for individual informed consent was obtained in accordance with institutional policy and applicable regulations.

Results

Baseline Characteristics: A total of 320 hospitalized geriatric patients were included in the final analysis. The mean age of the study population was 72.8 ± 7.1 years, with an age range of 65–91 years. Men constituted 174 (54.4%) patients and women 146 (45.6%). Delirium occurred in 86 patients (26.9%), whereas 234 patients (73.1%) did not develop delirium during hospitalization. The distribution of patients according to delirium status is shown in Figure 1.

Patients who developed delirium were significantly older than those without delirium, with mean ages of 76.1 ± 7.8 and 71.6 ± 6.6 years, respectively (p<0.001). Patients aged ≥75 years accounted for 53 (61.6%) of the delirium group compared with 84 (35.9%) of the non-delirium group (p<0.001).

Pre-existing cognitive impairment was present in 29 (33.7%) patients with delirium compared with 27 (11.5%) patients without delirium (p<0.001). Functional dependence was also significantly more common among patients with delirium than among those without delirium (44.2% vs. 22.2%; p<0.001). Visual impairment and hearing impairment were significantly more frequent in the delirium group (27.9% vs. 16.2%, p=0.020; and 24.4% vs. 12.8%, p=0.014, respectively).

Among comorbid conditions, cerebrovascular disease and heart failure were significantly more common among patients with delirium than among those without delirium (23.3% vs. 12.0%, p=0.014; and 29.1% vs. 18.4%, p=0.041, respectively). Hypertension, diabetes mellitus, and chronic kidney disease did not differ significantly between the two groups.

Polypharmacy was significantly more frequent among patients with delirium than among those without delirium (84.9% vs. 70.5%; p=0.009). Psychoactive medication use was also more common in the delirium group (36.0% vs. 17.9%; p<0.001).

Acute infection, electrolyte abnormality, anemia, hypoxia, and urinary catheterization were significantly more frequent among patients who developed delirium than among those who did not. Acute infection was present in 48 (55.8%) patients with delirium compared with 69 (29.5%) patients without delirium (p<0.001). Electrolyte abnormality was observed in 35 (40.7%) versus 54 (23.1%) patients (p=0.002), while hypoxia was present in 27 (31.4%) versus 37 (15.8%) patients (p=0.002). Urinary catheterization was documented in 34 (39.5%) patients with delirium compared with 48 (20.5%) patients without delirium (p<0.001). Detailed demographic and clinical characteristics according to delirium status are presented in **Table 1**.

Table 1: Baseline demographic and clinical characteristics according to delirium status

Variable	Delirium (n=86)	No delirium (n=234)	p-value
Age, years, mean ± SD	76.1 ± 7.8	71.6 ± 6.6	<0.001
Age ≥75 years	53 (61.6%)	84 (35.9%)	<0.001
Male sex	44 (51.2%)	130 (55.6%)	0.475
Female sex	42 (48.8%)	104 (44.4%)	0.475
≥3 comorbidities	49 (57.0%)	72 (30.8%)	<0.001
Cognitive impairment	29 (33.7%)	27 (11.5%)	<0.001
Functional dependence	38 (44.2%)	52 (22.2%)	<0.001
Visual impairment	24 (27.9%)	38 (16.2%)	0.020
Hearing impairment	21 (24.4%)	30 (12.8%)	0.014
Hypertension	57 (66.3%)	139 (59.4%)	0.270
Diabetes mellitus	43 (50.0%)	99 (42.3%)	0.224
Chronic kidney disease	31 (36.0%)	60 (25.6%)	0.078
Cerebrovascular disease	20 (23.3%)	28 (12.0%)	0.014
Heart failure	25 (29.1%)	43 (18.4%)	0.041
Polypharmacy ≥5 drugs	73 (84.9%)	165 (70.5%)	0.009
Psychoactive medication use	31 (36.0%)	42 (17.9%)	<0.001
Acute infection	48 (55.8%)	69 (29.5%)	<0.001
Electrolyte abnormality	35 (40.7%)	54 (23.1%)	0.002
Anemia	39 (45.3%)	75 (32.1%)	0.029
Hypoxia	27 (31.4%)	37 (15.8%)	0.002
Urinary catheterization	34 (39.5%)	48 (20.5%)	<0.001

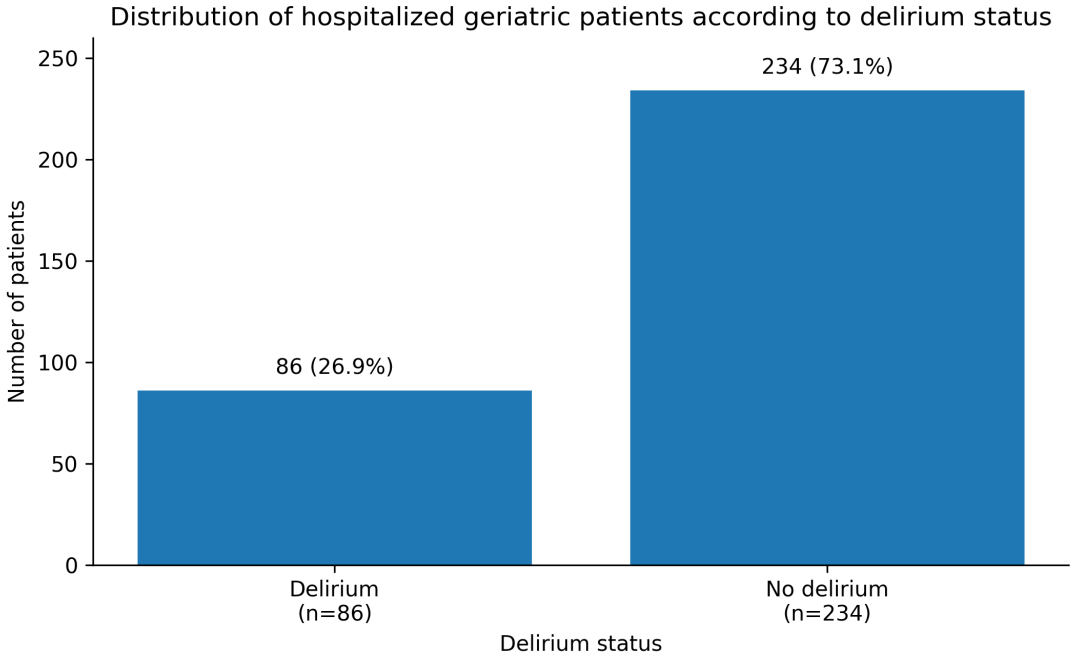

Figure 1: Distribution of hospitalized geriatric patients according to delirium status.

Occurrence and Clinical Characteristics of Delirium: Delirium occurred in 86 of 320 patients, representing 26.9% of the study population. Among patients who developed delirium, the most frequent

clinical subtype was hypoactive delirium, identified in 37 (43.0%) patients, followed by mixed delirium in 31 (36.0%) and hyperactive delirium in 18 (20.9%). The median time from hospital admission to recognition of delirium was 3 days (interquartile range [IQR], 2–5 days).

Delirium was recognized within 48 hours of admission in 31 (36.0%) patients, whereas 55 (64.0%) were recognized after 48 hours. Acute infection was present in 48 (55.8%) patients, electrolyte abnormalities in 35 (40.7%), hypoxia in 27 (31.4%), psychoactive medication exposure in 31 (36.0%), and urinary catheterization in 34 (39.5%). ICU transfer occurred in 19 (22.1%) patients with delirium, while physical restraint was documented in 14 (16.3%). The distribution of delirium subtypes and other clinical characteristics is summarized in Table 2 and illustrated in Figure 2.

Table 2: Clinical characteristics of patients with delirium

Characteristic	Delirium patients, n (%)
Total delirium cases	86 (100)
Hypoactive delirium	37 (43.0)
Hyperactive delirium	18 (20.9)
Mixed delirium	31 (36.0)
Delirium recognized within 48 h	31 (36.0)
Delirium recognized after 48 h	55 (64.0)
Acute infection present	48 (55.8)
Electrolyte abnormality	35 (40.7)
Hypoxia	27 (31.4)
Psychoactive medication exposure	31 (36.0)
Urinary catheterization	34 (39.5)
ICU transfer	19 (22.1)
Physical restraint documented	14 (16.3)

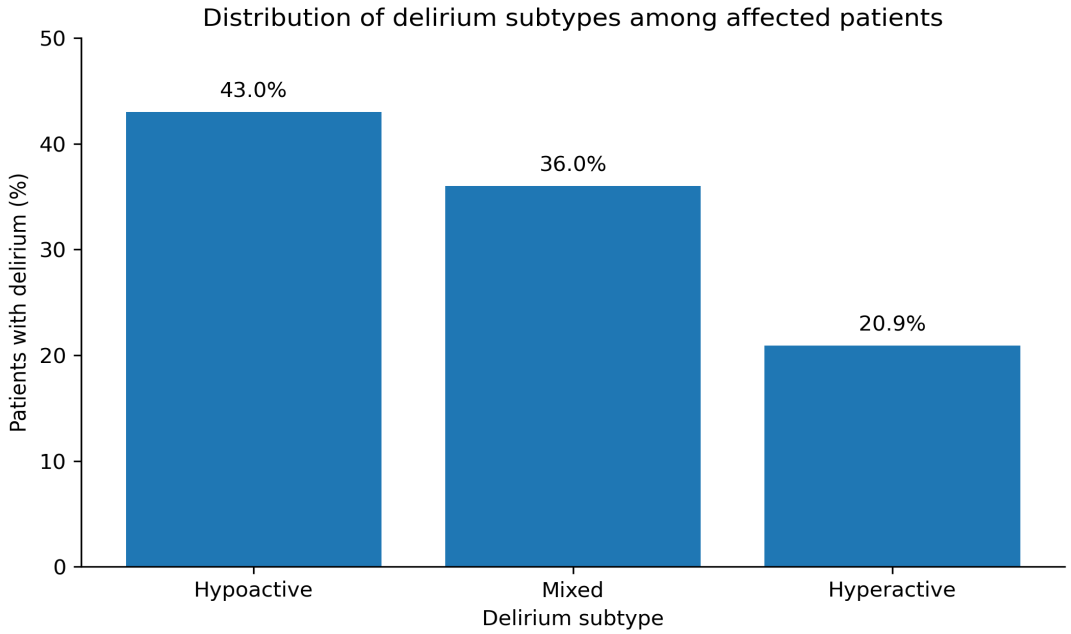

Figure 2: Distribution of delirium subtypes among affected patients.

Factors Associated with Delirium: In univariable analysis, delirium was significantly associated with advanced age, multimorbidity, cognitive impairment, functional dependence, visual and hearing impairment, polypharmacy, psychoactive medication exposure, acute infection, electrolyte abnormalities, anemia, hypoxia, and urinary catheterization.

The proportion of patients developing delirium was particularly high among those with pre-existing cognitive impairment, acute infection, psychoactive medication exposure, hypoxia, and urinary catheterization. The detailed univariable associations are presented in Table 3.

Table 3. Univariable factors associated with delirium

Risk factor	Delirium present, n/N (%)	Delirium absent, n/N (%)	p-value

Age ≥75 years	53/137 (38.7)	84/137 (61.3)	<0.001
Age <75 years	33/183 (18.0)	150/183 (82.0)	
≥3 comorbidities	49/121 (40.5)	72/121 (59.5)	<0.001
<3 comorbidities	37/199 (18.6)	162/199 (81.4)	
Cognitive impairment	29/56 (51.8)	27/56 (48.2)	<0.001
No cognitive impairment	57/264 (21.6)	207/264 (78.4)	
Functional dependence	38/90 (42.2)	52/90 (57.8)	<0.001
No functional dependence	48/230 (20.9)	182/230 (79.1)	
Visual impairment	24/62 (38.7)	38/62 (61.3)	0.020
No visual impairment	62/258 (24.0)	196/258 (76.0)	
Hearing impairment	21/51 (41.2)	30/51 (58.8)	0.014
No hearing impairment	65/269 (24.2)	204/269 (75.8)	
Polypharmacy ≥5	73/238 (30.7)	165/238 (69.3)	0.009
No polypharmacy	13/82 (15.9)	69/82 (84.1)	
Psychoactive medication	31/73 (42.5)	42/73 (57.5)	<0.001
No psychoactive medication	55/247 (22.3)	192/247 (77.7)	
Acute infection	48/117 (41.0)	69/117 (59.0)	<0.001
No acute infection	38/203 (18.7)	165/203 (81.3)	
Electrolyte abnormality	35/89 (39.3)	54/89 (60.7)	0.002
No electrolyte abnormality	51/231 (22.1)	180/231 (77.9)	
Anemia	39/114 (34.2)	75/114 (65.8)	0.029
No anemia	47/206 (22.8)	159/206 (77.2)	
Hypoxia	27/64 (42.2)	37/64 (57.8)	0.002
No hypoxia	59/256 (23.0)	197/256 (77.0)	
Urinary catheterization	34/82 (41.5)	48/82 (58.5)	<0.001
No urinary catheterization	52/238 (21.8)	186/238 (78.2)	

Multivariable Logistic Regression: Variables demonstrating clinical relevance and/or significant associations in univariable analysis were entered into the multivariable binary logistic regression model.

After adjustment for potential confounding factors, five variables remained independently associated with delirium: age ≥75 years, pre-existing cognitive impairment, acute infection, polypharmacy, and electrolyte abnormality.

Pre-existing cognitive impairment demonstrated the strongest independent association with delirium (aOR 2.87; 95% CI, 1.52–5.42; p=0.001). Acute infection was also independently associated with delirium (aOR 2.61; 95% CI, 1.50–4.53; p=0.001), as were age ≥75 years (aOR 2.14; 95% CI, 1.24–3.69; p=0.006), polypharmacy (aOR 2.08; 95% CI, 1.18–3.67; p=0.011), and electrolyte abnormality (aOR 1.94; 95% CI, 1.10–3.43; p=0.022).

Female sex, ≥3 comorbidities, functional dependence, psychoactive medication use, hypoxia, and urinary catheterization were not independently associated with delirium after adjustment. The adjusted associations are presented in **Table 4**.

Table 4: Multivariable logistic regression analysis of factors independently associated with delirium

Predictor	Adjusted OR	95% CI	p-value
Age ≥75 years	2.14	1.24–3.69	0.006
Female sex	1.12	0.68–1.85	0.651
≥3 comorbidities	1.48	0.89–2.46	0.128
Cognitive impairment	2.87	1.52–5.42	0.001
Functional dependence	1.61	0.94–2.76	0.082
Polypharmacy ≥5 drugs	2.08	1.18–3.67	0.011
Psychoactive medication use	1.72	0.98–3.02	0.059
Acute infection	2.61	1.50–4.53	0.001
Electrolyte abnormality	1.94	1.10–3.43	0.022
Hypoxia	1.53	0.83–2.82	0.169
Urinary catheterization	1.42	0.79–2.54	0.240

Clinical Outcomes: Patients who developed delirium experienced significantly poorer short-term hospitalization outcomes than those without delirium.

The mean duration of hospitalization was significantly longer among patients with delirium than among those without delirium (10.8 ± 5.6 vs. 6.9 ± 3.7 days; p<0.001). A hospital stay of ≥7 days occurred in 69 (80.2%) patients with delirium compared with 101 (43.2%) patients without delirium (p<0.001).

ICU transfer occurred in 19 (22.1%) patients with delirium compared with 20 (8.5%) patients without delirium (p=0.001). In-hospital complications were documented in 31 (36.0%) patients with delirium compared with 39 (16.7%) patients without delirium (p<0.001).

Falls occurred in 8 (9.3%) patients with delirium and 9 (3.8%) patients without delirium; this difference was not statistically significant (p=0.073). In contrast, aspiration-related events were significantly more frequent among patients with delirium than among those without delirium (11.6% vs. 3.8%; p=0.018).

New institutional or high-dependency discharge occurred in 18 (20.9%) patients with delirium compared with 17 (7.3%) patients without delirium (p<0.001). Overall comparisons of hospitalization outcomes according to delirium status are presented in **Table 5** and summarized visually in **Figure 3**.

Table 5: Comparison of hospitalization outcomes according to delirium status

Outcome	Delirium (n=86)	No delirium (n=234)	p-value
Length of stay, days, mean ± SD	10.8 ± 5.6	6.9 ± 3.7	<0.001
Hospital stay ≥7 days	69 (80.2%)	101 (43.2%)	<0.001
ICU transfer	19 (22.1%)	20 (8.5%)	0.001
In-hospital complications	31 (36.0%)	39 (16.7%)	<0.001
Fall during hospitalization	8 (9.3%)	9 (3.8%)	0.073
Aspiration-related event	10 (11.6%)	9 (3.8%)	0.018
New institutional/high-dependency discharge	18 (20.9%)	17 (7.3%)	<0.001
In-hospital mortality	11 (12.8%)	7 (3.0%)	0.002

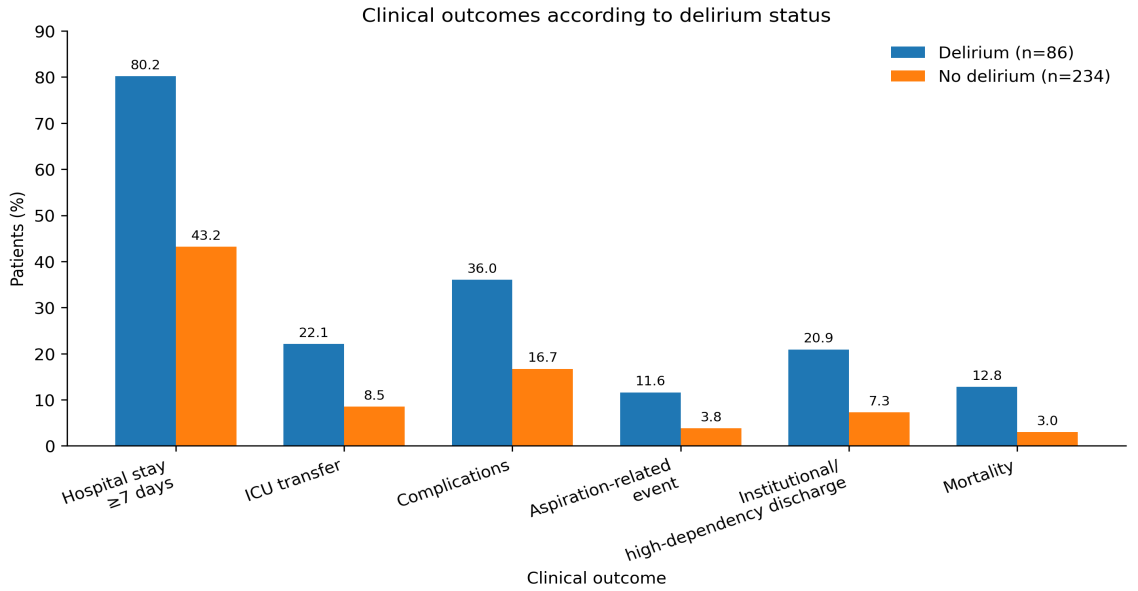

Figure 3: Clinical outcomes according to delirium status.

Mortality According to Delirium Status: A total of 18 deaths occurred during hospitalization. Eleven deaths (12.8%) occurred among patients with delirium, whereas seven deaths (3.0%) occurred among patients without delirium.

The crude odds of in-hospital mortality were approximately 4.7-fold higher among patients with delirium than among those without delirium (OR 4.72; 95% CI, 1.80–12.39; p=0.002). Mortality according to delirium status is presented in Table 6.

Table 6: In-hospital mortality according to delirium status

Mortality status	Delirium, n (%)	No delirium, n (%)

Survived to discharge	75 (87.2)	227 (97.0)
Died during hospitalization	11 (12.8)	7 (3.0)
Total	**86 (100)**	**234 (100)**

Discussion

In this retrospective study of 320 hospitalized geriatric patients, delirium occurred in 26.9% of the cohort. The findings demonstrate that delirium represents a substantial clinical problem among hospitalized older adults and is associated with both patient-related vulnerability and potentially modifiable acute precipitants. This is consistent with the established understanding that delirium results from an interaction between predisposing factors and acute physiological insults rather than from a single isolated cause. [2-5]

The prevalence observed in the present study is clinically plausible for a hospitalized geriatric population. Delirium frequency varies according to patient characteristics, severity of illness, clinical setting, diagnostic approach, and timing of assessment. Inouye reported that delirium is common among hospitalized older adults and that its prevalence increases substantially with advancing age. [2] Similarly, subsequent reviews have emphasized that delirium is common, serious, and frequently underrecognized among older hospitalized patients. [3,5]

Advanced age was independently associated with delirium in the present analysis. Patients aged ≥75 years had more than twice the adjusted odds of delirium compared with younger geriatric patients. Increasing age is associated with declining physiological reserve and greater susceptibility to acute physiological disturbances. Age should therefore be considered an important marker of vulnerability when evaluating older adults at hospital admission. [2,4]

Pre-existing cognitive impairment demonstrated the strongest independent association with delirium in the multivariable model. Patients with cognitive impairment had nearly threefold higher adjusted odds of developing delirium. This finding is consistent with the multifactorial model of delirium in which baseline cognitive vulnerability reduces the threshold for development of acute cognitive dysfunction in response to environmental, metabolic, infectious, or pharmacological stressors. [4] Cognitive impairment is therefore an important factor to establish at admission and should prompt closer monitoring for acute changes in mental status.

Acute infection was another independent predictor of delirium. More than half of the patients who developed delirium had an acute infection. Infection can contribute to delirium through systemic inflammation, fever, dehydration, hypoxia, metabolic disturbances, and other physiological effects of acute illness. [2,4,5] The presence of an acute change in cognition or behavior in an older hospitalized patient should consequently prompt assessment for infection and other reversible medical precipitants.

Polypharmacy was independently associated with delirium after adjustment for other factors. Patients receiving five or more medications had approximately twice the odds of developing delirium. Medication exposure is particularly relevant in geriatric patients because multimorbidity frequently results in the concurrent use of several therapeutic agents. Some medication classes, including benzodiazepines and opioids, have been associated with increased delirium risk, while the cumulative effect of multiple medications may further increase vulnerability. [9]

Electrolyte abnormalities were also independently associated with delirium. Abnormalities in serum electrolytes can interfere with normal neuronal function and may occur in association with dehydration, acute illness, renal dysfunction, medication effects, or inadequate nutritional intake. Early recognition and correction of clinically important metabolic abnormalities should therefore form part of a comprehensive approach to delirium prevention and management.

Several other factors were significantly associated with delirium in the univariable analysis but did not remain independently associated after adjustment. These included multimorbidity, functional dependence, psychoactive medication exposure, hypoxia, and urinary catheterization. This suggests that their observed associations may be partly explained by other patient characteristics or acute clinical factors included in the multivariable model. Psychoactive medication exposure, although significantly associated with delirium in the univariable analysis, did not reach statistical significance after adjustment. Similarly, hypoxia and urinary catheterization were not independently associated with delirium in the adjusted analysis.

The present study also demonstrated a significant association between delirium and prolonged hospitalization. Patients with delirium had a mean hospital stay of 10.8 days compared with 6.9 days among patients without delirium. Delirium may contribute to prolonged hospitalization through increased nursing requirements, impaired mobility, difficulty participating in treatment and rehabilitation, and increased risk of complications. Conversely, prolonged hospitalization may expose susceptible patients to additional precipitating factors, suggesting that the relationship between

delirium and length of stay may be bidirectional. [6-8]

Delirium was additionally associated with increased ICU transfer and inpatient complications. Patients with delirium had higher frequencies of aspiration-related events and new institutional or high-dependency discharge. These findings are consistent with the broader literature linking delirium with adverse clinical and functional outcomes. [6,7] Delirium may represent both a marker of underlying disease severity and a contributor to adverse outcomes. Although falls were more frequent among patients with delirium than among those without delirium, this difference did not reach statistical significance in the present study (9.3% vs. 3.8%; p=0.073).

In-hospital mortality was significantly higher among patients who developed delirium. Mortality occurred in 12.8% of patients with delirium compared with 3.0% of those without delirium, corresponding to a crude odds ratio of 4.72. The association between delirium and mortality has been documented in previous research, including meta-analytic evidence demonstrating an association between delirium and adverse long-term outcomes. [6] However, caution is required when interpreting this association because delirium often occurs in patients with more severe underlying illness and greater baseline vulnerability.[6] Therefore, the present findings demonstrate an association rather than establishing that delirium independently caused mortality.

The findings have practical implications for inpatient geriatric care. Older adults with advanced age, cognitive impairment, multimorbidity, polypharmacy, acute infection, or metabolic abnormalities may benefit from early delirium-risk assessment. Preventive strategies should emphasize regular orientation, preservation of sleep–wake cycles, early mobilization, adequate hydration and nutrition, correction of sensory impairment, appropriate medication review, avoidance of unnecessary urinary catheterization, and prompt identification and treatment of acute medical precipitants. [3-5]

The use of a standardized delirium assessment instrument is also important. The CAM provides a structured approach for recognizing delirium based on acute onset or fluctuating course, inattention, and changes in thinking or consciousness. [10] Systematic assessment may improve recognition, particularly in patients with hypoactive presentations that can otherwise be overlooked.

Overall, the present findings support the concept that delirium should be regarded as an important clinical outcome rather than simply a transient behavioral disturbance. Early identification of vulnerable patients and correction of reversible precipitants may provide opportunities to reduce the clinical burden associated with delirium.

Strengths: The study has several strengths. First, it specifically evaluated delirium in a geriatric inpatient population at increased risk of acute cognitive dysfunction. Second, a broad range of demographic, cognitive, functional, medication-related, and acute clinical variables was assessed. Third, multivariable logistic regression was used to identify independent predictors while accounting for potential confounding. Finally, the study evaluated clinically meaningful outcomes, including prolonged hospitalization, complications, ICU transfer, discharge disposition, and mortality.

Limitations: The retrospective design introduces the possibility of incomplete documentation, information bias, and misclassification. The identification of delirium depended on the availability and quality of clinical documentation and the consistency with which mental status was assessed. Residual confounding by illness severity, frailty, baseline functional status, or other unmeasured variables cannot be excluded. Medication-related analyses may also be affected by variation in dose, duration, indication, and timing of drug exposure. Furthermore, the observational design permits identification of associations but does not establish causality. Finally, the single-center nature of the study may limit generalizability to other healthcare settings.

Conclusion

Delirium occurred in 26.9% of hospitalized geriatric patients in this study. Advanced age, pre-existing cognitive impairment, acute infection, polypharmacy, and electrolyte abnormalities were independently associated with delirium. Delirium was also associated with prolonged hospitalization, increased inpatient complications, greater ICU utilization, institutional or high-dependency discharge, and higher in-hospital mortality.

These findings emphasize the importance of systematic delirium surveillance among hospitalized older adults, particularly those with baseline cognitive vulnerability and multiple acute or chronic medical risk factors. Early recognition and correction of potentially modifiable precipitating factors may help reduce the clinical burden associated with delirium.

Declarations

Ethics Approval: The study was conducted after approval from the Institutional Ethics Committee. The study procedures were performed in accordance with institutional requirements and applicable ethical standards.

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Conflict of Interest: The authors declare no conflicts of interest related to this study.

Data Availability: The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to institutional and ethical restrictions.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington (DC): American Psychiatric Association; 2013.
2. Inouye SK. Delirium in older persons. N Engl J Med. 2006;354(11):1157-65. doi:10.1056/NEJMra052321.
3. Inouye SK, Westendorp RGJ, Saczynski JS. Delirium in elderly people. Lancet. 2014;383(9920):911-22. doi:10.1016/S0140-6736(13)60688-1.
4. Inouye SK. Predisposing and precipitating factors for delirium in hospitalized older patients. Dement Geriatr Cogn Disord. 1999;10(5):393-400. doi:10.1159/000017177.
5. Oh ES, Fong TG, Hshieh TT, Inouye SK. Delirium in older persons: advances in diagnosis and treatment. JAMA. 2017;318(12):1161-74. doi:10.1001/jama.2017.12067.
6. Witlox J, Eurelings LSM, de Jonghe JFM, Kalisvaart KJ, Eikelenboom P, van Gool WA. Delirium in elderly patients and the risk of postdischarge mortality, institutionalization, and dementia: a meta-analysis. JAMA. 2010;304(4):443-51. doi:10.1001/jama.2010.1013.
7. Siddiqi N, House AO, Holmes JD. Occurrence and outcome of delirium in medical in-patients: a systematic literature review. Age Ageing. 2006;35(4):350-64.
8. Leslie DL, Marcantonio ER, Zhang Y, Leo-Summers L, Inouye SK. One-year health care costs associated with delirium in the elderly population. Arch Intern Med. 2008;168(1):27-32. doi:10.1001/archinternmed.2007.4.
9. Clegg A, Young JB. Which medications to avoid in people at risk of delirium: a systematic review. Age Ageing. 2011;40(1):23-9. doi:10.1093/ageing/afq140.
10. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. Ann Intern Med. 1990;113(12):941-8. doi:10.7326/0003-4819-113-12-941.