

Original Article



Mortality Rates during Hospitalization and Affecting Factors in Geriatric Delirium Patients: a Retrospective Cohort Study

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Conflict of Interest

The authors have no financial conflicts of interest.

Author Contributions

Conceptualization: Özdin S; Data curation: Özdin S, Bolat R; Formal analysis: Özdin S; Investigation: Özdin S, Bolat R; Methodology: Özdin S, Bolat R; Project administration: Özdin S; Resources: Özdin S, Bolat R; Supervision: Özdin S; Visualization: Bolat R; Writing - original draft: Özdin S; Writing - review & editing: Bolat R.

ABSTRACT

Background and Purpose: The purpose of this study was to investigate the prevalence of mortality during hospitalization among patients diagnosed with delirium at geriatric consultations requested in the previous one year, together with the factors affecting this.

Methods: The electronic medical records of geriatric consultations requested from the psychiatry department between January 1, 2019 and December 31, 2019 were examined from the automation system. The 200 geriatric delirium patients were included in the study. Patients' age, sex, length of hospital stay (LOHS), time between hospitalization and consultation, the department requesting consultation, reason for consultation request, psychiatric recommendations after consultation, reason for hospitalization, number of comorbid medical diseases, number of daily medications used, and history of psychiatric disease were retrieved from the electronic medical records in the automation system.

Results: LOHS and time from hospitalization to consultation were longer in the exitus group. Numbers of comorbid disease and daily medications used were higher in the died patients. Male gender, higher numbers of comorbid diseases, and daily medications were predictors of death.

Conclusions: Early detection of delirium may be important for short term results of disease. When evaluating these patients, reviewing the drugs used as much as possible can affect the outcome of the disease.

Keywords: Delirium; Aged; Consultation; Death; Male; Length of Stay

INTRODUCTION

The proportion of the geriatric population to the general population is increasing worldwide as life expectancy increases. In 2000, those who aged 65 years or more accounted for 5.6% of the population in Turkey. This is predicted to rise to 10.2% in 2023 and more in subsequent years.¹ The age of 65 is a symbolic one generally adopted for the geriatric population. Due to their increasing prevalence in the geriatric era, delirium and dementia are frequently found in geriatric patients.²

The one-year mortality rate after psychiatric consultation is 15.2%.³ Malignancy and delirium have been identified as conditions that can increase the risk of mortality. An extended time between hospitalization and consultation,³ a prolonged total duration of hospitalization, and an advanced age⁴ are associated with mortality. Patients with delirium during consultation have been found to have higher one-year mortality rate after psychiatric consultation than patients with depression.⁴

Delirium is a neurocognitive disorder that develops rapidly. Attention and awareness are principally affected in patients with delirium, with fluctuations throughout the day. Delirium derives from changes in cerebral functions due to an underlying medical cause.⁵ The prevalence of delirium is increasing together with increases of medical diseases in the geriatric era. The significance of delirium at advanced age derives from its close association with mortality independently of other accompanying factors. The one-year mortality rate in geriatric patients with delirium is 60%, increasing to 72.2% at the end of 5 years.⁶ In addition, 14.7% of geriatric patients with delirium die during hospitalization. Approximately 70% of delirium consultation requests are made by internal medicine departments. Inappropriate benzodiazepine use in delirium is more frequent in surgical departments than in internal medicine departments. However, there is no difference in mortality between the 2 departments.⁷ Comorbidity of delirium and dementia can increase mortality.⁸ Diagnosis of delirium increases the probability of first-time hospitalization in the geriatric era.⁹ It can also increase the probability of subsequent re-hospitalization¹⁰ and prolongs the time to discharge.¹¹ Several variables such as anemia, electrolyte imbalance, nutrition disorders, medications employed, decreased function in sensory organs, infection, trauma, and malignancies commonly seen in the geriatric era play a preparatory role in delirium.¹² Mortality is not associated with diagnostic features of delirium of acute onset or disorganized thinking, although impaired attention and altered state of consciousness can affect the mortality. The risk of mortality increases 2.31-fold in patients meeting all diagnostic criteria for delirium and 1.26-fold in those with subsyndromal delirium.¹³

The purpose of this study was to investigate mortality during hospitalization among patients diagnosed with delirium at geriatric consultations requested in the previous one year, together with factors affecting this mortality.

METHODS

Electronic medical records of geriatric consultations requested from the Psychiatry Department between January 1, 2019 and December 31, 2019 were examined from the hospital automation system, including psychiatric consultation reports, daily progress notes, discharge summaries, expiration summaries, and medication administration records. Delirium diagnosis was based on clinical examination at the time of consultation. Of a total of 3,367 consultations (age ≥ 18 years) during the study period, 1,115 involved the geriatric population (age ≥ 65 years). These 1,115 consultations were requested for 754 different patients. Consultation notes of these 754 patients were examined and all patients diagnosed with delirium were identified. At the end of these procedures, 200 patients were identified as being diagnosed with delirium (**Fig. 1**). The delirium was diagnosed according to Diagnostic Statistical Manual of Mental Disorders 5 diagnostic criteria (disturbance in attention and awareness, additional disturbance in cognition, evidence of a direct physiological consequence of another medical condition, substance intoxication

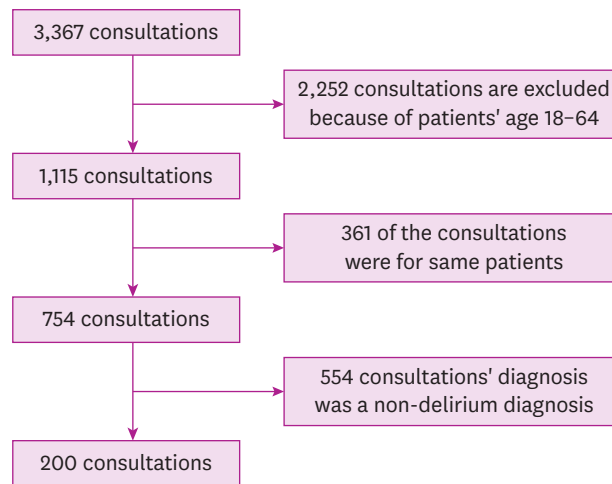


Fig. 1. Flowchart showing patient selection.

or withdrawal, development in a short period of time).⁵ All geriatric delirium patients were included in this study. Age, sex, length of hospital stay (LOHS), time between hospitalization and consultation, the department requesting consultation, reason for consultation request, psychiatric recommendations after consultation, reason for hospitalization, number of comorbid medical diseases, number of daily medications used, repeat consultation requests, history of psychiatric disease, neuroimaging findings, and information concerning administration of general anesthesia during hospitalization of these patients were retrieved from their electronic medical records in the hospital automation system. Laboratory findings (hemoglobin, creatinine, aspartate transaminase, and sodium) and accompanying chronic diseases (hypertension, diabetes mellitus, acute/chronic kidney disorder, malignancy, infection, cardiovascular disorder) of patients when they were hospitalized were also noted. If more than one reason was present on the consultation request note, all reasons were included in this study. Departments from which consultations were requested were classified as surgery and internal medicine. Since information for comorbid medical diseases was unavailable for 4 patients, they were not included in the calculation for the number of comorbid diseases. Number of daily medications used was calculated as the number of daily drugs used by the patient in the week preceding discharge or death. Hydration therapy and drugs used during resuscitation were not included when calculating daily medication numbers. Approval for the study was granted by the Ondokuz Mayıs University Medical Faculty Clinical Research Ethical Committee (No. 2020/144).

Statistical analysis

All statistical analyses were performed using SPSS 22.0 software (SPSS Inc., Chicago, IL, USA). Chi-square test was applied for comparing categorical variables. Numerical variables were expressed as mean±standard deviation (SD), while categorical variables were expressed as number (%). Student's *t*-test was used to compare numerical variables between 2 groups. Binary logistic regression analysis was applied to predict mortality following consultation. Age, sex, LOHS, time between hospitalization and consultation, department requesting consultation, drug recommendation, number of comorbid medical diseases, number of daily medications used, repeat consultation requests, and information concerning administration of general anesthesia during hospitalization were used as covariates. For all tests, *p*-values <0.05 were regarded as statistically significant.

RESULTS

Sociodemographic and clinical characteristics of patients are summarized in **Table 1**. The mean age \pm SD of geriatric patients diagnosed with delirium was 77.3 \pm 7.2 years. There were 129 (64.5%) male patients. The mean LOHS was 25.6 \pm 27.99 days. The mean time between the first day of hospitalization and the day when consultation was requested was 10.7 \pm 12.4 days. A total of 78 (39%) patients died during hospitalization. One hundred fifty-seven (78.5%) of department-requested consultations were from the internal medicine department. General anesthesia was administered to 33 (16.5%) patients during hospitalization. The most common reasons for consultation requests were agitation (n=64, 32%) and hallucination (n=33, 16.5%). Psychosocial recommendations and drug therapy were advised for the majority of consultations (n=158, 79%). The drug most frequently recommended was haloperidol (n=143, 71.5%). The most common reasons for hospitalization were cancer and associated problems (n=65, 32.5%) and problems caused by acute-chronic renal failure (n=33, 16.5%). The mean daily number of medications was 8.5 \pm 4.6 and the mean number of comorbid diseases was 2.9 \pm 1.5. Diagnosis of dementia was present in 14 (7%) patients. Repeat consultations were requested for 53 (26.5%) patients following the initial consultation. Twenty-nine (14.5%) patients had a history of psychiatric disease prior to hospitalization.

It was observed that the mean age of the discharged patients was lower than the patients who died. LOHS and time elapsing from the first day to consultation were longer in the exitus group. No differences in department-requested consultation, recommendation of drug therapy, drug groups recommended, repeat consultation requests, or application of general anesthesia during hospitalization were observed between groups. Hemoglobin level was found to be lower in patients who died than in patients who survived. Numbers of comorbid diseases and daily medications used were higher in exitus patients. While the rate of diabetes and hypertension was found to be higher in patients who died, the rate of kidney diseases (chronic or acute) was found to be higher in survived patients. The most common reasons of death were malignancy (24.4%) and sepsis (19.3%). Results of comparison of sociodemographic and clinical characteristics between groups are shown in **Table 2**. Mortality was higher in patients with delirium due to infection (6/11, 54%) and delirium whose aetiology was being investigated (19/29, 65%). Those whose reasons for consultation were depressive symptoms (5/9, 55%) and sleep-wake problems (12/26, 46%) had higher mortality rates than other consultation reasons.

Male gender in geriatric delirium consultations and greater numbers of comorbid diseases and daily medications used were identified as variables showing statistically significant effects on mortality during hospitalization. Data for the model are shown in **Table 3**.

Table 1. Sociodemographic and clinical features of delirium patients

Variables	Value
Sex	
Male	129 (64.5)
Female	71 (35.5)
Age	77.3±7.2
Result of hospitalization	
Discharged	122 (61)
Died	78 (39)
Hospitalization-consultation time	10.7±12.4
LOHS	25.60±27.99
Department requesting consultation	
Internal medical department	157 (78.5)
Surgical medical department	43 (21.5)
Reasons for consultation	
Agitation	64 (32)
Hallucination	33 (16.5)
Delirium	30 (15)
Sleep-waking problems	26 (13)
Disorientation	23 (11.5)
Depression-anxiety	14 (7)
Impaired consciousness	8 (4)
Others*	9 (4.5)
Recommendations after consultation	
Psychosoc+Psychophar	158 (79)
Psychophar	18 (9)
Psychosoc	11 (5.5)
Others†	13 (6.5)
Recommended drug	
Haloperidol	143 (71.5)
Quetiapine	36 (18)
Benzodiazepine	1 (0.5)
Reason for hospitalization	
Cancer and associated problems	65 (32.5)
ARF-CRF	33 (16.5)
Cardiovascular problems	29 (14.5)
Etiological research	29 (14.5)
Shortness of breath-pneumonia	20 (10)
Infection	11 (5.5)
Others‡	13 (6.5)
Daily No. of medications	8.5±4.6
Comorbid medical diseases	2.9±1.5
MRI (n=38)	
Space-occupying lesion	3
Ischemia	4
Normal Imaging	31
Repeated consultation	
Yes	53 (26.5)
No	147 (73.5)
History of psychiatric disease	
Yes	29 (14.5)
No	171 (85.5)
Accompanying dementia	
Yes	14 (7)
No	186 (93)
General anesthesia during hospitalization	
Yes	33 (16.5)
No	167 (83.5)

Values are presented as number (%) or mean±standard deviation.

LOHS: length of hospital stay, Psychosoc: psychosocial recommendations, Psychophar: psychopharmacological recommendations, ARF: acute renal failure, CRF: chronic renal failure, MRI: magnetic resonance imaging.

*Etiological research, suicide ideation, noncompliance to treatment, psychotic symptoms; †Medication if needed, no recommendation; ‡Trauma, cerebrovascular accident, cirrhosis.

Table 2. Comparison of sociodemographic and clinical features of geriatric delirium patients who died during hospitalization and those who were discharged from the hospital

Variables	Died (n=78)	Discharged (n=122)	p-value
Age	74.9±6.6	78.8±7.3	>0.001
LOHS	39.5±16.7	16.7±15.6	>0.001
Hospitalization-consultation time	17.0±15.6	6.6±7.3	>0.001
Department requesting consultation			0.183
Internal medical department	65	92	
Surgical medical department	13	30	
Drug recommendation			0.122
Yes	67	113	
No	11	9	
Recommended drug			0.412
Haloperidol	52	91	
Quetiapine	14	22	
Repeated consultation			0.826
Yes	20	33	
No	58	89	
General anesthesia during hospitalization			0.465
Yes	11	22	
No	67	100	
Hemoglobin	12.2±1.2	12.7±1.0	0.005
Sodium	134.8±4.5	135.9±5.3	0.125
AST	58.0±28.9	52.4±22.8	0.131
Creatinine	1.0±0.3	1.1±0.3	0.070
Comorbid medical diseases	3.8±1.3	2.3±1.4	>0.001
Hypertension	55 (70.5)	67 (54.9)	0.027
Diabetes mellitus	54 (69.2)	50 (41.0)	>0.001
Malignancy	30 (38.5)	35 (28.7)	0.150
Chronic/acute kidney disorder	6 (7.7)	27 (22.1)	0.007
Infection	6 (7.7)	5 (4.1)	0.277
Cardiovascular disorders	8 (10.3)	21 (17.2)	0.173
Daily No.of medications	12.2±4.3	6.2±3.1	>0.001
Causes of death (n=78)			
Malignancy	19 (24.4)		
Sepsis	15 (19.3)		
Renal failure	13 (16.7)		
Diseases of the circulatory system	11 (14.1)		
Pneumonia	8 (10.2)		
Other reasons	8 (10.2)		
Unknown reasons	4 (5.1)		

Values are presented as number (%) or mean±standard deviation. Italic values are statistical significant results. LOHS: length of hospital stay, AST: aspartate aminotransferase.

Table 3. Results of multivariate binary logistic regression analysis of factors that might affect death in geriatric delirium patients

Variables	Died during hospitalization (n=78) vs. discharged (n=122)			
	B	SE	OR	95% CI for OR
Sex (male vs. female)	-1.05	0.52	2.86*	1.03-7.93
Age	0.14	0.03	0.98	0.92-1.04
LOHS	-0.14	0.01	1.01	0.97-1.05
Hospitalization-consultation time	-0.03	0.03	1.03	0.97-1.10
Department requesting consultation	0.58	0.61	0.55	0.16-1.86
Drug recom. (ref: not drug recommendation)				
Haloperidol	0.03	0.94	0.96	0.15-6.11
Quetiapine	0.38	0.57	0.67	0.22-2.08
Comorbid medical diseases	-0.67	0.17	1.96*	1.40-2.73
Daily drug numbers	-0.37	0.07	1.45*	1.26-1.67
Repeat consultation	0.49	0.52	0.61	0.21-1.71
General anesthesia during hospitalization	0.10	0.70	0.89	0.22-3.54

CI: confidence interval, OR: odds ratio, SE: standart error, LOHS: length of hospital stay.
*p<0.001.

DISCUSSION

Findings of this study showed that: 1) 39% of geriatric delirium patients died during hospitalization; 2) the majority of delirium patients were men; 3) the most commonly observed reasons for department-requested consultations were agitation and hallucination; and 4) psychosocial recommendations together with drug therapy were frequently used in treatment. Haloperidol was the most frequently recommended medication. In geriatric delirium patients who died, LOHS and the time between hospitalization and consultation were longer. In addition, the number of drugs used and the number of comorbid medical diseases were higher in geriatric delirium patients who died. Male gender and greater numbers of comorbid medical diseases and medications used were found to be predictors of mortality during hospitalization in geriatric delirium patients.

Delirium is a neurocognitive disorder that can develop within a short period of time, particularly involving impairment of attention and awareness. It is also accompanied by other cognitive disorders. It may be a hyperactive, hypoactive, or mixed type. The hyperactive type is characterized by agitation, emotional lability, and lack of cooperation with health care.⁵ The hyperactive type is the most common form among patients diagnosed in the geriatric era because it is easier to be diagnosed. The fact that agitation and hallucination were the most common reasons for consultation requests in the present study might also derive from the fact that they were easier to be identified.¹⁴ One reason for this might be that delirium is less frequently diagnosed in women as its association with hyperactive delirium symptoms is observed more frequently in men while hypoactive delirium symptoms are more frequently found in women.¹⁵ Male gender has been identified as a risk factor for hyperactive delirium and agitation symptoms.¹⁶ An association between patient deaths within one year of psychiatric consultation and diagnosis of delirium has also been reported.³ One previous study has reported a mortality rate of 14.7% during hospitalization among delirium patients.⁷ The mortality in the present study was 39%. One probable reason for such difference might be because delirium patients were not sufficiently recognized in our hospital or because consultation was not requested unless the patient's condition worsened even if delirium was recognized. Consistent with this, 72% of geriatric delirium patients hospitalized for treatment were not recognized in one previous study, with reasons being institutional, individual, or patient-specific.¹⁷ On the other hand, even if delirium is diagnosed, fewer psychiatric consultations might have been requested.¹⁸ Previous studies have reported that earlier requests for psychiatric consultation and compliance with recommendations made by patient's primary physician could lead to earlier discharge.^{19,20} Similar to results of the present study, shorter LOHS and shorter time between hospitalization and consultation were also observed in discharged geriatric delirium patients in those previous studies.^{19,20} From that perspective, it may be concluded that early psychiatric consultation is important. Previous studies have also shown that routine evaluation of patients for early diagnosis of delirium can reduce mortality rates.²¹ Patients who died during hospitalization in this study were younger than those who discharged. This might be attributed to the high proportion of men enrolled in our study. This might be because delirium has a more severe impact on women at later ages while it has a more severe impact on men at earlier ages.²²

Delirium is a neurocognitive disease developing within a short period of time in which neuronal functions are affected through systemic causes.⁵ There are several preparatory and precipitating factors. Advanced age and male gender are unmodifiable risk factors. Various systemic diseases and conditions can also modify delirium. Thus, precautionary measures

can be taken.¹² Delirium has been associated with mortality independently of other variables. It has also been shown that it can increase the risk of mortality more than other psychiatric diagnoses. Male gender, hypertension, and Alzheimer disease have been identified as variables determining the mortality of patients with delirium.⁶ The most important step in the treatment of delirium is treating underlying preparatory factors (particularly diseases and using medications).²³ However, during delirium, individuals may become more susceptible to diseases and side-effects of medications in association with changes in the central nervous system. On the other hand, homeostatic mechanisms are less tolerant of stressors in older ages than in younger ages.²⁴ Increasing drug use and higher number of accompanying medications can also exacerbate frailty. Increased frailty and inadequate homeostatic mechanisms are linked to mortality.²⁵ For these reasons, greater numbers of medications used and higher numbers of comorbid diseases being linked to mortality might be regarded as an expected finding, although they did not exhibit a preparatory effect on delirium.

As a result, in delirium of the geriatric period, patients may need to be followed up closely in case of an excess of accompanying medical diseases and medications.

One limitation of the present study was that it was performed retrospectively. In addition, the severity of delirium was not measured. Another limitation of this study was that the study sample was small. Thus, generalization of study results might not be appropriate. Since only consultations requested from psychiatry were evaluated, cases where consultation was not desired or overlooked might have decreased the generalizability of this study.

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