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Evaluation of factors affecting the length of stay of geriatric patients in the emergency department

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ABSTRACT

OBJECTIVE: The emergency department length of stay (EDLOS) is one of the essential parameters of emergency healthcare management efficacy, and prominent factors that contribute to EDLOS are critical in enhancing emergency department (ED) patient care effectiveness, particularly for older patients, which is rarely investigated.

METHODS: This single-center, prospective cohort study was performed in the ED of a tertiary care hospital. The patients were classified into two groups according to EDLOS (≥4 h vs. <4 h). The chief complaints, consultant branches, the patients' comorbidities, polypharmacy status, time of presentation, laboratory, imaging investigations, EDLOS, Clinical Frailty Score (CFS) score, mini mental examination test, National Early Warning Score 2 (NEWS2), consultations, and outcome of the patients were compared with Spearman and Kendall tau-b correlations.

RESULTS: During the 30-day study period, a total of 222 geriatric patients were included in the study. The mean age of study patients was 79.13±9.43 years, and 47.05% of patients were male. The Median EDLOS was 250 (range, 60–1440) min. The patients who arrived on the night shift (p=0.047), who had chronic heart failure (p=0.025), chronic obstructive pulmonary disease (p=0.03), severe dementia according to the MMSE (p=0.008), higher CFS frailty scores (p=0.03), and higher clinical acuity according to the NEWS2 score, were found to be positively correlated to an EDLOS of >4 h. (p=0.001) Any specialty consultation and specialty consultation number, along with hospitalization, were also positively correlated to an EDLOS of >4 h. (p=0.001).

CONCLUSION: High-acuity patients with frailty and dementia are at increased risk for increased EDLOS via consultations. Emergency and consultation physicians should communicate better about which patients are vulnerable to EDLOS case by case, and the patient outcome must be decided as soon as possible.

Keywords: Emergency department; frailty; length of stay.

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Emergency department (ED) treatment is a critical component of public healthcare systems, but the growing number of patients seeking care from EDs has resulted in a longer ED length of stay (EDLOS), which is a crucial indicator of the effectiveness of emergency healthcare management and is influenced by various factors, including organizational practices and patient characteristics such as age and medical history [1, 2]. Globally, ED utilization increases, particularly for patients aged older than 80 years admitted to ED around 3.5 fold compared to younger patients, and in the future, the number of geriatric ED visits is expected to increase [3]. Furthermore, geriatric patients tend to present with multiple and complex comorbid diseases, often combined with multiple drug usage and frailty, with an increased risk of severe events such as delirium and death. Thus, management of older adults in the ED is time-consuming and requires the utilization of resources and hospitalizations [4, 5].

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The literature indicates that older patients in the ED tend to have a longer EDLOS with a longer length of stay in the observation units, and this situation leads to decreased personnel performance [6,7]. In ED, the prolonged LOS may cause hesitancy to order tests or consultations that may take a long time, uncompleted work-up, insufficient monitoring, and inadequate treatment [8], and delayed EDLOS is associated with reduced quality of care and, more importantly, patient harm and malpractice [9] Therefore, understanding the factors that contribute to EDLOS is a critical action in enhancing ED patient care effectiveness, particularly for older patients.

In the literature, most of the studies examining EDLOS are retrospective, and factors that are prominent in the geriatric population are rarely investigated. Moreover, the studies are commonly performed in the healthcare systems of developed countries. Although Turkiye is one of the countries in which the healthcare system depends on EDs, studies regarding EDLOS are scarce for geriatric ED attenders. In the present study, we aimed to identify the factors that affect the EDLOS based primarily on patient characteristics such as frailty, the National Early Warning Score 2 (NEWS2), the Mini-Mental State Examination (MMSE), and secondarily on organizational factors such as consultations during the patients' journey throughout the ED.

Highlight key points

- EDLOS in emergency deparment for elder patients is an essential concept to be kept in apropriately minimum.
- Patients who are frail, have COPD,dementia, Chronic heart disease are at risk for increased EDLOS.
- Hospital managers should consider appropriate measaures to decrease time of consultations for frail and dementia patients to keep EDLOS minimum.
- Practical scores such as Clinical Frailty Score and National Early Warning System 2 migth be used to predict EDLOS.

MATERIALS AND METHODS

Study Design and Study Population

This single-center, prospective cohort study was performed in the ED of a tertiary care hospital in Turkiye, which has an 850-bed capacity. The ED is run by eight to 10 interns, five to eight emergency medicine residents, one consultant emergency medicine physician specialist, and 25–30 emergency medicine nurses or paramedics in each shift.

The data for our study were collected between April 1st, 2021, and May 1st, 2021. All patients who presented to the ED were categorized into the five-level triage system using the Manchester Triage Scale triage protocol used in the ED to facilitate the prioritization of patients, and patients older than 65 years who were admitted to ED observation wards were enrolled in the study. Patients who were traumatic or referred from another hospital were excluded from the study.

According to the working scheme in the ED, after obtaining the patient's history and completing the physical examination by emergency medicine physicians, blood tests were taken or imaging studies (i.e., plain films, ultrasound, or computed tomography (CT) scan) were obtained, if required. After the evaluation of the patient, emergency medicine either consults the patient with a specialty physician or decides on discharge. After the consultation, the consultant decides on hospitalization, requests additional analysis and imaging, requests consultation from another department, or decides on the patient's discharge according to his or her specialty.

Data Collection

Data were collected directly from patients or their caregivers and recorded prospectively. The EDLOS was defined as the time between the initial presentation to the ED and the outcome. Collected data included the Mini Mental State Examination (MMSE), frailty score according to the Clinical Frailty Score (CFS), and National Early Warning System 2 score (NEWS2) to assess the acuity of the patient. The NEWS2 score, developed by the Royal College of Physicians of London, is an early warning score used to predict the risk of cardiac arrest, unexpected intensive care unit conditions within 24 h, or death. It is calculated on a predetermined table by evaluating parameters such as respiratory rate, oxygen saturation, whether or not oxygen support, body temperature, systolic pressure, pulse, and consciousness status [10]. Patients were classified as 0–3 according to the NEWS and included in the analysis. 0 indicates a low clinical risk, while 3 indicates a high clinical risk.

Frailty is a geriatric syndrome consisting of parameters such as decreased physical activity, weight loss, loss of motor power, and burnout, which occurs as a result of the decreased insufficiency in the physiological systems of patients [11]. The frailty of the patients was measured

with the Rockwood Frailty Index. This index is validated in the Turkish population [12]. In our study, patients scoring ≥5 points were considered frail.

The MMSE can be performed at the bedside to measure the mental state of the elderly. It is calculated by evaluating the patient's cognitive ability, orientation, calculation, attention, calculation, naming, repetition, reading, comprehension, and drawing abilities [13]. The scores can range between 0 and 30. A score of 25 and above is considered normal. Scores of 10–19 indicate moderate dementia. Scores of 19–24 indicate early dementia. In our study, we used the prespecified scores accordingly.

Besides the chief complaints, consultations, the patients' comorbidities, polypharmacy status, time of presentation, laboratory and imaging investigations, EDLOS, and outcome were noted. The patients were classified into two groups according to EDLOS (≥4 h vs. <4 h). The rationale behind this categorization is the policy of the Republic of Turkiye's Ministry of Health to conclude patients in the emergency room within 4 h. This practice is also observed in the health systems of other countries and is accepted by the literature [3]. The primary outcome of the study was to determine the parameters concerning the EDLOS of patients who attended an ED.

Statistical Analysis

Statistical analysis was performed using the Number Cruncher Statistical System version 2007 software (NCSS LLC, UT, USA). Continuous data were expressed in mean±standard deviation, or median (min–max), while categorical data were expressed in number and frequency. The distribution of the variables was examined using the Shapiro-Wilk normality test, while the Kruskal-Wallis test was used for the comparisons of the variables that did not show a normal distribution. The Spearman and Kendall tau-B tests were used to describe the correlation between parameters, and logistic regression analyses were performed for the subgroup analyses. A $p<0.05$ was considered statistically significant.

Ethical Considerations

Prior to the study, all patients were informed about the nature of the study, and written informed consent was obtained. The study was approved by the institutional Ethics Committee of a Medeniyet University (date of approval: February 24, 2021) (no. 2021/0157) and conducted in accordance with the principles of the Declaration of Helsinki and the ethical standards of Turkiye.

RESULTS

During the 30-day study period, a total of 222 geriatric patients were included in the study. The mean age of study patients was 79.13±9.43 years, and 47.05% of patients (n=104) were male. The Median EDLOS was 250 (range, 60–1440) min. The characteristics of the patients are given in Table 1.

Age (p=0.771, r=0.382) and sex (p=0.962, r=-0.134) were not correlated to EDLOS of >4 h. The patients who arrived on the night shift (p=0.047, r=0.010), and had chronic heart failure (p=0.025, r=0.151), chronic obstructive pulmonary disease (p=0.03, r=0.320), severe dementia according to the MMSE (p=0.008, r=0.24), higher CFS frailty scores (p=0.003, r=0.200), and higher clinical acuity according to the NEWS2 score (p=0.0001, r=0.353), were found to be positively correlated to EDLOS of >4 h.

Any specialty consultation (p=0.0001, r=0.003), and specialty consultation number (p=0.0001, r=0.202), along with hospitalization (p=0.008, r=0.21), were also positively correlated to EDLOS of >4 h. The median duration of consultation was 123 (range, 40–273) min. No statistically significant correlation was found between the total consultation duration of 131 patients who were consulted in specialties with MMSE scores, CFS frailty scores, NEWS2 scores, and age (p=0.994, p=0.194, p=0.778, and p=0.136, respectively). However, the number of consultations was statistically significantly and positively correlated to the NEWS2, CFS frailty score, MMSE score, and admittance to the ward (r=0.142, p=0.039; r=0.292, p=0.00; r=0.170, and p=0.014; p=0.0001, r=0.510, respectively). Age was not correlated to the number of consultations (r=-0.124, p=0.72).

The factors affecting the EDLOS groups were further examined with subgroup logistic regression analysis for the parameters that were found to affect the EDLOS of >4 h (Table 2). Specialty consultation and number of consultations were found to be the more significant contributors to EDLOS of >4 h (p=0.0001 for both) than CFS and NEWS2 scores (p=0.869 and p=0.093, respectively).

DISCUSSION

In the current study, we found that the most prominent factor of EDLOS is consultation number, clinical frailty assessed by the CFS score, and the clinical severity of the patient, which is determined by the NEWS2 score.

Table 1. Patient characteristics and parameters which effect the EDLOS longer than 4 h

	<4 h (n=108)	>4 h (n=113)	p	r
Age			0.771	0.382
65–74 age	33.33	32.74		
75–85 age	40.74	41.59		
>85 age	25.93	25.66		
Gender			0.962	-0.134
Male	47.22	46.90		
Female	52.78	53.10		
Time of arrival			**0.047**	**0.010**
Morning shift	61.11	47.79		
Night shift	38.89	52.21		
Polypharmacy	62.96	61.95	0.876	0.11
Co-morbidities				
Diabetes mellitus	49.07	37.17	0.99	0.0001
Systemic hypertension	79.63	79.65	0.998	0.132
Coronary artery disease	19.44	32.74	0.49	0.151
Chronic renal failure	11.11	9.73	0.75	-0.021
Chronic heart failure	19.4	0.00	**0.025**	**0.151**
Chronic obstructive pulmonary disase	2.78	14.16	**0.03**	**0.320**
Cerebrovascular disease	1.85	1.77	–	–
Atrial fibrillation	2.78	2.65	–	–
Dementia	10.19	22.12	0.891	0.203
Malignities	3.70	4.42	–	–
Mini mental test score			**0.008**	**0.24**
18–23	26.85	31.86		
23–30	62.96	46.90		
<18	10.19	21.24		
Clinical frailty score (4.02±2.17)/4.89±2.1)				
Frailty score <5	72.22	54.87	**0.003**	**0.200**
Frailty score≥5	27.78	45.13		
National early warning system 2 score				
Low risk	65.74	41.59	**0.0001**	**0.353**
Moderate or high risk	34.26	58.41		
Specialty consultation				
No	50.9	15.92	**0.0001**	**0.003**
Yes	49	84.07		
Consultation number	0.69±0.82	1.51±1.22	**0.0001**	**0.202**
Computerized tomography				
Yes	62.04	71.68	0.105	-0.077
Magnetic resonance imaging				
Yes	25.93	19.47	0.253	0.172
Any ultrasonography				
Yes	2.78	11.50	0.11	0.42
Admittance to ward				
Yes	35.2	53.1	**0.008**	**0.21**
Arrival way				
Self	25.00	21.24	0.531	-0.111
Ambulance	75.00	77.88		
Diagnosis				
Int medicine	65.4	34.6	**0.00**	-0286
Neurology	53.2	46.8	0.718	0.20
Cardiology	50	50	0.927	0.005
Chest diseases	100	0	**0.0**	-0.224
Surgery	85.1	14.9	**000**	-0.0307
Infectious diseases	18.1	81.9	0.01	0.184

Table 2. Logistic regression analyses of the factors which was shown to affect the EDLOS of geriatric patients

	B	SE	Wald	Sig.	Exp(B)	95% CI	
						Lower	Upper
Age	-0.014	0.022	0.391	0.532	0.986	0.945	1.030
Sex	-0.315	0.348	0.820	0.365	0.730	0.369	1.443
Arrival time	-0.799	0.342	5.467	**0.019**	0.450	0.230	0.879
Chronic heart failure	0.794	0.405	3.845	**0.050**	2.213	1.000	4.894
COPD	1.799	0.773	5.418	**0.020**	6.045	1.329	27.498
Clinical frailty score	0.076	0.458	0.027	0.869	1.079	0.439	2.649
NEWS2	0.606	0.361	2.826	0.093	1.834	0.904	3.720
Specialty consultation	-1.701	0.321	28.040	**0.000**	0.183	0.097	0.343
Consultation number	0.827	0.202	16.768	**0.000**	2.286	1.539	3.397
Admittance to ward	0.735	0.276	7.095	**0.008**	2.085	1.214	3.581
Infectious diseases	0.199	1.424	0.019	0.886	1.220	0.75	18.8

EDLOS: Emergency department length of stay; SE: Standard error; CI: Confidence interval; NEWS2: National early warning system 2; COPD: Chronic obstructive pulmonary disease.

The EDLOS is an important quality factor for EDs that increases patient mortality. Although age has frequently been associated with EDLOS [14], there are a limited number of reports on parameters that affect the EDLOS of geriatric ED attendees, and the studies available in the literature are usually retrospective in nature [3,5]. In addition, age-related changes in comorbidity and disease severity or problems that occur in later stages of life, such as frailty and dementia, have not been extensively researched. Several studies in the literature only perform patient-based analysis and do not focus on consultation times, blood tests, or imaging, which are important problems that increase EDLOS [15]. We believe that the current literature lacks data about quick, reliable, and easy-to-use tools that may predict the EDLOS. Therefore, in the present study, we attempted to prospectively examine the effect of factors such as CFS, NEWS2, and MMSE on EDLOS, along with other clinical parameters and consultations.

In the study, frailty, the NEWS2 score, and advanced dementia patients, according to the MMSE, increased EDLOS. Frailty is usually described as an aging-related syndrome of physiological deterioration, characterized by significant susceptibility to adverse health consequences. Although there are abundant studies on frailty and hospital length of stay, there are few studies on the effect of frailty on EDLOS [16]. In a study conducted in a tertiary care hospital in Germany, frailty increased EDLOS, but the causality between these two parameters was not determined [17]. It is observed that Frailty was found to be associated with both increased consultations and EDLOS. Frail adults are less competent to tolerate and adapt to stressors such as acute illness or trauma than non-frail older adults [18], which may complicate ED management and cause more consultations, imaging, and blood tests, thereby increasing EDLOS. Recognition of frailty and related risks for adverse health outcomes may enhance treatment for this most susceptible group of patients and reduce EDLOS.

In the study, MMSE scores were positively correlated with increased EDLOS. We hypothesized that patients' dementia severity might affect EDLOS, as they would be examined for a long time due to communication defects, consultation would be requested, and more tests and imaging would be performed on these patients. Geriatric patients with dementia have longer hospital visits, need more intensive care, and sustain higher expenses compared to elderly patients without dementia [19]. The length of hospital stay seems to be influenced by comorbidities, comedication, neuropsychiatric symptoms, and hospital organizational factors in patients with dementia [20]. Further studies are needed to examine the factors that explain why dementia increases EDLOS in the ED and to explain the causality relationship.

The NEWS2 is a valid test that has long been used in EDs for the evaluation of patients' acuity. Although it is shown in the study that the NEWS2 score could be used as a potential risk factor for increased EDLOS, there is a limited amount of data in the literature. In a previous study, which was only conducted on frail patients, the lack of a significant relationship between EDLOS and the NEWS2 score was attributed to hospital overcrowding [21]. While non-critical patients can be followed by emergency physicians and their discharge can be decided, other patients need hospitalization, which results in increased monitoring and consultations that may explain the relationship between EDLOS and the NEWS2 score in the current study.

Consultation and referral are essential elements of patient management in EDs. Consultations are common and frequently lead to hospital admittance in E.D. Most of the communication regarding consultation occurs between attending emergency physicians and consulting residents. It was found that the clinical conditions that contributed the greatest to the high number of consultations were NEWS2, CFS frailty score, MMSE score, and admittance to the ward. While the number of consultations affects EDLOS, it is not affected by the duration of individual consultations. In other words, it is predicted that the EDLOS of the patients would be shortened if they were consulted less by the appropriate departments. We suggest that patients with geriatric syndromes such as frailty and dementia who are admitted to the emergency room be examined by the Geriatric Team, with the expectation that several consultations will be required. Clinical management algorithms may be developed for potential long-term EDLOS patients. In addition, the consultation decision can be made by an experienced emergency physician, so the number of consultations can be limited. The most experienced clinician should be the consultant. The fact that patients attend in the evening probably makes it difficult to access an experienced consultant physician during that period. It was observed that the period of patients with pre-diagnoses related to internal medicine and chest diseases was found to be short. It is predicted that emergency room physicians can quickly evaluate the pathologies related to these specialties and make their own discharge decision, thus reducing the need for consultation and ultimately EDLOS.

Although the study has numerous strengths, such as a prospective design that addresses problems associated with geriatric patients in detail, it also has certain limitations. The main limitation is that it is performed in a single center, which limits the representativeness and size of the sample. Second, the fact that physicians examining patients do not have similar medical knowledge, skills, and experience may have affected EDLOS. Nonetheless, we believe that, as a tertiary academic hospital, this effect is kept to a minimum, since we act according to certain clinical algorithms in the ED. Third, the results of the study may not represent the picture for hospitals at all levels, as tertiary hospitals usually manage more complicated patients that require a multidisciplinary approach and increase consultation rates, thereby increasing EDLOS eventually. In the future, we conclude that different frailty scores can be assessed on EDLOS, and intervention studies on consultant physicians awareness of frailty and clinical severity of geriatric patients in the emergency department might be planned.

Conclusion

EDLOS in emergencies for geriatric patients is an important concept that should be kept to a minimum. High-acuity patients with frailty and dementia are at increased risk for increased EDLOS via consultations. Emergency and consultation physicians should communicate better about which patients are vulnerable to EDLOS case by case, and the patient outcome must be decided as soon as possible.

Ethics Committee Approval: The Istanbul Medeniyet University Clinical Research Ethics Committee granted approval for this study (date: 24.02.2021, number: 2021/0157).

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