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RESEARCH

ANALYSIS OF THE USE OF RESOURCES AND FEATURES OF PRESENTATIONS AND THE TRENDS IN GERIATRIC PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT: 2011–2015

ABSTRACT

Introduction: The purpose of the present study was to evaluate presentation and resource utilization at the emergency department by patients ≥65 years of age and the associated trends over the years.

Materials and Method: This is a descriptive and retrospective study. Data related to patients ≥65 years of age who presented to emergency department of an urban university hospital between January 1, 2011 and December 31, 2015 were gathered from the hospital information management system. The data were analyzed using SPSS v17.0 software.

Results: A total of 29,298 (20.3%) of emergency department visits were made by patients ≥65 years of age. The composition of this group of patients was predominantly female and within the 65–74-year-old age group. A 25% increase in the number of emergency department visits by geriatric patients was observed between 2011 and 2015. Among the geriatric presentations, 76.5% had urgent conditions and 9.3% were admitted to the hospital. Most of the non-urgent patients were females of 65–74 years of age ($p<0.05$). Female patients had the highest wait times before evaluation by a physician and the highest non-admission rates ($p>0.05$). Patients of 75–84 years of age had the highest total costs as a group, whereas patients ≥85 years of age had the highest per-patient costs.

Conclusion: Resource utilization, length of emergency department stay, and hospital costs increased with geriatric patients' age. Analysis of the frequency of ED use and of resource utilization by geriatric patients would allow patient-centered and cost-effective planning for emergency department care.

Kew Words: Emergency Service; Hospital; Geriatrics; Patients.

ARAŞTIRMA

ACİL SERVİSE BAŞVURAN GERİATRİK HASTALARDA TRENDLERİN, BAŞVURU ÖZELLİKLERİNİN VE KAYNAK KULLANIMLARININ ANALİZİ: 2011–2015

ÖZ

Giriş: Çalışmanın amacı; acil servise başvuran ≥65 yaş hastaların acil servis başvurularını, kaynak kullanımlarını ve yıllar içerisindeki eğilimlerini değerlendirmektir.

Gereç ve Yöntem: Çalışma tanımlayıcı ve retrospektif bir çalışmadır. Bir üniversite hastanesinin acil servisine başvuran ≥65 yaş geriatrik hastaların verileri, 1 Ocak 2011-31 Aralık 2015 tarihleri arasında, hastane bilgi yönetim sisteminden elde edildi. Veriler SPSS 17.0 ortamına yüklenerek değerlendirildi.

Bulgular: Acil servs başvurularının 29.298'i (%20.3) ≥65 yaş hastalar oluşturdu. 65-74 yaş hastalar ve kadın hastalar bu grupta dominanttı. 2011-2015 arasındaki geriatrik hasta başvurusunda %25'lik artış saptandı. Hastaların %76.5'i 'acele' hastaydı ve %9.3'ü hastaneye yatırıldı. Acil olmayan hastaların çoğu 65-74 yaş ile kadın hastalardı ($p<0.05$). Kadın hastalar en yüksek, hekim muayenesini bekleme sürelerine ve yatışı yapılamayan hasta oranlarına sahipti ($p>0.05$). 75-84 yaş hastalar hizmet maliyeti en fazla, >85 yaş hastalar kişi başı hizmet tutarı en fazla olan gruptu.

Sonuç: Geriatrik yaş grubu yükseldikçe acil servis kaynak kullanımlarının, acil serviste kalış sürelerinin ve hizmet maliyetlerinin arttığı saptanmıştır. Geriatrik hastalar tarafından acil servisin kullanımının sıklığı ve kaynak kullanımı analizi, acil servis bakımı için hasta yararı odaklı ve maliyet etkin planlar yapılmasını sağlayacaktır.

Anahtar Sözcükler: Acil Servis; Başvuru; Geriatri; Hasta.

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Introduction

The percentage of geriatric patients receiving services from emergency departments (EDs) has been increasing over the years. Due to the services provided to the geriatric population at ED, the atypical disease presentations, and the multiple sources of health disorders in this population, the management of this patient group requires multi-dimensional planning. For this reason, having knowledge about the reasons and trends in geriatric patient ED visits is critical to allow the use of health resources in an efficient, productive, and cost effective manner.

With regard to the defining age of geriatric patients, it is only possible to discuss a widely accepted age range, rather than an age on which there is a consensus. In general, the well-accepted geriatric age range is ≥65 years (1, 2). Geriatric ages are grouped as: young-old (65–74 years), middle-old (75–84 years), and oldest-old (≥85 years) (1, 2).

Recent developments in medicine and improvements in life conditions resulted in an increased life expectancy at birth and an increase in the ratio of the geriatric population to the general population (3-5). In 2013, the life expectancy at birth was 76.3 years in Turkey (3). The percentage of the population ≥65 years of age was 7.2% in 2010, and it rose to 8% in 2014. This rate is expected to reach 10.2% by 2023 (3). Furthermore, in recent years, the rates of hospital admission, resource utilization, number of ED visits by geriatric patients have increased (5,7).

Using institutional and national epidemiological data, this study aims to contribute to the planning of emergency healthcare services for geriatric patients by evaluating ED use by this population.

Materials and Method

Study Design and Population

This descriptive and retrospective study was approved by Baskent University Institutional Review Board (Project No: KA15/283). Geriatric patients ≥65 years of age who had presented to the Baskent University Ankara Hospital Adult Emergency Department (ED) between January 1, 2011 and December 31, 2015 were included in the study, excluding patients with incomplete hospital records.

Study Scope

Data regarding the use of emergency services and the demographic characteristics of geriatric patients during the study period were obtained from the hospital patient information management system (PIMS). The following evaluations were conducted on the patients:

a. Parameters, including gender, age group, presentation time, triage codes (emergent, urgent, non-urgent), International Classification of Diseases (ICD) 10 codes, complaints, wait times for physician examination, resource utilization rates, ED length of stay, admission rates to observation units or other wards, consultation rates, death rate, referral rate, prescription rates upon discharge, and average costs for services.
b. Changes number of ED visits, rates of use of resources, and rates of admission to the intensive care unit (ICU) and other wards during the study period.
c. Analyses were performed to determine whether there was a statistically significant difference between different age groups and genders and their respective wait times for physician examinations, triage codes, length of stay in ED, and admissions to ICU and other wards.

Data Analysis

The study data were analyzed using the SPSS 17.0 software. The descriptive statistical data were presented as frequency distributions, percentages, minimum and maximum values, mean, median, and standard deviations. Analytical data, including the relationship between the patients' genders and ages and their respective length of stay in ED, presentation time, triage codes, admission to ICU or another ward from ED, and wait times for examination by a physician were tested using the chi-square test. The differences between the rates of these variables for different categories of patients were assessed for statistical significance using the Z-test. A p-value of <0.05 was considered to be statistically significant.

Results

A total of 166,519 adult patient presentations to ED occurred during the study period. Among these, 33,789 (20.3%) of the patients were >65 years of age. Among this geriatric group, 4,491 were excluded from the study due to incomplete patient records. For the remaining group of 29,298 patients, 44% were of ages 65–74 years and 61% were female (Table 1). From the first (2011) to the last year (2015) of the study, geriatric patient presentations at ED increased by 25% (Table 2).

The time duration between admission to ED and examination by the emergency physician was defined as "physician

Table 1— Distribution of Geriatric Patient Age Groups Based on Gender and Associated Costs for Services

Age Group (years)	Male (n)	Female (n)	Total (n/%)	Total Costs for Services (TL)	Costs for Services per-patient (TL)
65–74	5.305	7.505	12.810/44	1.134.697	89
75–84	4.272	6.782	11.054/37	1.185.315	107
≥85	1.829	3.605	5.434/19	698.495	129
Total (n/%)	11.406/39	17.892/61	**29.298/100**	3.018.506	103*

*Mean service cost per geriatric patient

Table 2— Trends in the Numbers of Geriatric Patients Presenting to ED

Data	2011 (n)	2015 (n)	Change During 2011–2015 (%)*
Age (years)			
65–74	2521	3245	+29
75–84	2303	2661	+16
≥85	1025	1407	+37
Gender			
Female	3645	4416	+21
Male	2204	2897	+31
Total	**5849**	**7313**	**+25**

**Per cent increased in the number of patients presented to the ED in the years 2011 and 2015.

examination wait time." The mean physician examination wait time was 22 min 49 s (95% CI, 22.42–22.95) and the median physician examination wait time was determined to be 15 min 55 s.

A statistically significant relationship was found between the patient genders and the physician examination wait times ($p<0.05$). Accordingly, while the majority of male patients waited for 15 min to be examined by the emergency physician, the majority of female patients waited for 60–90 min (Figure 1). Similarly, a statistically significant relationship was found between the patient age groups and the physician examination wait times ($p<0.05$). Patients ≥85 years waited for a shorter period for the physician examination than the patients of age 65–74 years (Figure 2).

Triage codes for patients have been recorded in PIMS since January 1, 2012. A total of 24,904 geriatric patients were coded from that day. Among those, 76.5% were urgent, 17% were emergent, and 6.5% were non-urgent cases (Table 3).

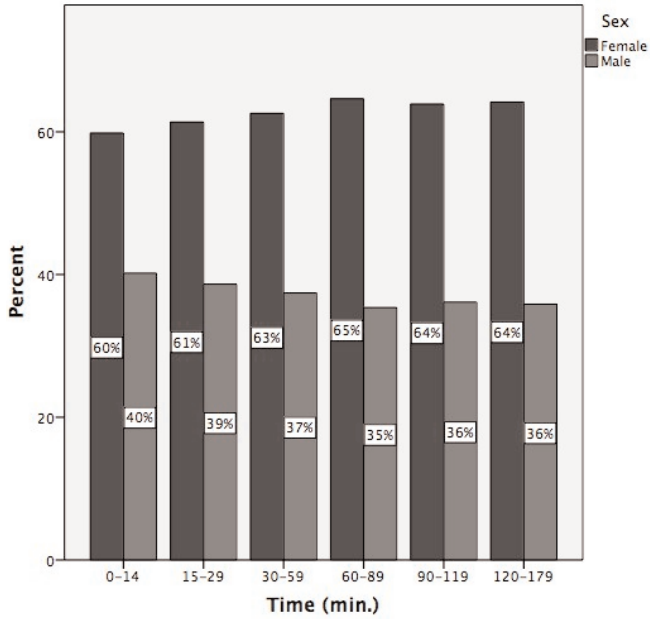

Figure 1— Relationship between patient genders and physician examination wait times.

A statistically significant relationship was found between patient gender and triage codes ($p<0.05$). The percentages of female patients categorized as non-urgent and male patients categorized as emergent were higher than percentages of each gender categorized under other triage codes.

A statistically significant relationship was also found between the patient age groups and triage codes ($p<0.05$). Specifically, the percentages of patients in the 65–74 age group categorized as non-urgent and in the 75–84 and the ≥85 age groups categorized as urgent and emergent, respectively, were higher than those categorized under other triage codes.

Table 3— Distribution of the Triage Codes Based on Geriatric Age Groups and Genders

Data	Emergent			Urgent			Non-Urgent		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
Age (years)									
65–74	1686	40	(0.385-0.415)	8313	44	(0.433-0.447)	950	59	(0.566-0.614)
75–84	1606	38	(0.365-0.395)	7211	38	(0.373-0.387)	480	30	(0.278-0.322)
≥85	961	23	(0.217-0.243)	3520	18	(0.175-0.185)	177	11	(0.095-0.125)
Gender									
Female	2377	56	(0.545-0.575)	11698	61	(0.603-0.617)	1053	66	(0.637-0.683)
Male	1876	44	(0.425-0.455)	7346	39	(0.383-0.397)	554	34	(0.317-0.363)
Total	4253	100		19044	100		1607	100	

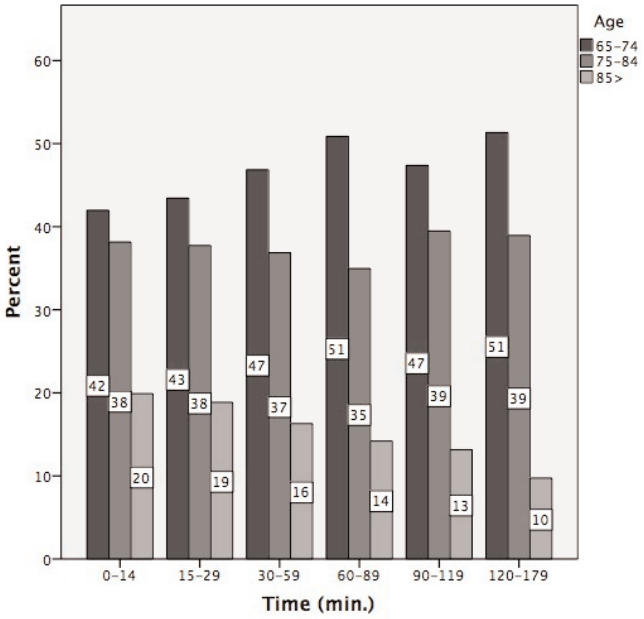

Figure 2— Relationship between patient age groups and physician examination wait times.

Among all patients, 43.8% were determined to have presented to ED during work hours ICD-10 diagnostic group records of the patients revealed that 16% of the patients visited ED due to circulatory problems, 15% due to metabolic/endocrine disorders, 9% due to respiratory system disorders, 6% due to gastrointestinal system disorders, 6% due to genitourinary system disorders, and 5% due to injuries sustained during falls. On the other hand, the R-coded ICD-10 diagnostic groups (symptoms, signs, and abnormal clinical and laboratory findings) patients' initial complaints included kidney function disorders (14%), abdominal pain (12%), nausea/vomiting (9%), chest pain (8%), difficulty in breathing (7%).

Among the geriatric patients presenting in ED during the course of this study, intravenous access was obtained in 61%, complete blood count was performed in 77%, renal function tests in 68%, liver function tests in 17%, and cardiac enzymes in 31.4% of the patients. Electrocardiography was performed in 33.3% of the patients, bleeding parameters were analyzed in 13.7%, CRP in 19.6%, D-Dimer 3.6%, urinalysis in 26.4%, and arterial blood gas analysis in 19.1%. Imaging studies included direct radiography in 74% of the patients, computed tomography in 27%, ultrasonography in 7%, angiography in 4%, and magnetic resonance imaging in 0.05%. The percentages of change in the rates of use of resources at EDs between 2011 and 2015 are presented in Table 4.

Among the treatments provided, 11% of the patients received bronchodilator treatment, 10.1% received supplemental oxygen, 8.5% received acetyl salicylic acid, 6.9% received intravenous hydration, 5.7% received anticoagulant agent, 3.6% received antiarrhythmic agents, 1.6% had orthopedic intervention, 1% received transfusion of blood and/or blood products, 1% received vasopressor agents, 0.6% had endotracheal intubation, 0.5% had cardiopulmonary resuscitation, and 0.04% had cardioversion.

We determined that 65.7% of the patients presenting to ED in 2014 were placed in the ED observation room. Among all geriatric patients that presented to ED between 2011 and 2015, 4.3% were admitted to ICU and 5% were admitted to another ward. Trends in patient admission from ED between 2011 and 2015 are shown in Table 5. Geriatric patients were most frequently admitted to the neurology, general surgery,

Table 4— Trends in Imaging and Laboratory Studies Utilized and Treatment Given for Geriatric Patients Between 2011 and 2015

Used Resource	2011 5849*		2015 7313*		2011–2015 Percentage of Change
	(n)	%	(n)	%	(%)
Imaging					
Any imaging	3760	64.3	5373	73.5	9.2
Any X-Ray	3155	53.9	4451	60.9	7
Any CT	1001	17.1	1960	26.8	9.7
Any MRI	32	0.5	16	0.2	-0.3
Any USG	318	5.4	605	8.3	2.9
ECG	1152	19.7	3122	42.7	23
Cardiac Monitoring	100	1.7	224	3.1	1.4
Laboratory					
Blood	3857	65.9	5723	78.3	12.4
Urinalysis	1497	25.6	1968	26.9	1.3
Treatment					
Intravenous fluid	1604	27.4	5314	72.7	45.3
Drugs	1187	20.3	5015	68.5	48.2
Intervention	1504	25.7	4053	55.4	29.7

*Total number of geriatric patients presenting to ED in the corresponding year.

Table 5— Trends in Patient Admission from ED Between 2011 and 2015

	n	¥(%)	§(%)	n	¥(%)	§(%)
Total number ED visits	30361	100	-	33706	100	-
Geriatric patients	5849	19	100	7313	22	100
65–74 years	2521	8	43	3245	10	44
74–85 years	2303	8	39	2661	8	36
≥85 years	1025	3	18	1407	4	19
Other patients	24512	81	-	26393	78	-
Total number of hospital admission	751	2	-	1055	3	-
Geriatric patients	289	-	5	402	-	5
Other patients	462	-	2	653	-	3
Total number of ICU admissions	491	2	-	534	2	-
Geriatric patients	262	-	4	314	-	4
Other patients	289	-	1	356	-	1

¥Rate of total number of ED visits
§Corresponding rates of total number of geriatric and other patients

cardiology, and nephrology wards, in the order mentioned. Similarly, the most frequent ICU admissions took place for cardiology, pulmonology, neurology, and anesthesiology.

Among the admitted female patients, 3% were admitted to the ICU while 3.4% were admitted to other wards. Similarly, among the male patients admitted, 4% were admitted to the ICU while 4.5% were admitted to other wards. Of all patients admitted to the wards other than the ICU, 55% were female and 45% were male. Almost half of the patients (50.1%) admitted to the ICU were female while the other half (49.9%) were male. Among the patients who were not admitted neither to the wards or to ICU, 61% were

female and 39% were male. A statistically significant relationship was found between patient gender and hospital admission (to hospital ward and ICU) rates from ED ($p<0.05$) The rate of female patients among those who were not admitted is higher than the female among those who were admitted to the hospital. On the other hand, the rate of the male patients among those who were admitted is higher than the male among those who were not admitted to the hospital.

When all geriatric age groups considered, the combined rate of ICU admission from the ED is 3.4% while 4% of those patients were admitted to other wards from the ED. No statistically significant relationship was found between the age groups and service admission ($p>0.05$). A statistically significant relationship was found between the age groups and ICU admission ($p<0.05$). The rate of patients over 85 years of age and were admitted to the ICU is higher than those over 85 years of age and not admitted to the ICU.

The length of stay (LOS) in ED was defined as the time between entry into ED and departure from ED. In 2015, the mean ED LOS for geriatric patients was 457 min 13 s (95% CI, 437.34–476.03) and the median was determined to be 239 min 05 s. Approximately half (50.2%) of the patients stayed in ED for 0–4 hours, whereas 6% spent >24 hours in ED. No statistically significant relationship was found between patient gender and ED LOS ($p>0.05$). On the other hand, there was a significant relationship between the age group of the patients and ED LOS ($p<0.05$). The most common LOS intervals were 0–4 and 4–12 hours for the 65–74 age group, while the most common LOS was ≥24 hours and 12–24 hours for 75–84 age group and ≥85 age group, respectively. It was noted that the length of ED stay had increased as the age of the patients increased. (Figure 3).

The specialist consultation rate for the geriatric patients between 2011 and 2015 was 56%. Consultations were most commonly requested from the cardiology, pulmonology, and neurology departments every year during the study period. The average time for consultation was 183 min. The death rate of geriatric patients in ED was 0.3%, rate of referral to another hospital was 4%, rate of discharge was 20.7%, and rate of prescription upon discharge was 42%.

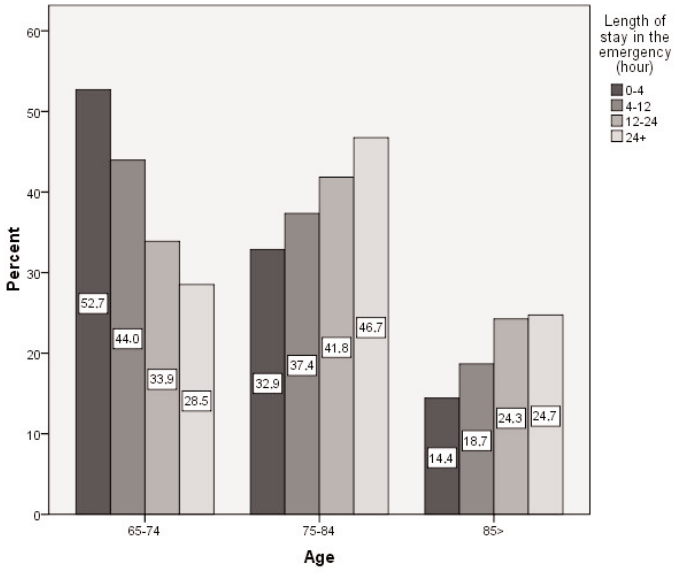

Figure 3— Relationship between age groups and length of stay in the emergency department.

Discussion

Historically, geriatric patients constitute 9–37% of the patients presenting to EDs (4-15). During the present study, this rate was 20.3%. In the present study, the majority of these patients were females, and the most common age group was 65–74 years, which is similar to previous findings (5,6,16,17). Overall, a 25% increase in ED visits by geriatric patients was observed over the length of the study from 2011 to 2015. This increase was even higher at 37% for those ≥85 years of age. An increase in the number of geriatric patient ED visits was also observed by Strange et al. (16% increase) and Pines et al. (24.5% increase) (5,7).

A total of 93.5% of the geriatric patients were categorized as urgent and emergent in the present study. In the study by Latham, this rate was 74.2% (16). The present study also revealed that female patients and patients between 65–74 years of age were found to present with non-urgent conditions, whereas those ≥85 years of age more commonly presented with emergent conditions. The present study revealed that geriatric patients more frequently visit EDs after business hours. These results are in line with the Taymaz (8) study; however, they contradict the findings of Akpinar et al. and Mert, in which they found ED visits more commonly taking place during business hours (6,13). We were able to observe a significant increase in the use of ED resources between 2011 and 2015. In particular, use of electrocardiography, computed tomography, direct X-ray, blood analyses, intravenous fluid and drug administration, and rates of interventions have increased. Similarly, the study by Pines reported an increase in the rate of resource utilization (7).

Akpinar et al. reported the most common diagnoses to be cardiovascular and respiratory diseases (6), whereas Kekec et al. reported metabolic/systemic, cardiovascular, and cerebrovascular diseases (14). The present study results showed the most common diagnoses to be circulatory system (cardiovascular and neurovascular), metabolic, respiratory, and alimentary system diseases. Similarly, the most frequent complaints were kidney function disorders, abdominal pain, nausea and vomiting, and chest pain. In Latham's study, however, the cost common complaints were reported to be difficulty in breathing, chest pain, and injuries (16). We believe the reasons for these differences are related to the healthcare centers being reference centers for specific diseases, geographic locations within the country, and sociocultural differences of the population to which the hospital provided services.

The percentage of geriatric patients admitted to the hospital from ED has a range of 11.5–61% (8,11,13-15). We found that 65.7% of the geriatric patients who presented in ED were admitted to the monitored observation units in ED. The total rate of admission to ICU or other wards from ED was 9.3% in our study. In spite of the increase in the number of ED visits by geriatric and non-geriatric patients between 2011 and 2015, the rates of admission to ICU and other wards remained constant for both groups in the present study. In their study, Strange et al. reported an increase in admission rates to other wards for geriatric and non-geriatric patient groups over the years (5). We attribute this discrepancy between the rates of geriatric patient admission to the possible variation in the rates of old age in different countries or in different regions of the same country, the level of care provided by ED, and the general health insurance coverage policies in different countries.

The wards that admitted the most ED patients were neurology, general surgery, and cardiology. In the study by Taymaz, general internal medicine, neurology–neurosurgery, and cardiology were the wards that admitted the highest number of ED patients (8), whereas it was neurology, pulmonology, and cardiology in the study by Akpinar et al. (6). We found that cardiology, pulmonology, and neurology ICU wards admitted ED patients most frequently. This order of admission was exactly the same in the study by Akpinar (6).

In the present study, the rate of consultation requests for geriatric patients was 56%. The most frequent disciplines from which consultations were requested were cardiology, pulmonology, and neurology. In their study, Logoglu et al. found this rate to be 43.4%, and the most frequent disciplines from which consultations were requested were cardiology, internal medicine, and pulmonology (17).

We found a higher rate of ED presentation, a higher rate of ICU admission, a longer ED LOS, and greater use of resources, which in turn increases the costs in the geriatric patient groups as their ages increased. These results are consistent with the results of similar studies in the literature (4,5,10,13,15,18-21).

As ages of geriatric patients increased, the average costs for services per individual have been reported to increase. The service cost per individual at ED was found to be 103 TL. In the study by Kapci et al., the average service cost for patients being discharged from ED was 115 TL (21).

Periodic analyses and comprehensive reviews and meta-analyses of the use of ED services by geriatric patients are needed to increase awareness of emergency health issues of geriatric patients and to allow formulation of effective solutions to meet their needs. The current study presents results concerning the use of EDs by geriatric patients and can be used to optimize planning of ED service processes, resource utilization, and investment at institutional and national levels.

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