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Investigation of Factors Affecting Cost of Geriatric Patients Admitted to the Emergency Department

Acil Servise Başvuran Geriatrik Hastaların Maliyetine Etki Eden Faktörlerin Araştırılması

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Abstract

Objective: Increased health cost, which is one of the major problems of countries, makes cost analysis studies become important in specific age groups and clinics. Although the aged population has an enormous role in increasing health costs, there are not much data about follow-up and treatment costs of geriatric patients in the Emergency Departments. We believe that the data obtained from this study would help to improve some arrangements about the geriatric population in ED's including cost and efficiency.

Material and Methods: In this study, we have included patients 65 years and above who were admitted to the Emergency Department from 01 January 2011 to 31 March 2011. We gathered data from detailed examination of computer records and the surveys of patients which we obtained at the first admission. We also used computer and billing records to calculate the total cost of patient application and the distribution of this cost into subgroups.

Results: Avarage cost of 536 geriatric patients (40.3% early, 48.1% middle and 11.6% late geriatric age group) who were admitted to the Emergency Department was 137.5±98.6 TL. Also there were statistically significant correlations between costs and count of consultations, staying time in the Emergency Department, hospitalisation, and presence of coronary artery disease and congestive heart failure.

Conclusion: In this study, we believe the results, which emphasize elderly patient characteristics and cost elements, might reduce costs to society and social security institution and also it can form a basis for large scale studies in the future. *(JAEM 2013; 12: 134-8)*

Key words: Emergency medical services, aged, hospital costs

Özet

Amaç: Çoğu ülkenin son yıllarda yaşadığı önemli sorunlardan biri olan sağlık harcamalarındaki artış, spesifik yaş gruplarında ve kliniklerde maliyet analizi çalışmalarını gündeme getirmiştir. Sağlık harcamalarındaki artışta nüfusun yaşlanmasının etkisi bilinmekle birlikte, acil servislerde geriatrik hastaların takip ve tedavi maliyeti ile ilgili veriler sınırlıdır. Bu çalışmadan elde edilen veriler dikkate alınarak, acil sağlık sistemi içinde geriatrik hastalarda, maliyet ve verimlilik de dâhil olmak üzere bazı yeni düzenlemeler ile ilgili öneriler sunulması hedeflenmektedir.

Gereç ve Yöntemler: Bu çalışmaya 1 Ocak 2011-31 Mart 2011 tarihleri arasında acil servise başvuran 65 yaş ve üzeri hastalar dâhil edildi. Hastalara ait veriler, ilk başvuru esnasında hazırlanan hasta formlarına kaydedilen bilgiler ve bilgisayar kayıtları incelenerek toplandı ve analiz edildi. Bilgisayar ve faturalama kayıtlarından hastanın başvurusunun acil servise toplam maliyeti ve bu maliyetin alt gruplar arasında dağılımı tespit edildi.

Bulgular: Acil Servis'e başvuran, %40,3'ü erken, %48,1'i orta, %11,6'sı ileri geriatrik yaş grubunda olmak üzere 536 geriatrik hastanın ortalama maliyeti 137,51±98,60 TL idi. Maliyet ile konsültasyon sayısı, acil serviste kalış süresi, hastaneye yatış, koroner arter hastalığı, konjestif kalp yetmezliği ve son dönem böbrek yetmezliği varlığı arasında anlamlı ilişki vardı.

Sonuç: Acil servislerdeki yaşlı hasta özelliklerini ve maliyet unsurlarını vurgulayan bu çalışmadan elde edilen sonuçlar; acil servise başvuran geriatrik hastaların, Sosyal Güvenlik Kurumu'na ve topluma maliyetlerinin azaltılması yönünden ileriye dönük geniş ölçekli çalışmalara yön verebilir. *(JAEM 2013; 12: 134-8)*

Anahtar kelimeler: Acil tıbbi servisler, yaşlı, hastane maliyetleri

Introduction

The increment of rise in health spending is one of the major problems experienced by most countries in recent years and cost analysis studies have increased among specific age groups and clinics. Turkey has a young population. The elderly population rate has been increasing steadily (1). Elderly patients admit to emergency departments with more complicated problems, they need more intensive service, and they undergo much more radiological evaluation and laboratory tests. So they stay longer in the emergency

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department. Additionally, they are hospitalised at a higher rate than the younger population (2).

Although it the effect of elderly population in the increase in health spendings is known, cost data is limited for the follow-up and treatment of geriatric patients in emergency departments. In this 'cost evaluation of geriatric emergency patients' study we aimed to provide recommendations on some of the new regulations, including cost and efficiency in geriatric patients in the emergency medical system.

Material and Methods

After ethical commitee approval (Süleyman Demirel University Ethical Commitee-10.11.2010/03), 536 geriatric patients admitted to our emergency department between January 2011-April 2011 were included in the study. All the patients were over 65 age.

Data from the data collection form, and hospital records were collected by using the automation system. Dependent variables were the patient's age, gender, hospital admission complaint, comorbid chronic diseases, patient number of consultations and consultation department during follow-up, length of hospitalization, patient status, discharge from service or intensive care unit and the academic year of the emergency assitant doctor who evaluated the patient in the emergency room. The independent variable was the patient's emergency service cost which was obtained from hospital bill records.

Statistical analysis

Definitive statistics such as age, hospitalisation time, follow-up and treatment costs were presented with measurement data and standard deviation. Percentage contribution is given for counting data. In all tests, the significance level was $p<0.05$. SPSS (Statistical Package for the Social Sciences) software 15.0 was used for all analysis.

The normal distribution and homogeneity of each parameter was tested by the Kolmogorov-Smirnov test. The Student t test and Kruskal-Wallis test were used to compare the variables. For counting data and cost correlation, the Kendall and Pearson test was used. Independent variables that have statistically significant effects on cost were iccluded in the Linear Regression model and odds ratio was calculated.

Results

Two hundred and thirty seven (44.2%) female, 299 (55.8%) male, making a total of 536 geriatric patients were included in the study. During this time period the total emergency admission count was constituted of 4111 patients. The geriatric patient rate was 13%. Two hundered and sixteen patients (40.3%) were in the early geriatric stage (65-74 age), 258 (48.1%) patients were in the median geriatric stage (75-84 age) and 62 patients (11.6%) were in the last geriatric stage (over 85 age). There was no significant difference between gender and age distribution (Table 1).

Three hundred and one patients (56.2%) used their own facilities to reach the emergency service, 150 patients (28%) were referred from another health care institution, 68 patients (12.7%) with ambulance, 12 patients (2.2%) had been in-hospital, 5 patients (0.9%) reached by othermeans. Four hundred and sixty four patients (86.6%) had at least one comorbid disease. Some patients had more than one disease. Hypertension was the most common comorbid disease (n=208-38.8%). One hundered and thirty one (24.5%) patients had coronary artery disease (CAD) and heart failure, 112 (20.9%) patients had chronic obstructive lung disease (COLD), 95 (17.7%) patients had diabetes mellitus (DM) and 76 (14.2%) patients had malignity. Others such as strokes, benign prostate hypertrophy, peptic disease etc.

The admission complaints of patients to the emergency service is given on Table 2. When we considered these complaints according to systems, 64 (60.4%) patients had abdominal pain in 106 patients with gastrointestinal symptoms, for respiratory complaints (total 105 patients), 70 patients (66.7%) had shortness of breath, for neurologically symptoms (total 82 patients), 46 (56.1%) patients had altered mental status, for cardiopulmonary symptoms (total 76 patients), 41 (51.9%) patients had chest pain, for musculoskeletal complaints (total 76 patients), 39 patients (51.3%) had traumatic fractures, for genitourinary symptoms (total 71 patients), 29 (45.1%) patients had pain in the kidney area, for ear-nose-throat complaints (total 71 patients), 29 (40.8%) patients had neck pain. The reason for 8 drug poisoning of 13 patients (61.5%) was multiple drug usage. Femur fracture (28 of 39 patients-72%) rate was high in traumatic fractures.

When we considered the diagnosis with age distribution; gastrointestinal diseases (54 of 216 patients-25%) was the most common disease in the early geriatric group, in the median geriatric group respiratory system diseases (62 of 258 patients-24%) were the most common, in the last stage geriatric group neurological diseases (24 of 62 patients-38.7%) were the most common disease. Four hundred and seventy six (88.8%) of 536 patients' prediagnosis at the admission time correlated with the diagnosis on leaving from the emergency department. There was no significant difference between age groups.

Table 1. Age groups-gender

Age	Male n (%)	Female n (%)	p*
Early stage (65-74)	122 (40.8)	94 (39.7)	0.553
Median stage (75-84)	139 (46.5)	119 (50.2)	
Last stage (>84)	38 (12.7)	24 (10.1)	
Total	299 (100.0)	237 (100.0)	
*Pearson ki-kare			

Table 2. Admission complaint distribution of patients

	n*
Gastrointestinal system complaints	106
Respiratory system complaints	105
Neurological complaints	82
Cardiovascular complaints	79
Musculoskeletal complaints	76
Genitourinary complaintsi	71
Ear-nose-throat complaints	71
Complaints related with drug poisoning	13
Psychiatric complaints	12
*More than one complaint.	

Three hundred and seventy five (70%) of 536 patients had consultations with at least one clinic. The consultation rate was 1.41±0.74 (1-5, median 1) per patient. internal diseases, chest diseases and neurology were the most consultated clinics (Table 3).

Two hundred and fifty four (47.4%) patients were discharged from the emergency service, 253 (47.2%) patients were hospitalised (service and intensive care unit). Twenty nine (5.4%) patients were referred to other hospitals, left without permission or died in the emergency room. Fifty four (21.2%) patients were hospitalised at internal medicine clinic, 35 (13.7%) patients were treated at the chest disease clinic, 26 (10.2%) patients at orthopaedics, 24 (9.4%) patients at general surgery clinic, 15 (5.9%) patients at neurology, 11 (4.7%) patients at neurosurgery, 10 (3.9%) patients at cardiology and 20 (7.9%) patients at other clinics.

The mean staying time of the patients in the emergency department was 213±192 (min: 13, max: 1740) mins. Mean emergency cost was 137.5±98.6 TL (Turkish Liras) (1 TL=0.567 ABD Dollars, and =0.422 Euro).

The cost and staying time in the emergecy department was correlated (r=0.425, 0.347; p<0.01).

The mean cost of patients who had CAD (175.6±96.8 TL) (p<0.01) and HF (177.2±97.0 TL) (p<0.001) was higher than the patient who did not have CAD and HF. We could not find a correlation between other diseases and service cost.

The last status of the patients in the emergency department was significantly different according to mean service cost (p<0.01). Discharged patient costs were low, exitus patient costs were high (Table 4).

Four hundred and eighty seven (90.9%) patients underwent blood tests (CBC, blood bichemistery etc.), 463 (86.4%) patients underwent X-Ray evaluation (Table 5). The mean cost of tests performed in the emergency room were; 35.7±35.3 TL for laboratory tests, 39.9±45.1 TL for radiological evaluation (chest X-ray, computed tomography etc.), 30.5±17.1 TL for physical examination and invasive procedures (central venous catheter, nasogastric tube etc.), and 45.3±266.8 TL for medical treatments (drugs, fluid therapy etc.).

The mean academic year of the emergency service assistant was 2.95±1.76 (min:1, max: 5) years. There was a positive correlation between academic year of the assitant and service cost (r=0.220; p<0.01). Similary the assistant's academic year was correlated with the amount of consultations requested (r=0.188; p<0.02).

Variables that affect the service cost (staying time in the emergency room, CAD, HF, academic year of assistant, number of consultations, last status of the patients) were considered with regression analysis. We could not find an autocorrelation among these variables in the Durbin-Watson 1.8 test. With this model it was seen that 28.6% of total change in cost was dependent on these variables (F analysis, F=35.39; SD=6; p<0.01). Service cost=33.53 + 26.70 (HF) + 25.27 (CAD) + 29.38 (consultation count) + 0.12 (staying time) + 9.54 (assistants academic year) + 8.22 (last status in the emergency room) was obtained after analysis.

Table 3. Consultation clinics distribution

	n*	%
Internal medicine	131	25.0
Chest diseases	81	15.5
Neurology	48	9.0
Orthopaedics	37	7.2
Cardiology	32	6.8
General surgery	30	5.8
Infectious diseases	27	5.2
Urology	27	5.2
Ear-nose-throat	26	5.0
Neurosurgery	26	5.0
Anesthesiology	23	4.5
Psychiatry	11	2.1
Cardiovascular surgery	10	2.0
Eye diseases	9	1.7
Totally	518	100

*In some cases numbers overlap because of multiple consultations

Table 4. Relation between service cost and last status of the patients

Leaving reason from emergency	n	Cost (mean±std)	p*
Discharge	254	115.1±89.9	<0.0001
Hospitalised at service	195	146.5±87.5	
Hospitalised at ICU	58	179.2±122.2	
Other (leave on own request etc.)	18	138.8±59.7	
Referred to another clinic	8	216.1±121.5	
Exitus	3	432.0±222.6	
Total	536	137.5±98.6	

*Kruskal Wallis test

Table 5. Diagnostic test distribution of patients in the emergency room

Tests	Patient count (n)	%
Venous and arterial blood tests	487	90.9
XRay	463	86.4
Computed tomography	128	23.4
Ultrasonography	70	13.0
Microbiological tests	35	6.5

Discussion

In this study we found that long length of stay in the emergency room, number of consultations, academic year of the assistant, CAD, HF and the exitus of the patient increased the emergecy cost.

The ratio of population over the age of 65 to the general population is rising with the increment of expected living time in world population. This upsurge in elderly population and mean living time results in an increase in chronical diseases in this age group. In the literature, it is reported that the chronic disease rate is 72.6-94.4% in the elderly population (3, 4). In our study this ratio is 86.6%.

Emergency admission of elderly patients may depend on regional differences (country, city, number of hospitals, population, transport etc). Results of studies about the rate of emergency geriatric patients are different, with a rate of 9-25% (5). Ünsaldı et al. (3) reported the admission rate of geriatric population to emergency servise as 13.0%.

In our study this rate was 13% and correlated with recent studies. Our hospitalisation rate (47.2%) is not compatible with the Şahin et al. (5) study (19.8%) but it is compatible with the Kekeç et al. (6) study (61%). This situation may be explained by hospitals reporting lower hospitalisation rates and patient density higher than the actual and the presence of many well-equipped health care provider centers in the same area. Our data is obtained from the only education and research hospital data of the city, it can be thought that high hospitalisation expectant patients are referred to our hospital.

In our study, emergency geriatric patients are most commonly hospitalised in internal medicine, chest diseases, orthopaedics, neurology and general surgery. Cardiology service hospitalisation is lower. Cardiology service hospitalisation of Kekeç's study (6) was 29.6%, in our study this ratio is 6.8%. The cardiology department was a separate building from our main hospital during the time period of the study and this situation may be explained by that.

Elderly patients' emergency admission symptoms are various. Gülalp et al. (7) studied 2046 geriatric emergent patients, the most common reasons for emergency visits were falls (18.3%), chest pain (14.2%), shortness of breath (13.7%), chronic extremity pain (10.2%), abdominal pain (9.9%) and fever (8.6%). Satar et al. (8) reported 2507 emergency geriatric patients at a mean age of 72 and the most common diagnosis was stroke (8.8%). In our study the commonest admission complaints were abdominal pain (11.9%), shortness of breath (13.0%), stroke and similar neurological problems (15.2%).

Elderly patients usually use the ambulance service. In the Kıdak et al. (9) study ambulance usage ratio was 5.1% among patients over the age of 65 and this ratio was three times higher than other age groups. In another study geriatric patients emergency admission through ambulance rate was 7.5% (10). In recent years emergency service admission for non-emergency reasons increased. It is thought that elderly patients contribute to this increment (11). In our study ambulance mediated admission rate was 12.7% and this ratio may change with the size of the city, transport facilities and patients' habits of using the ambulance system.

Elderly patients tend to suffer trauma more than younger population during daily activities. Comorbid diseases of elderly patients contribute to this (12). In our study 7.08% of the patients suffered traumatic fractures. So, one of two musculoskeletal system complaints of emergency geriatric patient had a traumatic fracture.

According to the multidisciplinary approach, consultation can be required for all age groups patients admitted to emergency service. Our most common consultations were internal medicine, chest diseases, neurology, orthopaedics, and cardiology. In these consultations we took into account the patient's clinical symptoms with the most common causes of mortality in elderly patients.

Staying time of the patient in the emergency room for physical examination and follow-up is one of the most important factors that affects emergency services' density and quality. In recent studies this time was reported as 900-1440 mins. and after 1440 mins patients were hospitalised for further follow-up (13). In our study mean staying time for emergency geriatric patients was 213±192 mins. This may be related with our emergency service's physical condition and the hospitalisation decisions of hospital management.

Diagnostic tests are the most important factors for the emergency service costs. Goodacre et al. (14) studied emergency diagnostic tests and they reported that 39% of the patients underwent blood tests, 4% microbiological tests, 29% X-Ray, 29% of the patients underwent computed tomography. Mortality reasons for geriatric patients are; cardiovascular diseases, cancer, stroke, respiratory system diseases and trauma (15). It is known that physical examination findings and cardiovascular, neurological and gastrointestinal system findings may be uncompatible in geriatric patients. This approach may increase the number of diagnostic tests in the emergency room. Our study is compatible with the recent studies about diagnostic tests. Radiography and blood tests are usually used in elderly patients and unusual symptoms, to make a general evaluation. In our study, the number of consultations and cost per patient were higher in patients of senior assistantdoctors. This may be a result of the evaluation and follow-up of patients who need geriatric emergency by trained and advanced academic year doctors.

In Arslanhan's study themean emergency service cost per patient was 27 TL, 33 TL per patient for outpatients and 796 TL per patient for hospitalised patients for the year 2009.

This reported 27 TL for emergency patients is lower than the outpatient cost for a second step health center. This situation indicates the usage of emergency services as a health center clinic. In this study they reported that a significant access increment and cost anaylsis could not be obtained because of admissions to emergency services for non-emergency reasons (16). In our study, the emergency cost per patient was 137.5 TL. Our hospital is outside the city and patients able to be evaluated in clinics do not present to our emergency service.

Conclusion

When the high hospitalisation rates are considered for geriatric patients admitted to the emergency department, results of our study provide findings for new clinical trials to calculate examination, intervention and follow-up costs in other clinics. In rapidly aging societies, solutions of problems caused by comorbid diseases electively, which may diminish intensity and duration of stay of geriatric patients in the emergency department may be considered.

Results of our study that emphasize the properties and cost elements of geriatric emergency patients may lead to further comprehensive studies for cost decrement for the general population and social insurance institution.

Conflict of Interest
No conflict of interest was declared by the authors.

Peer-review: Externally peer-reviewed.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Suleyman Demirel University School of Medicine (10.11.2010/03).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Author Contributions
Concept - Ö.T., M.K.; Design - M.K., Ö.T.; Supervision - İ.P., Ö.T., N.G.B., S.Y., E.K.; Funding - M.K.; Materials - M.K., İ.G.Y.; Data Collection and/or Processing - M.K., İ.G.Y.; Analysis and/or Interpretation - M.K., E.K., Ö.T.; Literature Review - M.K., Ö.T.; Writer - M.K., S.Y.; Critical Review - Ö.T., N.G.B., İ.P.

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