




RESEARCH
ARTICLE

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Emergency Department Neurosurgical Consultations in a Tertiary Care Hospital**ABSTRACT**

Objective: To reveal the characteristics of patients in need of neurosurgery by examining neurosurgery consultations within the emergency department (ED) admissions of a tertiary academic hospital.

Methods: This is a retrospective, single-centre observational study. Patients admitted to the ED between 01.01.2022 - 31.12.2022 and consulted to the neurosurgery department were identified through the hospital computer system and included in the study. The demographic information of the patients, mode of admission to the ED, the reasons for admission, the time of admission, the number of brain computed tomography (CT) scans, whether they underwent surgery or not, and the mortality results were recorded.

Results: A total of 441 neurosurgery consultations were examined. Fall 35.6% (n=157) and traffic accident 16.6% (n=73) were the most common reasons for consultation. It was observed that 92.5% (n=408) of the patients had a brain CT scan, and 19.5% (n=86) had two or more brain CTs. It was determined that 12.7% (n=56) of the patients consulted to neurosurgery were operated on, and 4.1% (n=18) of the patients' hospital admissions resulted in death. Only 53.7% (n=237) of the patients who underwent neurosurgery consultation were discharged from the ED. It was determined that significantly more Neurosurgery consultations were requested during working hours (p = 0.013).

Conclusions: Most consultation calls from the ED to neurosurgery are for trauma patients. Brain CT examination is frequently used in neurosurgical patient evaluation. As a result of the consultations, almost half of the patients are hospitalized. Emergency physicians can select patients who need neurosurgery well.

Keywords: Emergency Department, Neurosurgery, Consultation.

Üçüncü Basamak Bir Hastanede Acil Servis Nöroşirürji Konsültasyonları**ÖZET**

Amaç: Üçüncü basamak akademik bir hastanenin acil servis başvuruları içerisindeki nöroşirürji konsültasyonlarının incelenerek nöroşirürji ihtiyacı olan hastaların özelliklerinin ortaya konulması amaçlandı.

Gereç ve Yöntem: Bu retrospektif, tek merkezli gözlemsel bir çalışmadır. 01.01.2022 – 31.12.2022 tarihleri arasında acil servise başvuran ve acil servisten beyin cerrahi bölümüne konsulte edilen hastalar hastane bilgi işlem sistemi üzerinden tespit edilip çalışmaya dahil edildi. Hastaların demografik bilgileri, hastaneye başvuru şekilleri, başvuru nedenleri, başvuru saatleri, çekilen beyin bilgisayarlı tomografi (BT) sayıları, ameliyat olup olmadıkları ve mortalite sonuçları kaydedildi.

Bulgular: Acil servisten bir senede toplamda 441 nöroşirürji konsültasyonu yapıldı. Düşme %35,6 (n=157) ve trafik kazası %16,6 (n=73) en sık konsültasyon sebepleriydi. Hastaların %92,5 (n=408) 'ine beyin BT çekildiği, %19,5 (n=86) hastaya ise 2 ya da daha çok beyin BT tetkiki yapıldığı görüldü. Nöroşirürjiye konsulte edilen hastaların %12,7 (n=56) 'sının ameliyat edildiği, %4,1 (n=18) 'inin hastane başvurusunun eksitus ile sonuçlandığı saptandı. Nöroşirürji konsültasyonu yapılan hastaların sadece %53,7 (n=237) 'si acil servisten taburcu oldu. Mesai saatleri içerisinde anlamlı olarak daha fazla Nöroşirürji konsültasyonu yapıldığı tespit edildi (p=0.013).

Sonuç: Acil servisten nöroşirürjiye yapılan konsültasyon çağrılarının büyük çoğunluğu travma hastaları içindir. Nöroşirürjik hasta değerlendirmesinde sıklıkla beyin BT tetkikinden yararlanılmaktadır. Yapılan konsültasyonlar sonucunda hastaların neredeyse yarısı hastaneye yatırılmaktadır. Acil servis hekimleri nöroşirürji ihtiyacı olan hastaları iyi seçebilmektedir.

Anahtar Kelimeler: Acil Servis, Nöroşirürji, Konsültasyon.

INTRODUCTION

Emergency department (ED) constitute the most accessible step in the health systems all over the world due to their ease of access, their ability to be applied without an appointment and their 24-hour service. This accessibility is life-saving in medical situations requiring rapid intervention. Failure of other steps of the health system to provide adequate service makes EDs the safety valve of the health system. ED crowding reduces speed and accessibility, which are life-saving features of the ED. ED crowding is a public health problem worldwide (1).

Millions of ED visits are made in Türkiye every year (2). The majority of these admissions are green triage coded patients. It is possible to complete the examination and treatment of many patients in the ED and discharge them, but some patients need to be consulted with other departments in terms of both treatment recommendation and hospitalisation planning. In a study, it was shown that urgent consultation was required in the management of 10-40% of patients evaluated in the ED (3-5). Studies have shown that the time elapsed during the request for consultation, arrival of the consultant physician in the ED, evaluation of the patient by the consultant physician and making recommendations by the consultant physician is 33-54% of the total length of stay (LOS) in the ED (6). It is essential to consult the appropriate patient with the appropriate department by providing the necessary information completely. Unnecessary consultations will increase LOS and cause ED crowding (7). Precautions such as shortening the response time of the consultant and the time to reach the ED, identifying patients who will need consultation earlier and requesting consultations without wasting time can also be applied to decrease LOS (4).

Neurosurgery department (NSD) is one of the most consulted departments from ED. It is one of the departments with the highest number of emergencies with traumatic and non-traumatic emergency cases. However, even in developed countries, there is 1 neurosurgeon per 80.000 people. This rate drops to 1 neurosurgeon per 1 million people in African countries (8). Correct determination of the indications for consultation, performing the necessary examinations before consultation and presenting the patients to the consultant physician appropriately will reduce the loss of time and effort (3).

This study aimed to reveal the characteristics and clinical outcomes of patients who presented to the emergency department of a tertiary academic hospital and underwent neurosurgery consultation. The data to be obtained as a result of the study are expected to contribute to the establishment of a more efficient consultation system. It aims to analyze the data of the consulted patients in terms of both ED and NSD and to shed light on planning

interventions that will increase the quality of service.

MATERIAL AND METHODS

Study Setting and Design: This is a retrospective, single-centre observational study. It was conducted in ED of a tertiary university hospital in Türkiye, with approximately 90,000 admissions per year. After obtaining local ethics committee approval (2023/110, 10.07.2023), patients admitted to the emergency department between 01.01.2022 - 31.12.2022 and consulted to the NSD from the ED were identified through the hospital computer system and included in the study.

Multiple NSD consultations in the same admission were considered as a single consultation. Demographic information of the patients, method of admission, reasons for admission, time of admission, number of brain computed tomography (CT) scans, data of whether they underwent surgery or not, and mortality results were obtained from the hospital computer system and archive records and recorded in the study form.

Selection of Participants and Study Protocol: Patients who presented to the ED and were consulted to NSD for any reason within a one-year period were included in the study. Three patients were excluded from the study because they left the hospital voluntarily before the consultation was completed and four patients were excluded because they refused hospitalisation although they were offered hospitalisation.

The patients were divided into three groups according to the time of admission: patients who admitted between 24:00 - 08:00 were grouped as shift 1, patients who admitted between 08:00 - 16:00 were grouped as shift 2, and patients who admitted between 16:00 - 24:00 were grouped as shift 3. It was analysed whether there was any difference between the groups in terms of gender, complaint, hospitalisation status and mortality.

Data Analysis: Statistical software SPSS version 23 (SPSS Inc., Armonk, NY) was used for these analyses. Countable data were summarised as median (25th and 75th percentile), and categorical data as frequency and percentage. Countable data were compared between the two groups by Mann-Whitney U test. The relationship between two categorical variables was analysed by Pearson's Chi-square test or Fisher's Exact test. The significance level was determined as $p < 0.05$. In the case of Bonferoni correction, the significance level was determined as $p < 0.016$.

RESULTS

This study was performed with 441 patients presenting with ED and consulted with NSD during 2022. The median age of the patients was 57 years (IQR: 31) and 63.3% (n=279) were male.

When the presenting complaints of the patients were analysed, the most common complaint was falling with 35.6% (n=157) (Table

1). The second and third most common complaints were traffic accidents with 16.6% (n=73) and syncope with 13.8% (n=61), respectively. Regarding the methods of admission to the hospital, it was determined that 6.1% (n=27) of the patients were admitted by ambulance and the other admissions were made by the patients' own vehicles or on-foot.

Table 1. Neurosurgical consultations according to the reasons for admission.

Reason of Admission	Percentage	Count
Falling	%35.6	157
Traffic Accident	%16.6	73
Syncope	%13.8	61
Pain	%10.9	48
Seizure	%7.7	34
Assault	%2.3	10
Other	%13.2	58
Total	%100	441

It was observed that 7.5% (n=33) of the ED patients consulted with NSD did not undergo brain CT, and 19.5% (n=86) patients underwent 2 or more brain CT examinations.

When the hospitalisation status of the patients was analysed, it was observed that 53.7% (n=237) of the ED patients consulted with NSD were discharged without the need for hospitalisation (Table 2). 26.5% (n=117) patients were hospitalised in the neurosurgical service or

neurosurgical intensive care unit. It was determined that 1.4% (n=6) of the patients were hospitalised in the general intensive care unit, which was monitored by anaesthesiology physicians in our hospital, and the other patients were hospitalised in different wards by different departments.

Table 2. Number and percentages of patients according to hospitalisation status.

Hospitalization Status	Percentage	Count
Externated	%53.7	237
Hospitalisation in Neurosurgical Service or Neurosurgical Intensive Care Unit	%26.5	117
Hospitalisation in General Intensive Care Unit	%1.4	6
Hospitalisation in Other Services	%18.4	81
Total	%100	441

It was observed that 12.7% (n=56) of the ED patients consulted to NSD were underwent surgery. It was found that 4.1% (n=18) of the patients consulted with NSD resulted in excitus.

No statistically significant difference was found when the patients were compared with mortality in terms of age, gender, mode of presentation and operation status (Table 3).

Table 3. Comparison of age, gender, mode of admission and surgical status data with mortality.

Parameters	Total (n=441)	Mortality		p
		No (n=423)	Yes (n=18)	
Age	57 (37-68)	57 (37-68)	63.5 (55.5-70.5)	0.076
Gender / Male	279 (%63.3)	270 (%63.8)	9 (%50)	0.172
Mode of Admission / On-Foot	414 (%93.9)	397 (%93.8)	17 (%94.4)	0.697
Surgery / Yes	56 (%12.7)	51 (%12)	5 (%27.7)	0.064

Countable data were presented as median (25th - 75th percentile) and analysed by Mann - Whitney U test. Categorical data were expressed as n (%) and analysed by chi-square test. p < 0.05 was accepted as a significant difference.

Patients were divided into 3 groups according to the time of presentation. Shift 1 constituted 15.6% (n=69) of all patients, shift 2 45.6%, and shift 3 38.8% (n=201). When the shift groups were compared in terms of age, gender, surgical status and mortality, no significant difference was found between the groups. However,

a statistically significant difference was found between the groups in terms of ambulance or on-foot admissions to the hospital. It was determined that significantly more Neurosurgery consultations were requested during working hours (p = 0.013, Table 4).

Table 4. Comparison of mortality, gender, mode of admission, surgical status and age characteristics with shifting groups.

Parametreler	Shift 1 (n =69)	Shift 2 (n = 201)	Shift 3 (n = 171)	p
Mortality	2 (%2.9)	10 (%5)	6 (%3.5)	0.670
Gender / Male	41 (%59.4)	130 (%64.6)	108 (%63.1)	0.736
Mode of Admission / On-Foot	62 (%89.8)	196 (%97.5)	156 (%91.2)	0.013
Surgery / Yes	6 (%8.7)	31 (%15.4)	19 (%11)	0.255
Age	56 (30-66.5)	60 (43-70)	54 (31-69)	0.158

Quantifiable data were presented as median (25th - 75th percentile) and analysed by Kruskal - Wallis test. Categorical data were expressed as n (%) and analysed by chi-square test. p < 0.016 was considered as significant difference.

DISCUSSION

All over the world, EDs have been designed as departments where critically ill patients are admitted to the hospital, their first medical interventions are performed and their subsequent treatment is planned and they are hospitalised in the relevant departments. There are studies showing that 10-40% of the patients admitted to the ED are consulted with other departments (3-5). NSD is a department that serves a large number of patients. Patients who are in the scope of interest of the NSD have a high potential to be critically ill (8).

Traumas are still responsible for 9% of deaths worldwide. By 2030, traumas are expected to be one of the leading causes of death in the world (9). Studies have shown that patients consulted by the ED with NSD are mostly trauma patients. Traffic accidents, falls, collisions and assaults are the most common forms of trauma in studies (9,10). In our study, the most common reason for admission of patients consulted with NSD was found to be falls (35.6%), followed by traffic accidents (16.6%). Our study is similar to the literature in this respect. In our study, 63.3% of the patients were male. This may be explained by the fact that the majority of the patients consulted with NSD were trauma patients. When the literature is analysed, it is seen that males have more traffic accidents than females (11-13). Working in more dangerous jobs may also be considered to be a factor explaining the high rate of trauma and thus neurosurgical consultation in the male population.

Patients may admit to the ED by ambulance as well as coming on-foot. In studies conducted in various countries, the rate of admission by ambulance in patients admitted to the ED for any reason has been shown to be 20-30% (14,15,16,17). In another study conducted in Türkiye, the rate of presentation to the ED by ambulance was found to be 6.3% (18). Although our study was performed in a limited group of patients who were consulted to the NSD after admission, the rate of presentation by ambulance was found to be 6.1%. The result we obtained in our study is similar to other studies conducted in our country. The fact that the rate of presentation by ambulance is lower than the literature suggests that people in our region prefer to reach the ED by their own vehicles as much as possible. Detailed studies should be conducted on the accessibility and adequacy of ambulance services.

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Brain CT has become an important instrument of ED practice today. It has an intensive use especially in trauma patients. Since CT examination causes radiation exposure at a non-negligible level, it should be used within appropriate indications (19). Radiation may negatively affect the health status of patients (20). In our study, it was observed that only 7.5% of the patients did not undergo brain CT and 19.5% of the patients underwent two or more brain CT scans. This shows how important brain CT examination is in neurosurgical practice.

In our study, patients were divided into 3 groups according to the time of admission. Those who admitted between 00:00 - 08:00 were grouped as shift 1, those who admitted between 08:00 - 16:00 were grouped as shift 2, and those who admitted between 16:00 - 00:00 were grouped as shift 3. It was observed that the most frequent applications were made in the shift 1 group, i.e. from morning until the afternoon. In other studies conducted in Türkiye, it was shown that the most frequent emergency department admissions were made between 16:00 - 00:00 (18,21). Although our study was conducted with a limited group of patients consulted only with the neurosurgery department, the results in terms of the hours of frequent admission are similar to other studies in our country. When the shift groups were compared with each other in terms of age, gender, surgical status and mortality, no statistically significant difference was found between the groups. A statistically significant difference was found between the shift groups in the comparison made in terms of the type of access to the ED. Patients admitted between 08:00 - 16:00 used the ambulance less. The reason for this was thought to be that it was easier to use public transport during these hours. In addition, a large number of patients are directed to the ED from the outpatient clinics that are active in the hospital during these hours, and these patients increase the on-foot admission statistics.

CONCLUSION

The majority of consultation calls from ED to NSD are for trauma patients. NSD frequently uses brain CT examination in patient evaluation. Approximately half of the patients are hospitalised as a result of the consultations. Emergency physicians can properly differentiate patients who will need neurosurgery.

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