Annals of Medicine and Medical Sciences (AMMS)
Volume 04, 2025, *Page No.: 1382 to 1391*
Available at: *http://ammspub.com*

Original Article

OPEN ACCESS

Analysis of Patient Data Undergoing Computed Tomography Scans in the Emergency Department to Evaluate the Rates of Acute Pathology Detection According to the Reasons for Presentation

Mustafa ALPASLAN

Department of Emergency Medicine, Nevsehir Public Hospital, Turkey.

*Corresponding Author: Mustafa ALPASLAN; *mustafalpaslan@gmail.com*

Abstract

Objective: The aim of this study is to analyze the reasons for emergency department visits and the rates of pathological conditions in the imaging results of patients who underwent diagnostic computed tomography scans in the emergency department. ***Materials and Methods:*** This study was conducted retrospectively. Patients' reasons for presenting to the emergency department and computed tomography imaging results were evaluated. Data were compared between traumatic and non-traumatic patient groups and between patient groups with and without acute pathology on imaging. ***Results:*** Data from 2627 patients were evaluated in the study. 52% percent of the patients were male. The mean age was 46.92±24.58. 59.5% of patients presented with non-traumatic causes. The most common complaint among non-traumatic patients was abdominal pain (21.1%), while the most common complaint among traumatic patients was falling (28.2%). Brain computed tomography scans were the most frequently performed(44.8%). No acute pathological findings were observed in 87.4% of patients. ***Conclusion:*** Acute pathology was not seen in the vast majority of computed tomography scans performed in the emergency department. It should be remembered that radiation doses are high in computed tomography, and great care should be taken when requesting diagnostic imaging, and appropriate indications must be determined.

Keywords: ***Emergency department, Computed tomography, Diagnostic radiology.***

Introduction

Emergency departments are areas where patient admission rates are quite high and where various diseases are diagnosed and treated [1]. Medical history, physical examination, and imaging methods are important in diagnosing patients. Determining the appropriate tests and imaging will speed up the diagnostic process and reduce unnecessary radiation exposure and testing costs [1-3]. Computed tomography (CT) is an imaging method frequently used in the diagnosis and treatment phase in emergency departments. The demand for CT in emergency departments has increased due to its proven usefulness in diagnosis and its increased accessibility [4]. In the United States (US), more than 85 million CT scans are requested in emergency departments each year, and it is estimated that CT demand, which was 18% in 2006, rose to 27% in 2019 [4]. Reasons for this increase include the rising number of patients in emergency departments, the decreasing number of physicians, physicians' reliance on CT scans as a diagnostic tool, and consequently, physicians' tendency to use CT scans more frequently [4]. Computed tomography imaging is a test with a high radiation dose. Therefore, when CT imaging is requested from patients for diagnostic purposes, this request should be based on valid diagnostic reasons and should only be performed when indicated. This is because the most important factor in reducing radiation exposure is to avoid requesting unnecessary tests and unnecessary repeat tests [5,6].

The aim of this study is to determine the appropriateness of the examinations by evaluating the reasons for referral to the emergency department and the pathological conditions observed in the CT scans of patients who underwent diagnostic CT scans in the emergency department.

Materials And Methods

Data Collection and Analysis

This study was conducted retrospectively in the emergency department of a state hospital providing secondary healthcare services. August was selected as the month with the highest number of CT scans performed in the emergency department in 2024, and CT scans performed between August 1, 2024, and August 31, 2024, were evaluated. All patients who requested a CT scan from the hospital's adult emergency department, including pediatric trauma patients, were included in the evaluation. It was determined that 2818 CT scans were performed during the specified time period. Data were collected via the hospital's electronic database. Data from 191 patients were excluded from the study due to insufficient data in the database, and data from 2627 patients were evaluated. Demographic data such as gender and age at the time of presentation

Received: October 02, 2025; **Revised:** October 27, 2025; **Accepted:** October 29, 2025

were evaluated for the patients. The data from the CT scans were classified separately as brain, cervical, thoracic, upper abdomen, lower abdomen, and extremities. The patients' emergency department presentation complaints and CT scan results were evaluated. Patient data were evaluated in groups with and without trauma and with and without acute pathology on CT. Computed tomography results were performed with the evaluations of radiology specialist doctors in the electronic database. As a result, the reason for presentation, diagnosis, and the presence of acute pathological findings on CT scan were compared. Comparative analyses were performed with all the data obtained. Patients with insufficient data were excluded from the study. Patients with repeated CT scans in the emergency department were excluded from the study.

Ethics Committee Approval

Approval was obtained from the Hacıbektaş Veli University Non-Interventional Clinical Research Ethics Committee, decision number 2025/01 dated 30/04/2025.

Statistical Analysis

The Statistical Package for Social Sciences for Windows 21.0 (SPSS 21.0) program was used to analyze the data. Descriptive statistics (frequency, percentage distribution) were used for statistical analysis, and the 'Chi-square test' was used to compare categorical variables between two groups. For the comparison of independent groups, the 'Student T test' and/or Mann Whitney U test were used for analysis. The results are given as mean ± SD, or frequency (percentage), and $p<0.05$ was considered statistically significant at a 95% confidence interval.

Limitations of the Study

Due to the separate pediatric emergency department at the center where the study was conducted, only trauma cases were evaluated in the pediatric patient group.

Results

Data from 2627 patients were evaluated in the study. 52% percent of the patients were male. The mean age was 46.92±24.58. The highest number of patient admissions was in the 36-53 age group, accounting for 22.4% (**Table 1**). The mean age of traumatic patients was 34.34±27.79, while that of non-traumatic patients was 55.48±20.41, showing a significant difference (p=0.000). When looking at imaging times, it was seen that the highest number of images were taken on Thursdays and the lowest on Sundays (**Figure 1**). When looking at the time intervals, the highest number of imaging was between 20:00-21:59, while the lowest number of imaging was between 06:00-07:59 (**Figure 2**). The CT scans distributions according to time intervals are given in Table 2.

59.5% of patients presented with non-traumatic causes. The most common complaints among non-traumatic patients were abdominal pain (21.1%), shortness of breath (7.7%), and vomiting (4.6%). In traumatic presentations, the most common causes were falls (28.2%), traffic accidents (7.2%), and assault (2.8%). A comparison of data for traumatic and non-traumatic patients is provided in Table 3. Trauma was more common in males (58.3%). When looking at age groups, non-traumatic imaging was significantly more common with increasing age (p=0.000). There was no significant difference in trauma between imaging performed on weekdays and weekends (p=0.553). In the non-traumatic patient group, abdominal (86.1%) and thoracic (63.9%) CT scans were performed more frequently, while in the traumatic group, brain CT scans (61.6%) were performed significantly more frequently (p=0.000) (**Table 3**).

Looking at the imaging areas in general, brain CT scan was performed most frequently (44.8%). Most patients underwent imaging in a single area (88.1%). Regarding the outcome of the emergency department, 88.9% of patients were discharged, and 11% were admitted to the hospital (**Table 1**).

Table 1 shows the data of patients with and without acute pathology detected on CT. No acute pathological findings were detected on CT in 87.4% of patients. According to the data, the mean age was significantly higher in those with acute pathological findings (p=0.000). When examined according to the patients' presenting complaints, it was found that there were no significant acute pathological findings (p=0.000). No significant pathology was found in 95.9% of patients who underwent brain CT scan (p=0.000). Furthermore, no significant acute pathology was observed in 76.2% of patients who underwent chest CT (p=0.000). The ward admission rate for patients with acute pathology detected in imaging was 50.8%, and the intensive care admission rate was 54.4%.

Table 4 shows the imaging performed according to the patient's presenting complaint. Imaging of more than one region was significantly most common in traffic accident-related presentations (p=0.000). Accordingly, 18.9% of patients presenting with traffic accidents underwent imaging of one region, 20.5% underwent imaging of two regions, 28.4% underwent imaging of three regions, 10.5% underwent imaging of four regions, 20% underwent imaging of five regions, 1.1% underwent imaging of six regions, and 0.5% underwent imaging of seven different regions simultaneously.

Table 5 presents the analysis of CT scans results and the results according to gender and age groups. According to the data, there were no acute pathological findings in 93% of brain images, 96.7% of vertebral images, 72.2% of thoracic images, 84.5% of abdominal images, 98.2% of pelvic images, 94.2% of maxillofacial images, and 75.3% of extremity images. Significant differences were observed in thoracic and abdominal imaging according to gender (p=0.000). Significant differences were observed in the brain, vertebrae, thorax and abdomen according to age groups (p=0.000). Intracranial hemorrhage in the brain was most common in the 0-17 age group (34.8%) and the 72-89 age group (34.8%). Vertebral fracture was most common in the 72-89 age group (55.6%). Pathological findings related to the thorax were significantly more common in the 72-89 age group (p=0.000). Acute pathological findings related to the abdomen were significantly more common in the 36-53 age group (p=0.000).

Table 1: General Data

Data	General Data[a] n / % Average	No Acute Pathology[a] n / % Average	Acute Pathology Present[a] n / % Average	p value[b]
Gender				
Male	1366 (52)	1177 (86.2)	189 (11.2)	.045
Female	1261 (48)	1120 (88.8)	141 (13.8)	
Age (Average)	46.92±24.58	45.32±24.44	58.06±22.65	.000
Age Ranges				

0-17	340 (12.9)	325 (95.6)	15 (4.4)	.000
18-35	585 (22.3)	538 (92)	47 (8)	
36-53	589 (22.4)	523 (88.8)	66 (11.2)	
54-71	584 (22.2)	497 (85.1)	87 (14.9)	
72-89	483 (18.4)	378 (78.3)	105 (21.7)	
90-107	46 (1.8)	36 (78.3)	10 (21.7)	
Application Complaint				
Falls	742 (28.2)	679 (91.5)	63 (8.5)	.000
Abdominal pain	553 (21.1)	469 (84.8)	84 (15.2)	
Dyspnea	203 (7.7)	126 (62.1)	77 (37.9)	
Traffic accident	190 (7.2)	178 (93.7)	12 (6.3)	
Vomiting	120 (4.6)	103 (85.8)	17 (14.2)	
Chest pain	86 (3.3)	74 (86)	12 (14)	
Headache	85 (3.2)	85 (100)	0 (0)	
Muscle and joint pain	81 (3.1)	72 (88.9)	9 (11.1)	
Respiratory tract infection	81 (3.1)	70 (86.4)	11 (13.6)	
Assault	73 (2.8)	71 (97.3)	2 (2.7)	
Syncope and fainting	72 (2.7)	71 (98.6)	1 (1.4)	
Hypertension	58 (2.2)	57 (98.3)	1 (1.7)	
Dizziness	47 (1.8)	46 (97.9)	1 (2.1)	
Altered consciousness	41 (1.6)	31 (75.6)	10 (24.4)	
Diarrhea	37 (1.4)	35 (94.6)	2 (5.4)	
Hemiparesis	34 (1.3)	30 (88.2)	4 (11.8)	
Fever	27 (1)	16 (59.3)	11 (40.7)	
Bicycle accident	25 (1)	22 (88)	3 (12)	
Work accident	13 (0.5)	11 (84.6)	2 (15.4)	
Constipation	11 (0.4)	8 (72.7)	3 (27.3)	
Motorcycle accident	10 (0.4)	9 (90)	1 (10)	
Injuries from piercing and cutting tools	9 (0.3)	8 (88.9)	1 (11.1)	
Cardiopulmonary arrest	7 (0.3)	6 (85.7)	1 (14.3)	
Suicide attempt	5 (0.2)	5 (100)	0 (0)	
Speech disorder	4 (0.2)	4 (100)	0	
Anxiety disorder	3 (0.1)	3 (100)	0 (0)	
Epilepsy	3 (0.1)	3 (100)	0 (0)	
Visual impairment	3(0.1)	3 (100)	0 (0)	
Hemoptysis	2 (0.1)	1 (50)	1 (50)	
Gunshot wound	1 (0.05)	0 (0)	1 (100)	
Electrical shock	1 (0.05)	1 (100)	0 (0)	
Imaging Area				
Brain	1182 (44.9)	1134 (95.9)	48 (4.1)	.000
Vertebra	247 (9.4)	225 (91.1)	22 (8.9)	.070
Thorax	764 (29.1)	582 (76.2)	182 (23.8)	.000
Abdomen	803 (30.6)	682 (84.9)	121 (15.1)	.013
Pelvis	56 (2.1)	49 (87.5)	7 (12.5)	.100
Maxillofacial	52 (2)	49 (94.2)	3 (5.8)	.201
Extremity	93 (3.5)	70 (75.3)	23 (24.7)	.002
Number of Imaging Areas[c]				
1	2314 (88.1)	2028 (87.6)	286 (12.4)	.746
2	178 (6.8)	148 (83.1)	30 (16.9)	
3	65 (2.5)	62 (95.4)	3 (4.6)	
4	22 (0.8)	18 (81.8)	4 (18.2)	
5	45 (1.7)	38 (84.4)	7 (15.6)	
6	2 (0.1)	2 (100)	0 (0)	
7	1 (0.05)	1 (100)	0 (0)	
Emergency department discharge status				
Discharged	2336 (88.9)	2155 (92.3)	181 (7.7)	.000
Service admission	248 (9.4)	122 (49.2)	126 (50.8)	
Intensive care admissions	42 (1.6)	20 (47.6)	22 (54.4)	
Transfer to another center	1 (0.05)	0 (0)	100 (1)	
Total	**2627 (100)**	**2297 (87.4)**	**330 (12.6)**	

[a]Percentage ratios for general data are provided within their own groups, and those with and without acute pathology are provided within their own groups.

[b]Descriptive statistics (frequency, percentage distribution) were used for statistical analysis, and the 'Chi-square test' was used to compare categorical variables between two groups. The 'Student T-test' and/or Mann Whitney U test were used to analyze comparisons between independent groups. Results are presented as mean ± SD or frequency (percentage), and $p < 0.05$ was considered statistically significant at a 95% confidence interval.

[c]The number of imaging areas was given as any one or more of brain, vertebra, thorax, abdomen, pelvis, maxillofacial, and extremity imaging at the same time.

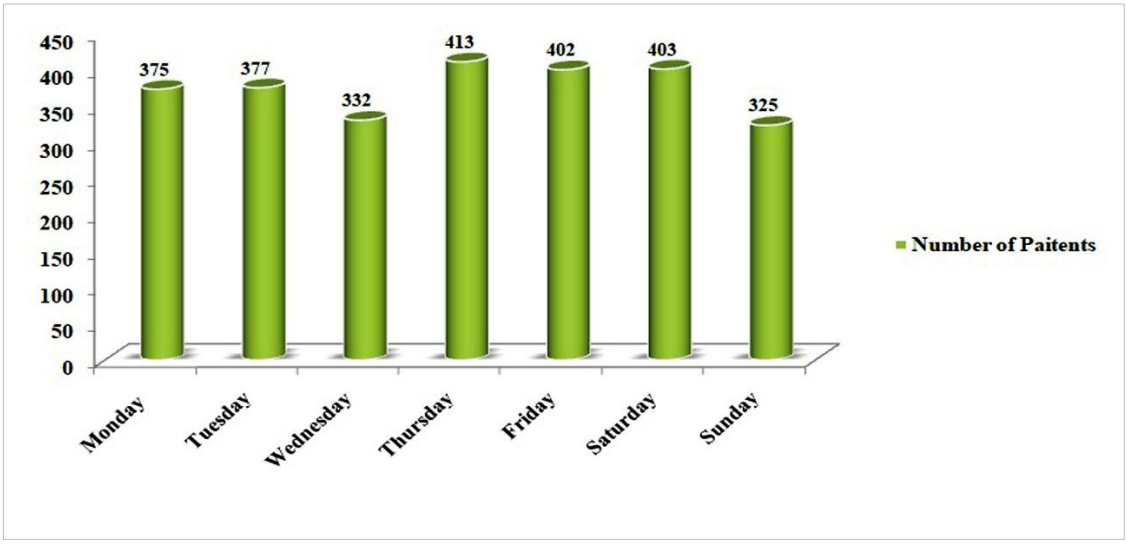

Figure 1: Distribution of the number of patients undergoing computed tomography imaging in the emergency department by day

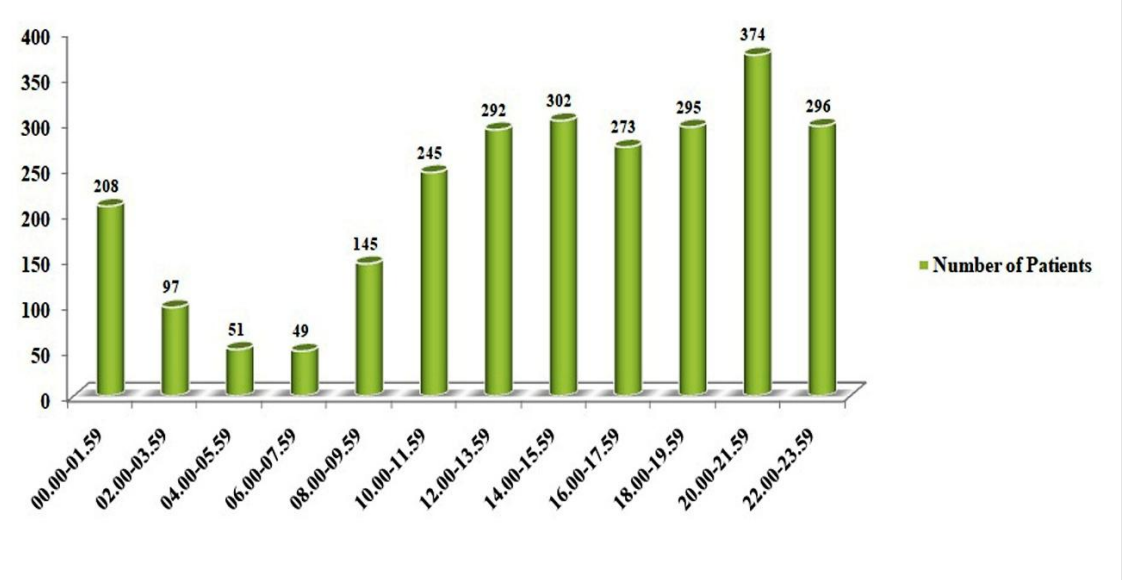

Figure 2: Distribution of the number of patients undergoing computed tomography imaging in the emergency department according to the time of admission

Table 2: Number and percentage of patients according to computed tomography imaging hours

Time Range	Brain (n/%)	Spine (n/%)	Thorax (n/%)	Abdomen (n/%)	Pelvis (n/%)	Maxillofacial (n/%)	Extremity (n/%)
00.00-01.59	80 (38.5)	19 (9.1)	60 (28.8)	77 (37)	1 (0.5)	3 (1.4)	6 (2.9)
02.00-03.59	31 (32)	8 (8.2)	30 (30.9)	47 (48.5)	1 (1)	2 (1.2)	2 (2.1)
04.00-05.59	13 (25.5)	2 (3.9)	10 (19.6)	30 (58.8)	1 (2)	2 (3.9)	0 (0)
06.00-07.59	23 (46.9)	3 (6.1)	13 (26.5)	13 (26.5)	0 (0)	0 (0)	0 (0)
08.00-09.59	65 (44.8)	10 (6.9)	44 (30.3)	43 (29.7)	3 (2.1)	4 (2.8)	2 (1.4)
10.00-11.59	104 (42.4)	24 (9.8)	80 (32.7)	74 (30.2)	5 (2)	2 (0.8)	13 (5.3)
12.00-13.59	122 (41.8)	18 (6.2)	88 (30.1)	77 (26.4)	2 (0.7)	6 (2.1)	10 (3.4)
14.00-15.59	145 (48)	47 (15.6)	101 (33.4)	92 (30.5)	13 (4.3)	6 (2)	9 (3)
16.00-17.59	128 (46.9)	22 (8.1)	70 (25.6)	85 (31.1)	8 (2.9)	6 (2.2)	12 (4.4)
18.00-19.59	144 (48.8)	33 (11.2)	94 (31.9)	76 (25.8)	7 (2.4)	5 (1.7)	16 (5.4)

20.00-21.59	180 (48.1)	35 (9.4)	96 (25.7)	100 (26.7)	6 (1.6)	9 (2.4)	10 (2.7)
22.00-23.59	147 (49.7)	26 (8.8)	78 (26.4)	89 (30.1)	9 (3)	7 (2.4)	13 (4.4)
Statistical value (p)[a]	.003	.027	.285	.000	.072	.844	.089

[a]Descriptive statistics (frequency, percentage distribution) were used for statistical analysis, and the 'Chi-square test' was used to compare categorical variables between two groups. Results are presented as frequencies (percentages), and $p < 0.05$ was considered statistically significant at a 95% confidence interval.

Table 3: Comparison of data for traumatic and non-traumatic patients

Data	General Data[a] n / % Mean	Traumatic[a] n / % Average	Non-Traumatic[a] n / % Average	p value[b]
Gender				
Male	1366 (52)	621 (45.5)	745 (54.5)	.000
Female	1261 (48)	443 (35.1)	818 (64.9)	
Age (Average)	46.92±24.58	34.34±27.79	55.48±20.41	.000
Age Ranges				
0-17	340 (12.9)	333 (97.9)	7 (2.1)	.000
18-35	585 (22.3)	271 (46.3)	314 (53.7)	
36-53	589 (22.4)	186 (31.6)	403 (68.4)	
54-71	584 (22.2)	168 (28.8)	416 (71.2)	
72-89	483 (18.4)	91 (18.8)	392 (81.2)	
90-107	46 (1.8)	15 (32.6)	31 (67.4)	
Application Time (days)				
Weekdays	1899 (72.3)	756 (39.8)	1143 (61.2)	.553
Weekend	728 (27.7)	308 (42.3)	420 (57.7)	
Application Time (hours)				
00.00-01.59	208 (7.9)	66 (31.7)	142 (68.3)	.000
02.00-03.59	97 (3.7)	30 (30.9)	67 (69.1)	
04.00-05.59	51 (1.9)	7 (13.7)	44 (86.3)	
06.00-07.59	49 (1.9)	12 (24.5)	37 (75.5)	
08.00-09.59	145 (5.5)	54 (37.2)	91 (62.8)	
10.00-11.59	245 (9.3)	101 (41.2)	144 (58.8)	
12.00-13.59	292 (11.1)	108 (37)	184 (63)	
14.00-15.59	302 (11.5)	127 (42.1)	175 (59.7)	
16.00-17.59	273 (10.4)	110 (40.3)	163 (59.7)	
18.00-19.59	295 (11.2)	137 (46.4)	158 (53.6)	
20.00-21.59	374 (14.2)	177 (47.3)	197 (52.7)	
22.00-23.59	296 (11.3)	135 (45.6)	161 (54.4)	
Imaging Area				
Brain	1182 (44.9)	728 (61.6)	454 (38.4)	.000
Vertebra	247 (9.4)	237 (96)	10 (4)	.000
Thorax	764 (29.1)	276 (36.1)	488 (63.9)	.003
Abdomen	803 (30.6)	112 (13.9)	691 (86.1)	.000
Pelvis	56 (2.1)	53 (94.6)	3 (5.4)	.000
Maxillofacial	52 (2)	52 (100)	0 (0)	.000
Extremity	93 (3.5)	83 (89.2)	10 (10.8)	.000
Imaging Findings				
Acute pathology present	330 (12.6)	85 (25.8)	(74.2)	.000
No acute pathology	2297 (87.4)	979 (42.6)	1318 (57.4)	
Areas without pathology				
Brain	1100 (93)	694 (63.1)	406 (36.9)	.000
Vertebra	238 (96.7)	228 (95.8)	10 (4.2)	.000
Thorax	552 (72.2)	252 (45.7)	300 (54.3)	.000
Abdomen	679 (84.5)	107 (15.8)	572 (84.2)	.000
Pelvis	55 (98.2)	52 (94.5)	3 (5.5)	
Maxillofacial	49 (94.2)	49 (100)	0 (0)	
Extremity	67 (75.3)	60 (89.6)	7 (10.4)	
Emergency Result				
Discharged	2336 (88.9)	1004 (43.6)	1332 (57)	.000
Inpatient service	248 (9.4)	53 (21.4)	195 (78.6)	
Intensive care admissions	42 (1.6)	6 (14.3)	36 (85.7)	

Transfer to another center	1 (0.05)	1 (100)	0 (0)	
Total	**2627 (100)**	**1064 (40.5)**	**1563 (59.5)**	

[a]Percentage ratios for general data are provided separately, and percentage ratios for traumatic and non-traumatic data are provided separately. [b]Descriptive statistics (frequency, percentage distribution) were used for statistical analysis, and the 'Chi-square test' was used to compare categorical variables between two groups. The 'Student T-test' and/or Mann Whitney U test were used to analyze comparisons between independent groups. Results are presented as mean ± SD or frequency (percentage), and $p < 0.05$ was considered statistically significant at a 95% confidence interval.

Table 4: Computed tomography imaging rates according to patient presentation complaints

Complaint	Brain (n/%)[a]	Vertebra (n/%)[a]	Thorax (n/%)[a]	Abdomen (n/%)[a]	Pelvis (n/%)[a]	Maxillofacial (n/%)[a]	Extremity (n/%)[a]
Fall	456 (61.5)	60 (8.1)	134 (18.1)	31 (4.2)	7 (0.9)	28 (3.8)	72 (9.7)
Abdominal pain	4 (0.7)	0 (0)	34 (6.1)	543 (98.2)	1 (0.2)	0 (0)	0 (0)
Dyspnea	17 (8.4)	0 (0)	194 (95.6)	9 (4.4)	0 (0)	0 (0)	0 (0)
Traffic accident	177 (93.2)	155 (81.6)	121 (63.7)	65 (34.2)	40 (21.1)	4 (2.1)	3 (1.6)
Vomiting	48 (40)	1 (0.8)	23 (19.2)	55 (45.8)	1 (0.8)	0 (0)	0 (0)
Chest pain	7 (8.1)	0 (0)	82 (95.2)	8 (9.3)	0 (0)	0 (0)	0 (0)
Headache	85 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Muscle and joint pain	23 (28.4)	8 (9.9)	30 (30.7)	13 (16)	0 (0)	0 (0)	10 (12.3)
Respiratory tract infection	8 (9.9)	0	74 (91.4)	1 (1.2)	0 (0)	0 (0)	0 (0)
Assault	58 (79.5)	7 (9.6)	2 (2.7)	4 (5.5)	0 (0)	14 (19.2)	1 (1.4)
Syncope and fainting	72 (100)	1 (1.4)	1 (1.4)	1 (14)	0 (0)	0 (0)	0 (0)
Hypertension	57 (98.3)	0 (0)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)
Dizziness	47 (100)	0	1 (2.1)	0 (0)	0 (0)	0 (0)	0 (0)
Altered consciousness	26 (63.4)	0 (0)	15 (36.6)	4 (9.8)	0 (0)	0 (0)	0
Diarrhea	0 (0)	0 (0)	0 (0)	36 (97.3)	1 (2.7)	0 (0)	0 (0)
Hemiparesis	34 (100)	0 (0)	2 (5.9)	0 (0)	0 (0)	0 (0)	0
Fire	2 (7.4)	0 (0)	22 (81.5)	8 (29.6)	0 (0)	0 (0)	0 (0)
Bicycle accident	18 (72)	4 (16)	6 (24)	1 (4)	0 (0)	1 (4)	0 (0)
Workplace accident	5 (38.5)	1 (7.7)	1 (7.7)	0 (0)	0 (0)	4 (38.8)	3 (23.1)
Constipation	0 (0)	0 (0)	1 (9.1)	11 (100)	0 (0)	0 (0)	0 (0)
Motorcycle accident	9 (90)	9 (90)	9 (90)	8 (80)	6 (60)	1 (10)	1 (10)
Puncture and cutting tool injury	4 (44.4)	1 (11.1)	3 (33.3)	2 (22)	0 (0)	0 (0)	3 (33.3)
Cardiopulmonary arrest	7 (100)	0	4 (57.1)	2 (28.6)	0 (0)	0 (0)	0 (0)
Suicide attempt	5 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Speech disorder	4 (100)	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anxiety disorder	2 (66.7)	0 (0)	1 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)
Epilepsy	3 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Vision impairment	3 (100)	0 (0)	1 (33.3)	0 (0)	0	0 (0)	0 (0)
Hemoptysis	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Firearm injury	0 (0)	0	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)
Electric shock	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Statistical Value (p)[b]	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**	**.000**

[a]Patient numbers and percentages are given according to the number of patients with the complaint in question. Descriptive statistics (frequency, percentage distribution) were used for statistical analysis, and the chi-square test was used to compare categorical variables between the two groups. Results are presented as frequencies (percentages), and $p < 0.05$ was considered statistically significant at a 95% confidence interval.

[b]Brain: 22 cells (35.5%) have an expected count less than 5. The minimum expected count is 45.

Vertebra: 27 cells (43.5%) have an expected count less than 5. The minimum expected count is 09.

Thorax: 22 cells (35.5%) have an expected count less than 5. The minimum expected count is 45.

Abdomen: 22 cells (35.5%) have an expected count less than 5. The minimum expected count is 29.

Pelvis: 37 cells (59.7%) have an expected count less than 5. The minimum expected count is 02.

Maxillofacial: 37 cells (59.7%) have an expected count less than 5. The minimum expected count is 02.

Extremity: 35 cells (56.5%) have an expected count less than 5. The minimum expected count is 04.

Table 5: Analysis of computed tomography imaging results and comparison by gender and age groups

Data[a]	Overall	Gender (n / %)		p value[b]	Age Ranges (n / %)						p-value[b]
Brain (n=1182)	**(n / %)[a]**	**Male**	**Female**		**0-17**	**18-35**	**36-53**	**54-71**	**72-89**	**90-107**	
No pathological findings	1100 (93)	523 (47.5)	577 (52.5)	.492	287 (26.1)	249 (22.6)	221 (20.1)	203 (18.5)	127 (11.5)	13 (1.2)	.000
Chronic findings present	55 (4.6)	24 (43.6)	31 (56.4)		1 (1.8)	1 (1.8)	2 (3.6)	13 (23.6)	33 (60)	5 (9.1)	
Skull fracture	4 (0.5)	1 (25)	3 (75)		2 (50)	2 (50)	0 (0)	0 (0)	0 (0)	0	
Intracranial hemorrhage	23 (1.9)	8 (34.8)	15 (65.2)		8 (34.8)	3 (13)	1 (4.3)	3 (13)	8 (34.8)	0 (0)	
Vertebra (n=247)											
No pathological findings	238 (96.7)	102 (42.9)	136 (57.1)	.066	46 (19.3)	83 (34.9)	47 (19.7)	46 (19.3)	15 (6.3)	1 (0.4)	.000
Vertebral fracture	9 (3.3)	2 (22.2)	7 (77.8)		1 (11.1)	1 (11.1)	1 (11.1)	1 (11.1)	5 (55.6)	0 (0)	
Thorax (n=764)											
No pathological findings	552 (72.2)	245 (44.4)	307 (55.6)	.004	42 (7.6)	126 (22.8)	129 (23.4)	131 (23.7)	118 (21.4)	6 (1.1)	.000
Chronic findings present	62 (8.1)	33 (53.2)	29 (46.8)		0 (0)	1 (1.6)	3 (4.8)	16 (25.8)	37 (59.7)	5 (8.1)	
Pneumonia	75 (9.8)	21 (28)	54 (72)		0 (0)	4 (5.3)	8 (10.7)	27 (36)	33 (44)	4 (4)	
Pleural effusion	71 (9.2)	39 (54.9)	32 (45.1)		0 (0)	2 (2.8)	9 (12.7)	19 (26.8)	35 (49.3)	6 (8.5)	
Rib fracture	18 (6.8)	10 (55.6)	8 (44.4)		0 (0)	1 (5.6)	5 (27.8)	7 (38.9)	5 (27.8)	0	
Hemothorax/pneumothorax	3 (0.3)	2 (66.7)	1 (33.3)		0 (0)	2 (66.7)	0 (0)	1 (33.3)	0 (0)	0 (0)	
Pneumomediastinum	1 (0.1)	0 (0)	1 (100)		0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	
Abdomen (n=803)											
No pathological findings	679 (84.5)	334 (49.2)	345 (50.8)	.000	19 (2.8)	222 (32.7)	195 (28.7)	152 (22.4)	82 (12.1)	9 (1.3)	.000
Chronic findings present	27 (3.3)	20 (74.1)	7 (25.9)		0 (0)	3 (11.1)	6 (22.2)	8 (29.6)	9 (33.3)	1 (3.7)	
Urolithiasis	29 (3.6)	5 (17.2)	24 (82.8)		0 (0)	7 (24.1)	13 (44.8)	4 (13.8)	5 (17.2)	0 (0)	
Ileus	21 (2.6)	12 (57.1)	9 (42.9)		0 (0)	1 (4.8)	5 (23.8)	7 (33.3)	7 (33.1)	1 (4.8)	
Acute cholecystitis	19 (2.3)	12 (63.2)	7 (36.8)		0 (0)	3 (15.8)	8 (42.1)	5 (26.3)	3 (15.8)	0 (0)	
Acute appendicitis	18 (2.3)	6 (33.3)	12 (66.7)		0 (0)	11 (61.1)	3 (16.7)	4 (22.2)	0 (0)	0 (0)	
Diverticulitis	4 (0.4)	3 (75)	1 (25)		0 (0)	0 (0)	2 (50)	2 (50)	0 (0)	0 (0)	
Over cyst rupture	3 (0.3)	3 (100)	0		0 (0)	0 (0)	3 (100)	0 (0)	0 (0)	0	
Strangulated hernia	3 (0.3)	2 (66.7)	1 (33.3)		0 (0)	0 (0)	1 (33.3)	2 (66.7)	0 (0)	0 (0)	
Stomach-intestinal perforation	2 (0.2)	0 (0)	2 (100)		0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	0 (0)	
Spleen rupture	1 (0.1)	1 (100)	0 (0)		0	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	
Abscess	1 (0.1)	1 (100)	0(0)		0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	
Pelvis (n=56)											
No pathological findings	55 (98.2)	25 (45.5)	30 (54.5)	.447	7 (12.7)	18 (32.7)	10 (18.2)	12 (21.8)	6 (10.9)	2 (3.6)	.519
Broken	1 (1.8)	1 (100)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	
Maxillofacial (n=52)											
No pathological findings	49 (94.2)	17 (34.7)	32 (65.3)	.143	10 (20.4)	16 (32.7)	13 (26.5)	9 (18.4)	0 (0)	1 (2)	.092
Broken	3 (5.8)	1 (33.3)	2 (66.7)		0 (0)	1 (33.3)	0 (0)	1 (33.3)	1 (33.3)	0 (0)	
Extremity (n=89)											
No pathological findings	67 (75.3)	33 (49.3)	34 (50.7)	.989	9 (13.4)	10 (14.9)	24 (35.8)	16 (23.9)	7 (10.4)	1 (1.5)	.424
Chronic findings present	3 (3.3)	1 (33.3)	2 (66.7)		0 (0)	2 (66.7)	0 (0)	1 (33.3)	0 (0)	0 (0)	
Broken	21 (23.6)	10 (47.6)	11 (52.4)		3 (14.3)	8 (38.1)	4 (19)	3 (14.3)	3 (14.3)	0 (0)	
Occlusion	2 (2.2)	1 (50)	1 (50)		0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	0	

[a]Results may include more than one pathological finding in a patient. Rates are calculated based on patients who underwent imaging.

[b]Descriptive statistics (frequency, percentage distribution) were used for statistical analysis, and the chi-square test was used to compare categorical variables between two groups. Results are presented as frequencies (percentages), and $p < 0.05$ was considered statistically significant at a 95% confidence interval.

Discussion

Imaging methods, especially CT scans, are frequently used diagnostic tests in emergency departments. When used with the correct indications, they can be the gold standard for obtaining important findings; however, when used incorrectly or inappropriately, they can have negative consequences in terms of patient and cost effectiveness. The reasons for requesting imaging in patients should be carefully evaluated, and imaging should be performed with the correct indications, guided by clinical decision-making guidelines [1].

During the period of our study, 25418 patients visited the emergency department, and CT was performed in 2627 of them (10.3%). Similarly, in another study, the rate of patients undergoing CT in the emergency department was 16.4% [7]. In another study, Bellolio et al. reported that CT imaging was performed in 17.8% of patients presenting to the emergency department [8].

The number of patient visits to the emergency department and the distribution of patient complaints may vary depending on the day of the week. This situation may also affect the frequency of CT scanuse in the emergency department. One study found that 66.8% of CT scans in the emergency department were performed on weekdays and 40.4% between 9:00 a.m. and 5:00 p.m. [9]. In another study, the highest rate of CT scans use in the emergency department was 32.4% during weekday working hours, while the lowest rate was during weekend night shifts (5.1%) [10]. In this study, 72.2% of CT scans in the emergency department were performed on weekdays and 47.1% between 16:00 and 23:59.

The most frequent age range for CT scans in this study was 36-53 years old, with a rate of 22.4%. A similar study reported that 20% of CT scan requests in the emergency department were for the 0-10 age group [11]. In another study, the highest rate of CT scans was 30.8% in the 22-45 age group [1]. In this study, the fact that CT scans performed in the pediatric emergency department were not included in the study and only pediatric trauma cases were included in the study may have affected the age group data.

The most common reason for imaging in the study was falls (28.2%), while overall, CT scans were most frequently requested for non-traumatic reasons (59.5%). In the study by Arslan et al., CT scans were requested for 55.9% of patients in the emergency department due to non-traumatic causes, 41.9% due to traumatic causes, and 2.2% due to unknown etiology [11]. The same study indicated that traumatic causes were mostly falls (83.7%), while non-traumatic causes were mostly neurological symptoms (53.6%) [11]. Similarly, another study found that the rate of patients undergoing imaging due to trauma was42%, while the most common reason for non-traumatic imaging was neurological diseases (46.7%) [1].

According to the results of the study, the most common imaging preference was brain CT scan (44.9%). Similarly, in another study, the most frequently requested CT scans were cranial CT (64.3%), abdominal-pelvic CT (25%), thoracic CT (12.6%), vertebral CT (6.2%), and extremity CT (5%) [11]. In a study conducted by Yıldız et al. in Bursa in 2019, it was stated that among 1700 patients who visited the emergency department of a secondary hospital and for whom a CT scan was requested for diagnostic purposes, the most common reason for the request was trauma, and cranial CT was the most frequently requested [1].

Studies have indicated that the vast majority of patients referred for CT scans in the emergency department do not have acute pathology [1,11-15]. A study by Yıldız et al. reported that acute pathology was not detected in 98.5% of cranial imaging performed due to trauma in childhood [1]. In this study, acute pathology was observed in 7% of patients who required cranial CT, 10.7% of patients who required thoracic CT, and 7.9% of patients who required abdominopelvic CT [1]. Furthermore, the study stated that no pathology was observed in 98.5% of cranial imaging performed due to trauma in childhood [1]. In another study, Arslan et al. observed that there was no acute pathology in 76.1% of patients who required CT in the emergency department [11]. In a study conducted by Özturk et al. in 2018, patients who presented to the emergency department due to syncope and for whom MRI or CT scan was requested were examined, and it was concluded that only 3.8% of the patients had abnormal pathologies as a result of imaging [12]. The same study concluded that methods to reduce the routine use of cranial CT scans in patients presenting to the emergency department with syncope should be investigated [12]. Similarly, Kapoor et al. stated that CT scans were beneficial in 4% of patients presenting to emergency departments with syncope complaints [14]. Goyal et al. stated that no pathology was observed on cranial CT scans in any of the 117 patients who presented to the emergency department with syncope [15]. Swartzberg and Goldstein evaluated CT scan requests in adult patients who presented to the emergency department over a four-month period in 2018. This study reported that CT scans were requested in 4.6% of patients presenting to the emergency department, with most requests being for trauma patients [16]. The same study found that cranial CT scans were requested most frequently, with pathological findings in 53.8% of cases [16]. This study also yielded results similar to those in the literature, with no acute pathological findings in 87.6% of requests.

In a study, CT scans results were evaluated according to gender and age groups, and the following results were obtained [1]. When the results were examined according to gender, it was stated that 70% of men and 75% of women did not have an urgent pathology in thoracic CT scan, while 68.6% of men and 63.9% of women did not have an urgent pathology in abdominopelvic CT scan [1]. All cases in the 0-12 age group included in the study were evaluated in the emergency department due to trauma, and 76.6% of those aged 13-21 had trauma [1]. Similar results were obtained in this study, and details are provided in Table 5 in the findings section.

Based on this study and similar studies on the subject, we observed that the majority of CT scans requested in the emergency department were not for acute pathological conditions. This situation has brought to the fore studies on how CT scans can be reduced. Indeed, there have been studies and recommendations in the literature on this subject. Maxwell et al. reviewed multiple studies and evaluated interventions aimed at reducing the rate of CT scans requested in the emergency department. As a result, only a few preventive interventions showed a consistent reduction in use. According to the study recommendations, clinicians and administrators, especially general practitioners, should adopt a multidisciplinary approach to educate themselves on the rationale for requesting CT scans. This will increase knowledge and skills and reduce CT scan requests in the emergency department [17]. Miller et al. found convincing evidence that CT scan can be safely reduced for emergency department patients [18]. To determine the cost-effectiveness of such reductions, they emphasized the need for further research to measure what patients and healthcare providers do after being discharged from the emergency department when unnecessary tests are not performed [18].

One study highlighted that inadequate primary care increases the rate of CT scans requests in the emergency department [7]. According to this study by Bellolio et al., the use of CT scans in adult patients in the emergency department has increased

significantly over the past 10 years. Patients without a primary care provider are more likely to undergo CT scans in the emergency department [7]. It has been suggested that ensuring access to primary care for emergency department follow-up could help optimize CT scansuse for the population, thereby reducing costs and radiation exposure [7].

In one study, Elhabr et al. noted that the use of emergency department neuroimaging increased significantly between 2007 and 2017 in both commercially insured and Medicare Advantage populations [19]. In their studies, overall, the rates of increase in use were driven by the oldest patients, and even when adjusted for patient age, there was a significant increase in the rates of use, particularly in the rates of CT scan use [19]. It has been suggested that further research on the overall appropriateness of neurovascular imaging and emergency department imaging could help determine whether this continuous increase in emergency department imaging volume and imaging intensity per patient improves health outcomes[19].

One of the most important reasons for physicians' excessive ordering of imaging tests in today's healthcare practice is the fear of malpractice [20]. While it was hoped that advances and widespread use of science and technology would minimize medical errors, the increasing number of lawsuits alleging unjustified medical malpractice and the rising amounts of compensation paid have led to the development of defensive medicine. Consequently, defensive behavior patterns are developing among physicians, such as resorting to unnecessary radiological methods like MRI, CT, x-ray, ultrasonography, and mammography; unnecessary hospitalization of patients; unnecessary tests; unnecessary consultations; unnecessary biopsies; unnecessary referrals; unnecessary cesarean sections; and unnecessary prescriptions [20]. Indeed, one study indicated that imaging requests are more frequent in the pediatric age group, especially in newborns and infants, due to the difficulty of neurological examination, the fact that existing findings are not always specific, parental anxiety, the desire to rule out differential diagnoses more definitively, and fear of malpractice [12].

Conclusion

In conclusion, in this study, we observed that 87.4% of CT requests in the emergency department were not based on acute pathological findings, and we found that studies in the literature were similar. We would like to emphasize that the radiation dose in computed tomography is high and therefore, when CT imaging is requested from patients for diagnostic purposes, this request should be based on valid diagnostic reasons and should only be performed when indicated. This is because the most important factor in reducing the radiation dose received is to avoid requesting unnecessary tests and repeating tests unnecessarily. Indeed, a study conducted by the Massachusetts Medical Society highlighted that CT scan requests tripled in the US between 1993 and 2007, with the number of CT scans performed in 2007 exceeding 72 million, and that these examinations were the direct cause of 30,000 cancer cases [20].

Declarations

Ethics Committee Approval

Approval was obtained from the Hacıbektaş Veli University Non-Interventional Clinical Research Ethics Committee, decision number 2025/01, dated 30/04/2025.

Conflict of Interest

The author have declared no conflict of interest.

Financial Support Statement

The author have not reported any financial support.

Ethics Statement

The author declare that they have adhered to research and publication ethics.

References

[1] Yıldız Ozkan O, Eraybar S, Kaya H, Armagan E. How effective are the computerized tomography imaging prompts in the emergency department? J Contemp Med. 2019; 9(3): 249-254. doi: 10.16899/jcm.596718

[2] Hendee WR, Becker GJ, Borgstede JP, Bosma J, Casarella WJ, Erickson BA, et al. Addressing overutilization in medical imaging. Radiology. 2010; 257(1): 240-5. doi: 10.1148/radiol.10100063.

[3] Carnevale TJ, Meng D, Wang JJ, Littlewood M. Impact of an emergency medicine decision support and risk education system on computed tomography and magnetic resonance imaging use. J Emerg Med. 2015; 48(1): 53-57. doi: 10.1016/j.jemermed.2014.07.033.

[4] Mettler FA Jr, Mahesh M, Bhargavan-Chatfield M, Chambers CE, Elee JG, Frush DP, et al. Patient Exposure from Radiologic and Nuclear Medicine Procedures in the United States: Procedure Volume and Effective Dose for the Period 2006-2016. Radiology. 2020; 295(2): 418-427. doi: 10.1148/radiol.2020192256.

[5] Griffey RT, Jeffe DB, Bailey T. Emergency physicians' attitudes and preferences regarding computed tomography, radiation exposure, and imaging decision support. Acad Emerg Med. 2014; 21(7): 768-777. doi: 10.1111/acem.12410.

[6] Erkoc MF, Imamoglu H, Dostbil AB, Okur A. Is cranial CT really required in the emergency department for each patient with headache? Middle East Journal of Medicine. 2012; 4(3): 114-116. https://doi.org/10.16899/jcm.596718.

[7] Bellolio MF, Bellew SD, Sangaralingham LR, Campbell RL, Cabrera D, Jeffery MM, et al. Access to primary care and computed tomography use in the emergency department. BMC Health Services Research. 2018; 18(1):154. doi: 10.1186/s12913-018-2958-4.

[8] Bellolio MF, Heien HC, Sangaralingham LR, Jeffery MM, Campbell RL, Cabrera D, et al. Increased Computed Tomography Utilization in the Emergency Department and Its Association with Hospital Admission. West J Emerg Med. 2017; 18(5): 835-845. doi: 10.5811/westjem.2017.5.34152.

[9] Maxwell S, Ha NT, Bulsara MK, Doust J, Mcrobbie D, O'Leary P, et al. Increasing use of CT requested by emergency department physicians in tertiary hospitals in Western Australia 2003-2015: an analysis of linked administrative data. BMJ Open. 2021; 11(3): e043315. doi: 10.1136/bmjopen-2020-043315.

[10] Cross R, Bhat R, Li Y, Plankey M, Maloy K. Emergency Department Computed Tomography Use for Non-traumatic Abdominal Pain: Minimal Variability. West J

Emerg Med. 2018; 19(5): 782-796. doi: 10.5811/westjem.2018.6.37381.

[11] Arslan E, Aydın I, Lök U, Gülaçtı U, Turgut K, Yavuz E, et al. Evaluation of the effectiveness of radiological imaging examinations requested from the emergency department. Adıyaman University Journal of Health Sciences. 2021; 7(2): 136-145. doi:10.30569/adiyamansaglik.874510

[12] Quayle KS, Jaffe DM, Kuppermann N, Kaufman BA, Lee BC, Park TS, et al. Diagnostic testing for acute head injury in children: when are head computed tomography and skull radiographs indicated? Pediatrics. 1997; 99(5):E11. doi: 10.1542/peds.99.5.e11.

[13] Ozturk K, Soylu E, Bilgin C, Hakyemez B, Parlak M. Predictor variables of abnormal imaging findings of syncope in the emergency department. Int J Emerg Med. 2018; 11(1):16. doi: 10.1186/s12245-018-0180-0.

[14] Kapoor WN, Karpf M, Wieand S, Peterson JR, Levey GS. A prospective evaluation and follow-up of patients with syncope. N Engl J Med. 1983; 309(4): 197-204. doi: 10.1056/NEJM198307283090401.

[15] Goyal N, Donnino MW, Vachhani R, Bajwa R, Ahmad T, Otero R. The utility of head computed tomography in the emergency department evaluation of syncope. Intern Emerg Med. 2006; 1(2): 148-50. doi: 10.1007/BF02936543.

[16] Swartzberg K, Goldstein LN. High positive computed tomography yields in the emergency department might not be a positive finding. S Afr Med J. 2018; 108(3): 230-234. doi: 10.7196/SAMJ.2018.v108i3.12635.

[17] Maxwell S, Ha NT, Bulsara MK, Doust J, Mcrobbie D, O'Leary P, et al. Increasing use of CT requested by emergency department physicians in tertiary hospitals in Western Australia 2003-2015: an analysis of linked administrative data. BMJ Open. 2021; 4;11(3):e043315. doi: 10.1136/bmjopen-2020-043315.

[18] Miller DG, Vakkalanka P, Moubarek ML, Lee S, Mohr NM. Reduced Computed Tomography Use in the Emergency Department Evaluation of Headache Was Not Followed by Increased Death or Missed Diagnosis. West J Emerg Med. 2018;19(2):319-326. doi: 10.5811/westjem.2017.12.34886.

[19] ElHabr A, Merdan S, Ayer T, Prater A, Hanna TN, Horný M, et al. Increasing Utilization of Emergency Department Neuroimaging From 2007 Through 2017. AJR Am J Roentgenol. 2022; 218(1): 165-173. doi: 10.2214/AJR.21.25864.

[20] Aşırdizer M, Ekiz A. Proposed Solutions in Medical Malpractice Claims. Forensic Medicine Bulletin 2022;27(3):288-294. doi: 10.17986/blm.1564