

The Impact of the COVID-19 Pandemic on Emergency Surgical Operations in State Hospitals in Turkey: A Retrospective and Descriptive Study

Attila Beştemir¹, Hakan Aydın¹, Alpay Tuncar²

¹University of Health Sciences Turkey, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of Emergency Medicine, İstanbul, Turkey

²The Minister of Health, Department of Medical Specialty Board, Department of Emergency Medicine, Ankara, Turkey

Abstract

Aim: Emergency surgery can be defined as surgical interventions and operations necessary to deal with an acute threat to life, organ, limb, or tissue. Our study examined the impact of the Coronavirus disease-2019 (COVID-19) pandemic on emergency surgical operations (ESOs) performed in state hospitals in Turkey.

Materials and Methods: In this national, retrospective, and descriptive study, ESOs performed in 2nd and 3rd-level state hospitals in Turkey in 2021 were recorded for the study. ESOs performed in 2019 were taken as the control group, and the changes between the two groups were examined.

Results: A total of 1,822,075 ESOs were included in the analysis. There was a 7.6% decrease in ESOs in 2021 compared to 2019. In both 2019 and 2021, cesarean section, surgical treatment of upper/lower extremity fractures and dislocations, and cholecystectomy were the most frequently performed ESOs. An increase in the number of ESOs in 2021 compared to 2019 was observed only in the urology department (7.1%) and orthopedics and traumatology department (2.7%). The surgical departments with the greatest decreases were neurosurgery (-28.1%), Otolaryngology-Head and Neck Surgery (-27.7%), and thoracic surgery (-20.9%)

Conclusion: During the COVID-19 pandemic, the number of ESOs performed in the 2nd and 3rd-level state hospitals in Turkey decreased compared with the previous year.

Keywords: Emergency surgery, emergency department, cesarean section, cholecystectomy, COVID-19

Introduction

Emergency surgical operation (ESO) can be defined as surgery needed to deal with an acute threat to life, tissue, limb, or organ caused by an acute disease process, trauma, complication of an interventional or surgical procedure, or acute exacerbation of a chronic disease process (1). Patients undergoing ESOs risk higher mortality and morbidity than elective operations due to the limited preoperative anesthesia preparation time (2-4). In developing countries, perioperative cardiac arrest rates range from 2.99 to 40.4 per 10,000 (5,6). The rate of perioperative cardiac arrest is higher in ESO patients, ranging from 6.48 to 62.1 per 10,000 (7,8). Two studies reported that 50-60% of all

cardiac arrest episodes in surgical patients occurred in patients undergoing emergency surgery (9,10).

Declared a pandemic by the World Health Organization (WHO) in March 2020, the COVID-19 and its indirect effects had negative consequences on health systems and the habits of patients (11-13). The number of examinations in Turkey's 2nd and 3rd-level state hospitals, which exceeded 321 million in 2019, decreased to approximately 205 million in 2020 (14). Decreased emergency department (ED) visits, including critically ill patients, have been reported during the pandemic period (11). There have also been delays in accepting and treating surgical emergencies (12,13). During the pandemic period, a significant decrease was observed



Corresponding Author: Attila Beştemir MD, University of Health Sciences Turkey, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of Emergency Medicine, İstanbul, Turkey
Phone: +90 532 397 77 37 **E-mail:** attilabes@hotmail.com **ORCID ID:** orcid.org/0000-0003-0986-9039

Received: 01.09.2022
Accepted: 18.01.2023

Cite this article as: Beştemir A, Aydın H, Tuncar A. The Impact of the COVID-19 Pandemic on Emergency Surgical Operations in State Hospitals in Turkey: A Retrospective and Descriptive Study. Eurasian J Emerg Med. 2023;22(1): 34-40.

©Copyright 2023 by the Emergency Medicine Physicians' Association of Turkey
Eurasian Journal of Emergency Medicine published by Galenos Publishing House.

in blood transfusions along with a decrease in the hospital admissions and a decrease in the number of surgical operations (15). This study examines the effects of the COVID-19 pandemic on the number of ESOs performed in state hospitals and their distribution by clinics throughout Turkey. It also provides a perspective for similar outbreaks we may encounter in the coming years.

Materials and Methods

In this retrospective, descriptive, observational study, ESOs performed in 2nd and 3rd-level state hospitals in Turkey in 2019 and 2021 were discussed. The number of ESOs performed by general surgery, orthopedics and traumatology, thoracic surgery, neurosurgery, cardiovascular surgery, plastic surgery, urology, ophthalmology, gynecology and obstetrics, and otolaryngology departments in Turkey in 2021 and the distribution according

to surgical departments was recorded in the study form. ESOs performed in 2019 were taken as the control group. The same ESOs were recorded for the control group. The changes between the two groups were calculated. The primary outcome of this study was ESOs performed throughout Turkey in 2021 (pandemic period). The secondary outcome was to compare the 2021 data with the 2019 (pre-pandemic period) data.

Statistical Analysis

In this descriptive study, data were presented as number and percentages. The number and rates of surgical treatments included in the study and the changes over the years are summarized in Table 1. The distribution of ESOs according to departments is presented in Table 2. The changes in the number of ESOs performed in the departments in 2021 compared to 2019 are presented in Figure 1.

Emergency surgical operations	Year 2019 n (%)	Year 2021 n (%)	Diff. * n (%)
Otolaryngology-Head and Neck Surgery			
Repair of facial bone fractures	3055 (0.32)	2320 (0.27)	-24.06
Repair of nasal/septal fracture or perforation	19883 (2.10)	12402 (1.42)	-37.63
External auditory canal or nose foreign body removal, surgical	21614 (2.28)	17501 (2.00)	-19.03
Surgical drainage of parotid abscess	1052 (0.11)	743 (0.08)	-29.37
Ophthalmology			
Repair of eye or eyelid injuries	12567 (1.33)	11086 (1.27)	-11.78
Intraocular foreign bodies removal	334 (0.04)	277 (0.03)	-17.07
Retinal detachment surgery	311 (0.03)	332 (0.04)	6.75
Thoracic Surgery			
Rib fracture/sternum fracture, surgical stabilization	991 (0.10)	577 (0.07)	-41.78
Thoracotomy, foreign body removal, or bleeding control	1085 (0.11)	1066 (0.12)	-1.75
Cardiovascular Surgery			
Pericardiocentesis, pericardiotomy, or pericardial window opening	1807 (0.19)	1777 (0.20)	-1.66
Heart repair after injury	426 (0.04)	362 (0.04)	-15.02
Ruptured aortic or/and its branches aneurysm	539 (0.06)	631 (0.07)	17.07
Vascular repair	13410 (1.42)	12256 (1.40)	-8.61
General Surgery			
Intervention for rectus sheath hematoma	77 (0.01)	49 (0.01)	-36.36
Repair of incarcerated/strangulated inguinal hernia	14466 (1.53)	11235 (1.28)	-22.34
Repair of esophageal perforation	70 (0.01)	49 (0.01)	-37.14
Endoscopic removal of foreign bodies	11642 (1.23)	11065 (1.26)	-4.96
Laparotomy for removal of the foreign body	300 (0.03)	300 (0.03)	0
Repair of the perforated stomach or duodenum	4532 (0.48)	4650 (0.53)	2.60
Small bowel perforation, primary suture	4881 (0.52)	4247 (0.49)	-12.99
Ileus and obstruction, surgical treatments	22326 (2.36)	20704 (2.37)	-7.27
Appendectomy	95913 (10.13)	86076 (9.84)	-10.26

Table 1. Continued			
Emergency surgical operations	Year 2019 n (%)	Year 2021 n (%)	Diff. * n (%)
Colon perforation, primary suture	2834 (0.30)	2480 (0.28)	-12.49
Sigmoid volvulus reduction	105 (0.01)	113 (0.01)	7.62
Drainage of abscess in the biliary system or liver	235 (0.02)	179 (0.02)	-23.83
Liver/gallbladder injuries, primary suture	1269 (0.13)	1121 (0.13)	-11.66
Cholecystectomy	129719 (13.70)	97268 (11.12)	-25.02
Acute pancreatitis. debridement, drainage	100 (0.01)	77 (0.01)	-23.00
Interventions for pancreatic injuries	85 (0.01)	72 (0.01)	-15.29
Splenectomy	2241 (0.24)	2007 (0.23)	-10.44
Urology			
Fournier's gangrene: surgical debridement	3887 (0.41)	4185 (0.48)	7.67
Repair of traumatic kidney rupture	48 (0.01)	45 (0.01)	-6.25
Repair of bladder perforation	1143 (0.12)	1131 (0.13)	-1.05
Repair of penile fracture	340 (0.04)	332 (0.04)	-2.35
Repair of urethral injury	73 (0.01)	100 (0.01)	36.99
Testicular detorsion	1679 (0.18)	1889 (0.22)	12.51
Obstetrics and Gynecology			
Cesarean section	271921 (28.71)	265933 (30.39)	-2.20
Ectopic pregnancy operation	1898 (0.20)	2157 (0.25)	13.65
Ovarian detorsion-cyst excision	18680 (1.97)	16449 (1.88)	-11.94
Repair of uterine perforation	442 (0.05)	699 (0.08)	58.14
Neurosurgery			
Epidural/subdural hematoma drainage	7453 (0.79)	6815 (0.78)	-8.56
Surgical management of depressed cranial fractures	921 (0.10)	731 (0.08)	-20.6
Surgical treatment of spinal fracture-dislocations	6730 (0.71)	3312 (0.38)	-50.8
Orthopedics and Traumatology			
Surgical treatment of upper/lower extremity fractures and dislocations	164315 (17.35)	169073 (19.32)	2.9
Foreign body removal from deep tissue, fasciotomy	52270 (5.52)	53367 (6.10)	2.1
Plastic and Reconstructive Surgery			
Tendon repair	37445 (3.95)	34403 (3.93)	-8.1
Amputation of fingers or stump repair	10030 (1.06)	11293 (1.29)	12.6
*Difference between 2019 and 2021. Values below 0.01% were expressed as 0.01%.			

Results

A total of 1,822,075 [947,144 cases (52.0%) in 2019 vs. 874,931 cases (48.0%) in 2021] were included in the analysis. There was a 7.6% decrease in the total number of ESO in 2021 compared to 2019.

The most common ESO performed in 2019 and 2021 was a cesarean section, followed by surgical treatment of upper/lower extremity fractures and dislocations, and cholecystectomy, respectively. The highest increase in 2021 compared to 2019 was

the repair of uterine perforation (442 cases in 2019 vs. 699 cases in 2021, a difference of 58.14%), repair of urethral injury (73 cases in 2019 vs. 100 cases in 2021, a difference of 36.99%), and repair of the ruptured aorta and/or aneurysm of its branches (539 cases in 2019 vs. 631 cases in 2021, a difference was 17.07%). The greatest decrease in 2021 compared to 2019 was the surgical treatment of spinal fracture-dislocations (6730 cases in 2019 vs. 3312 cases in 2021, a difference of -50.8%), surgical stabilization of rib fracture/sternum fracture, (991 cases in 2019 vs. 577 cases in 2021 cases, a difference of 41.78%), and repair of esophageal

perforation (70 cases in 2019 vs. 40 cases in 2021, a difference of 37.14%). ESO numbers and change rates in 2021 and 2019 are summarized in Table 1.

In 2019, the most ESO was performed in the obstetrics and gynecology department with 292,941 cases (30.93%) followed by the general surgery departments with 290,795 cases (30.70%) and orthopedics and traumatology departments with 216,585 cases (22.87%). In 2021, the most ESO was performed in the obstetrics and gynecology departments with 285,238 cases (32.60%), followed by general surgery departments with 241,683 cases (27.62%) and orthopedics and traumatology departments with 227,079 cases (25.42%). The distribution of the ESOs according to the departments is summarized in Table 2.

An increase in the number of ESOs in 2021 compared to 2019 was observed only in the urology department (7.1%) and orthopedics and traumatology department (2.7%). Surgical departments with the greatest decreases were neurosurgery (-28.1%),

Otolaryngology-Head and Neck Surgery (-27.7%), and thoracic surgery (-20.9%) (Figure 1).

Discussion

In this national retrospective study, ESOs performed in state hospitals in 2021 (pandemic period) were analyzed and the results were compared with 2019 (pre-pandemic) data. This study found a 7.6% decrease in the number of ESOs performed in state hospitals in 2021 compared to 2019. The most frequently performed ESOs in both periods were cesarean section and surgical treatment of upper/lower extremity fractures and dislocations. The ESOs with the highest increase in 2021 compared to 2019 were perforated uterus repair and repair of urethral injury. The most decreased ESOs were surgical treatment of spine fracture-dislocations and surgical stabilization of rib fracture/sternum fracture.

WHO reported that as of October 19, 2022, there had been more than 623 million confirmed cases of COVID-19, including 6,550,033 deaths, since the pandemic's start (16). COVID-19 has deeply affected the entire healthcare system (11,17,18). The question that inevitably arises is how the COVID-19 pandemic has affected our ability to maintain the highest quality of care for all of our patients, not just COVID-19 patients. In this process, elective surgical operations have come to a standstill in many hospitals, and a change is needed in the treatment protocols of ESOs (18,19). Additionally, a general decrease in surgical emergency procedures has been observed during the COVID-19 pandemic (12,20). Cano-Valderrama et al. (12) reported that there was a 65.4% decrease in emergency surgical activity during the pandemic period, and the number of patients who underwent emergency surgery in each hospital decreased from 2.6 during the control period to 0.9 during the pandemic period. Alimoglu et al. (21) reported that emergency surgical case consultations, hospitalizations, and ESOs decreased significantly during the

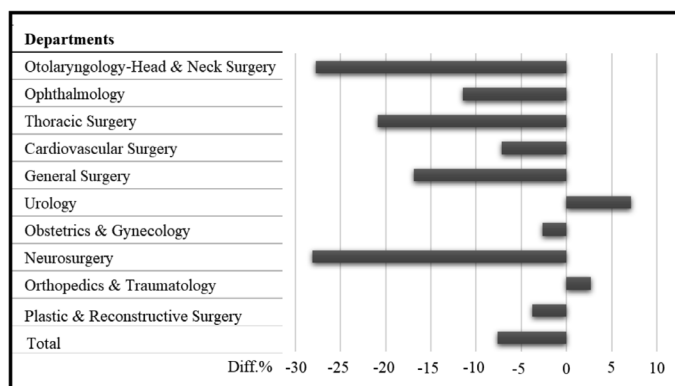


Figure 1. Change in the number of emergency surgical interventions performed in departments in 2021 compared to 2019

Departments	Year 2019 n (%)	Year 2021 n (%)
Otolaryngology-Head and Neck Surgery	45604 (4.81)	32966 (3.77)
Ophthalmology	13212 (1.39)	11695 (1.34)
Thoracic Surgery	2076 (0.22)	1643 (0.19)
Cardiovascular Surgery	16182 (1.71)	15026 (1.72)
General Surgery	290795 (30.70)	241687 (27.62)
Urology	7170 (0.76)	7682 (0.88)
Obstetrics and Gynecology	292941 (30.93)	285238 (32.60)
Neurosurgery	15104 (1.59)	10858 (1.24)
Orthopedics and Traumatology	216585 (22.87)	227440 (25.42)
Plastic and Reconstructive Surgery	47475 (5.01)	45696 (5.22)
Total	947144 (100)	874931 (100)

pandemic period compared with 2018 and 2019. Rausei et al. (22) reported a 45% decrease in emergency surgery admissions and a 41% decrease in ESOs in March 2020 compared with March 2019. Kamine et al. (23) reported a decrease in the number of hospitalizations in trauma patients during the pandemic period, but no change in the number of emergency surgeries. The inclusion of all types of emergency surgery patients in our study may have caused this difference. İlhan et al. (24,25), in their study in a tertiary hospital with a trauma center, reported that there was a decrease in the number of patients visited with trauma during the pandemic period, but there was no change in the emergency surgical needs of the patients. The lack of a decrease in the number of ESOs may be because the hospital where the study was conducted was an important trauma center in the region and the selected patient group. All secondary and tertiary state hospitals were included in our study. One of the leading reasons for the decrease in the number of ESOs in this study may be the hospitals where the data were obtained. Our study excluded data from private and university hospitals. Along with the pandemic, many state hospitals have been declared as pandemic hospitals. Therefore, patients requiring ESO may have preferred universities or private hospitals more than in previous years. Additionally, during the pandemic period, the ministry of health encouraged emergency health services to move more patients to private health institutions. The abovementioned situations may have contributed to the decrease in the number of ESOs performed in state hospitals compared to the pre-pandemic period. Moreover, the COVID-19 pandemic has affected the habits of patients and the healthcare system (26-28). A significant decrease in ED visits for acute life-threatening conditions has been reported during the COVID-19 pandemic (17,29). There has also been an increase in the rates of refusal of treatment despite medical advice in patients visiting the ED during the pandemic (26). Patients may have delayed or avoided medical care because of the risk of catching COVID-19, stay-at-home advice, or other reasons.

In our study, most of the ESO was performed in obstetrics and general surgery departments in both years. In both periods, the most frequently performed ESO was a cesarean section. Cesarean section was the most frequently performed major operating room procedure in the United States of America (USA) (30). In the USA, cholecystectomy with a rate of 129.4 per 100,000 people, and appendectomy with a rate of 93.3 are the most commonly performed operating room procedures, except for non-mother and newborn hospitalizations (31). Although their numbers decreased during the pandemic period in this study, cholecystectomy and appendectomy were among the most frequently performed ESOs in both periods.

A significant proportion of the patients in this study were trauma patients. The number of trauma surgeries decreased during the pandemic period compared with the previous period. However, the surgical treatment of upper/lower extremity fractures and dislocations increased by 2.9% in 2021 compared to 2019. İlhan et al. (24) reported that the frequency of multiple trauma decreased during the pandemic period compared to the previous period, but the frequency of upper and lower extremity injuries increased. Similarly, in the study by Esteban et al. (32), the incidence of upper and lower extremity injuries increased during the pandemic period. With the pandemic restrictions, people had to spend more time at home. This situation may be demonstrated as the reason for the decrease in high-energy trauma such as traffic accidents and the increased incidence of lower-energy extremity injuries such as home accidents.

Considering these findings, healthcare systems should guide to help patients choose the most appropriate hospital to receive care and ensure that patients with severe illnesses and injuries continue to visit EDs without fear of contamination or inefficiency. A careful balance must be struck between patient needs and resource availability during the pandemic. To respond effectively to the COVID-19 pandemic, hospitals should prepare detailed pandemic preparedness plans for emergency surgical services. Otherwise, secondary damage from health problems unrelated to outbreaks can have enormous social and economic consequences for the entire health system.

Study Limitations

This was a retrospective study that could lead to selection bias. The data only belong to state hospitals; data from private hospitals are excluded. However, in our study, emergency elective differentiation could not be made in some surgical procedures such as cholecystectomy and splenectomy. Finally, we could not distinguish in which department some surgical interventions were performed. Spinal trauma surgery was included in the neurosurgery department, and Fournier's gangrene was included in the urology department. Finally, we could not differentiate between pediatric surgery because we did not know the ages of the patients.

Conclusion

It is important to underline the points learned from the past in the 3rd year of the COVID-19 pandemic. This article provides an overview of Turkey's statistics on ESOs during the pandemic. The number of ESOs performed in 2nd and 3rd-level state hospitals in Turkey decreased compared to the previous year during the COVID-19 pandemic. This decrease in ESO numbers is likely

attributable to the strict stay-at-home policy, many patients staying away from healthcare facilities for fear of contracting Severe acute respiratory syndrome-Coronavirus-2 in the hospital, or opting for private healthcare facilities they consider more reliable.

Ethics

Ethics Committee Approval: The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki. The study was approved by the Ethical Committee of Ankara City Hospital (date: 27/05/2022, no: E2-22-1883).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: A.B., A.T., Design: A.B., H.A., Data Collection or Processing: A.B., A.T., Analysis or Interpretation: A.B., A.T., Literature Search: A.B., H.A., Writing: A.B., H.A.

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

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Sá AF, Lourenço SF, Teixeira RDS, Barros F, Costa A, Lemos P. Urgent/emergency surgery during COVID-19 state of emergency in Portugal: a retrospective and observational study. *Braz J Anesthesiol.* 2021;71:123-8.
2. Siriphuwanun V, Punjasawadwong Y, Lapisatepun W, Charuluxananan S, Uerpaiojkit K. Incidence of and factors associated with perioperative cardiac arrest within 24 hours of anesthesia for emergency surgery. *Risk Manag Healthc Policy.* 2014;7:155-62.
3. Holland R. Anaesthetic mortality in New South Wales. *Br J Anaesth.* 1987;59:834-41.
4. Braz LG, Módolo NS, do Nascimento P Jr, Bruschi BA, Castiglia YM, Ganem EM, et al. Perioperative cardiac arrest: a study of 53,718 anaesthetics over 9 yr from a Brazilian teaching hospital. *Br J Anaesth.* 2006;96:569-75.
5. Tamdee D, Charuluxananan S, Punjasawadwong Y, Tawichasri C, Kyokong O, Patumanond J, et al. Factors related to 24-hour perioperative cardiac arrest in geriatric patients in a Thai university hospital. *J Med Assoc Thai.* 2009;92:198-207.
6. Charuluxananan S, Suraseranivongse S, Jantorn P, Sriraj W, Chanchayanon T, Tanudsintum S, et al. Multicentered study of model of anesthesia related adverse events in Thailand by incident report (The Thai Anesthesia Incidents Monitoring Study): results. *J Med Assoc Thai.* 2008;91:1011-9.
7. Desalu I, Kushimo O, Akinlaja O. Adherence to CPR guidelines during perioperative cardiac arrest in a developing country. *Resuscitation.* 2006;69:517-20.
8. Kaewprasit P. Perioperative mortality in Buddhachinaraj Phitsanulok Hospital. *Buddhachinaraj Medical Journal.* 2008;25:581-6.
9. Ahmed A, Ali M, Khan EA, Khan MU. An audit of perioperative cardiac arrests in a Southeast Asian university teaching hospital over 15 years. *Anaesth Intensive Care.* 2008;36:710-6.
10. Newland MC, Ellis SJ, Lydiatt CA, Peters KR, Tinker JH, Romberger DJ, et al. Anesthetic-related cardiac arrest and its mortality: a report covering 72,959 anesthetics over 10 years from a US teaching hospital. *Anesthesiology.* 2002;97:108-15.
11. İlhan B, Bozdereli Berikol G, Dogan H. Impact of COVID-19 Outbreak on Emergency Visits and Emergency Consultations: A Cross-Sectional Study. *Cureus.* 2021;13:e14052.
12. Cano-Valderrama O, Morales X, Ferrigni CJ, Martín-Antona E, Turrado V, García A, et al. Acute Care Surgery during the COVID-19 pandemic in Spain: Changes in volume, causes and complications. A multicentre retrospective cohort study. *Int J Surg.* 2020;80:157-61.
13. Patel R, Hainsworth AJ, Devlin K, Patel JH, Karim A. Frequency and severity of general surgical emergencies during the COVID-19 pandemic: single-centre experience from a large metropolitan teaching hospital. *Ann R Coll Surg Engl.* 2020;102:1-6.
14. Beştemir A, Aydın H. Yıllık 300 milyon Hasta Muayenesi; Türkiye’de 2. ve 3. Basamak Kamu Sağlık Tesisleri Acil Servis ve Poliklinik Hizmetlerinin Değerlendirilmesi. *Sakarya Tıp Dergisi.* 2022;12:496-502.
15. Bestemir A, Tuncar A. A Comparative Analysis of the Blood Products used in the Emergency Room and other Clinics with the Pre- pandemic Period. *Med Bull Haseki.* 2022;60:461-7.
16. WHO Coronavirus (COVID-19) Dashboard. Available from: URL: <https://covid19.who.int/> Accessed October 19, 2022.
17. Diegoli H, Magalhães PSC, Martins SCO, Moro CHC, França PHC, Safanelli J, et al, Venancio VG, Liberato RB, Longo AL. Decrease in Hospital Admissions for Transient Ischemic Attack, Mild, and Moderate Stroke During the COVID-19 Era. *Stroke.* 2020;51:2315-21.
18. Ti LK, Ang LS, Foong TW, Ng BSW. What we do when a COVID-19 patient needs an operation: operating room preparation and guidance. *Can J Anaesth.* 2020;67:756-8.
19. De Simone B, Chouillard E, Di Saverio S, Pagani L, Sartelli M, Biffl WL, et al. Emergency surgery during the COVID-19 pandemic: what you need to know for practice. *Ann R Coll Surg Engl.* 2020;102:323-32.
20. Patrìti A, Eugeni E, Guerra F. What happened to surgical emergencies in the era of COVID-19 outbreak? Considerations of surgeons working in an Italian COVID-19 red zone. *Updates Surg.* 2020;72:309-10.
21. Alimoglu O, Erol CI, Kayali A, Acar M, Colapokulu N, Leblebici M, et al. Emergency Surgery During COVID-19 Pandemic; What Has Changed in Practice? *Br J Surg.* 2020;107:e581-2.
22. Rausei S, Ferrara F, Zurleni T, Frattini F, Chiara O, Pietrabissa A, et al. Dramatic decrease of surgical emergencies during COVID-19 outbreak. *J Trauma Acute Care Surg.* 2020;89:1085-91.
23. Kamine TH, Rembisz A, Barron RJ, Baldwin C, Kromer M. Decrease in Trauma Admissions with COVID-19 Pandemic. *West J Emerg Med.* 2020;21:819-22.
24. İlhan B, Bozdereli Berikol G, Aydın H, Arslan Erduhan M, Doğan H. COVID-19 outbreak impact on emergency trauma visits and trauma surgery in a level 3 trauma center. *Ir J Med Sci.* 2022;191:2319-24.
25. İlhan B, Berikol GB, Doğan H. Impact of COVID-19 Outbreak on Pediatric Trauma Cases in a Tertiary Trauma Center. *Med J Bakırköy.* 2022;18:70-6.
26. Aydın H, Doğan H. COVID-19 outbreak impact on discharge against medical advice from the ED: A retrospective study. *Am J Emerg Med.* 2022;57:21-6.
27. Vural A, Aksoy İ, Ekiz M. The Change in Acute Ischemic Stroke Numbers in the Emergency Service During Early Phase of COVID -19 Pandemic. *Middle Black Sea Journal of Health Science.* 2022;8:139-45.
28. Aydın H, Bestemir A, Berikol GB, Doğan H. Pandemi Hastanesinin Acil Servisine Başvuran Hastaların Analizi: Bir Retrospektif Türkiye Çalışması. *Tıbbi Sosyal Hizmet Dergisi.* 2022;76-85.

29. Mafham MM, Spata E, Goldacre R, Gair D, Curnow P, Bray M, et al. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. *Lancet*. 2020;396:381-9.
30. Healthcare Cost and Utilization Project (HCUP) Statistical Briefs [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US). 2006.
31. Fingar KR, Stocks C, Weiss AJ, Steiner CA. Most Frequent Operating Room Procedures Performed in U.S. Hospitals, 2003-2012. In: Healthcare Cost and Utilization Project (HCUP) Statistical Briefs. Agency for Healthcare Research and Quality (US), Rockville (MD). 2006.
32. Esteban PL, Querolt Coll J, Xicola Martínez M, Camí Biayna J, Delgado-Flores L. Has COVID-19 affected the number and severity of visits to a traumatology emergency department? *Bone Jt Open*. 2020;1:617-20.