EURASIAN JOURNAL OF EMERGENCY MEDICINE
Original Article
DOI: 10.4274/eajem.galenos.2019.72621
Eurasian J Emerg Med. 2020;19(4): 186-90

Utilization of Coagulation Studies in Emergency Department: A Chart Review

Ahmad Wazzan[1], Abdulhadi Tashkandi[2]

[1]Department of Emergency Medicine, King Saud Bin Abdulaziz University For Health Sciences, Jeddah, Saudi Arabia
[2]Department of Emergency Medicine, Ministry of National Guard Health Affairs - King Abdulaziz Medical City, Jeddah, Saudi Arabia

Abstract

Aim: This study aimed to determine the prevalence of abnormal coagulation studies in emergency department (ED) patients with and to investigate the relationship among chief complaints, past medical history or drug history, and abnormal results of coagulation studies.

Materials and Methods: In this retrospective chart review study, ED records of patients who had undergone coagulation studies were obtained. Patient data, including demographics, chief complaints, past medical history, drug history, and clinical impression, were reviewed. Descriptive and statistical analyses were performed.

Results: A total of 322 charts were reviewed. Thirteen patients (4.04%) had an abnormal international normalized ratio (INR), of which six (46.2%) were on warfarin therapy. Although chest pain was the most prevalent chief complaint (10.4%), no statistically significant relationship was found between chief complaints and INR levels. Patients with past medical history of thromboembolic risk were likely to have an abnormal INR [likelihood ratio (LR): 8.8]. Patients on warfarin therapy had a statistically significant likelihood of having abnormal INR (LR: 32.8) (p=0.000). Coagulation profiling was repeated in 4.35% of the patients, with a request gap mean of 6 days.

Conclusion: Chief complaints upon presentation to the ED are not good predictors of INR abnormalities. However, warfarin therapy and past medical history of thromboembolic events demonstrated robust association with abnormal INR levels. Routine coagulation studies are not indicated in all patients presenting to the ED.

Keywords: Coagulation, emergency department, utilization

Introduction

Emergency departments (EDs) use coagulation tests as part of their patients' evaluation. This would include a wide range of clinical scenarios where there is an anticipated possibility of performing an invasive procedure or initiating an anticoagulant or thrombolytic therapy. This is obviously done as a screening test for an unrecognized bleeding disorder or hypercoagulable state i.e. a baseline value.

Cost-effectiveness and patient satisfaction are two important factors that play a big role in health care management, particularly in the ED where waiting time and resources utilization are of a huge impact on the services provided. These two factors should be modified for the institutional benefit, patient care, and quality improvement. Proper utilization of certain laboratory tests plays a determinantal role in these factors. In our ED, 45,000 annual visits, the total number of coagulation profile requested in a single year was 8,695. This represents 18.5% of total hematology tests and 7.2% of total laboratory investigations ordered throughout the same year.

The operational cost of the coagulation profile in the Kingdom of Saudi Arabia ranges from 18 to 37 US dollars.

Many studies showed a clear relationship between the patient length of stay in the ED, and laboratory performance and the number of tests requested per patient. Reduction in turnaround time affects emergency staff satisfaction as well (1,2). Laboratory turn-around time for hematology requests from our department

Corresponding Author: Asst. Prof. Ahmad Wazzan, Department of Emergency Medicine, King Saud Bin Abdulaziz University For Health Sciences, Jeddah, Saudi Arabia
E-mail: dramwaz@hotmail.com **ORCID:** orcid.org/0000-0002-3958-4440

Received: 14.05.2019
Accepted: 30.05.2019

Cite this article as: Wazzan A, Tashkandi A. Utilization of Coagulation Studies in Emergency Department: A Chart Review. Eurasian J Emerg Med. 2020;19(4):186-90

was ranging from 12 minutes to 665 minutes per sample. The average turn-around time was 75 minutes.

Many studies have evaluated the efficacy of routine coagulation studies, most of them in the surgical and anesthesia literature as preoperative screening tests (3). Additional studies evaluated their utility prior to angiographic tests, on admission to the general medicine ward, and one study evaluated their importance in patients with a probable diagnosis of deep vein thrombosis (4-6). None of these studies found any justification for routine administration of the tests in any of the above-mentioned conditions. On the other hand, other studies showed the importance of Coagulation Profile as a prognostic factor in certain conditions e.g. polytrauma, head injuries, Systemic Inflammatory Response Syndrome, and Gastrointestinal bleeding (7-20).

Materials and Methods

Leaders of ED noticed that coagulation studies are being overutilized. A thorough literature review was done to find out that there are multiple studies that address the overutilization of the coagulation profile in other settings in the hospital.

The purpose of this study was to determine the prevalence of abnormal international normalized ratio (INR) levels in patients presenting to the ED and if there is a correlation between the INR levels and patients' chief complaints and other clinical data. The study was also quantifying the relevance and utilization of coagulation tests and its financial burden to the institution as well as the length of stay of patients in the ED, hence inconveniencing both the department and the patients.

In this retrospective chart review, we selected the month of August to apply our study to as it had the highest number of coagulation tests being requested throughout the year. The total number of ED visits during August was 3,579 patients.

We identified those patients who had a coagulation study done for, who were 801 patients. We postulated our margin of error to be <5% which gave as a sample size of at least 260. Using simple random sampling, we reviewed 322 charts of ED visits.

Data were entered through electronic sheets. Data collected were demographics, chief complaint, drug history "specifically aspirin, plavix, warfarin, and low molecular weight heparin (LMWH)", past medical history, clinical impression, and repeated tests if any. Some patients had more than one chief complaint; each chief complaint was counted as a separate entry. For statistical purposes, relevant chief complaints were grouped together and analyzed as one entity. All charts were included No patients were excluded from the study. For charts with missing "chief complaint" field, they were included in the "no history" category. Other missing data were left blank during data entry. Past Medical History was categorized into groups of possible disease risk. These are; 1. Atherosclerotic Risk [diabetes mellitus (DM), hypertension (HTN), ischemic heart disease (IHD), cerebrovascular accidents (CVA) and dyslipidemias]; 2. Thrombo-embolic Risk [pulmonary embolism (PE), deep vein thrombosis (DVT), oncology patients]; 3. Respiratory Risk [chronic obstructive pulmonary diseases (COPD), bronchial asthma (BA), other pulmonary conditions]; 4. Other past medical histories. INR results were classified as normal and abnormal. Abnormal INR was defined as any INR >1.5.

Statistical Analysis

Linear Regression analysis of data was done using SPSS program version 15.0. This included descriptive data analysis and statistical data analysis for each variant versus INR. The study was done in accordance with the methods/methodical section of the Ethical Principles for Medical Research amended in October 2013. Statistical significance was defined at the 5% ($p<0.05$).

Results

Descriptive data analysis showed a wide range of Chief complaints for which coagulation studies are being requested (Table 1). The commonest chief complaint among patients who had a coagulation study requested was chest pain, followed by

Table 1. Frequency of chief complaints

Chief complaint	n	%
Chest pain	41	10.4%
Abdominal pain	38	9.7%
Shortness of breath	31	7.9%
Other central nervous system complaints	29	7.4%
Other gastrointestinal complaints	24	6.1%
Vomiting	23	5.9%
Musculoskeletal pain	23	5.9%
Fever	23	5.9%
Obstetrics and gynecology	23	5.9%
Other complaints	23	5.9%
Limb(s) weakness	17	4.3%
No history	16	4.1%
Other cardiopulmonary complaints	16	4.1%
Dizziness	15	3.8%
Other abdominal pains	14	3.6%
Epigastric pain	12	3.1%
Motor vehicle accident	10	2.5%
Renal pain	8	2.0%
Head, eye, ear, nose or throat pain	7	1.8%

n: Number

abdominal pain and shortness of breath (10.4%, 9.7%, 7.9%). Out of 322 INR results, 13 patient (4.04%) had abnormal INR level, ranging from 1.6 to 5.6 with a mean of 2.7. These patients had different presenting chief complaints to the ED and variable past medical history (Tables 2 and 3). Among the patients with high INR levels, six patients were on warfarin (46.2%), one of them was on aspirin as well. None of them was on plavix nor heparin/LMWH (Table 4). One of the patients with abnormal INR had an INR level measured three days earlier. The first time showed a normal INR "1.2" while three days later it showed a high INR of 2.6. This patient was on Warfarin in both visits.

Table 2. INR levels and their frequencies

INR	Frequency	Percentage
<1.5	309	96.0%
>1.5	13	4.0%
Total	322	100.0%

INR: International normalized ratio

Table 3. Frequency of past medical history

Past medical history	n	%
Hypertension	80	25.7%
Diabetes mellitus	74	23.8%
Ischemic heart disease	45	14.5%
Oncology	30	9.6%
Chronic obstructive pulmonary disease	10	3.2%
Cerebrovascular accident	9	2.9%
Bronchial asthma	9	2.9%
Other lung diseases	6	1.9%
Chronic liver disease	6	1.9%
Patient on active chemotherapy	6	1.9%
Thyroid disease	6	1.9%
Chronic renal failure	5	1.6%
Epilepsy	5	1.6%
Dyslipidemia	4	1.3%
Organ transplant	4	1.3%
Deep vein thrombosis	3	1.0%
Sickle cell anemia	2	0.6%
Psychiatric Illness	2	0.6%
Pulmonary embolism	1	0.3%
Pregnancy	1	0.3%
Other blood diseases	1	0.3%
Valvular heart disease	1	0.3%
Atrial fibrillation	1	0.3%
Total	311	100.0%

n: Number

Coagulation studies were repeated for 14 patients on different presentations to the ED. Each patient had a repeated test twice with an interval ranging from 1 to 23 days, and a mean of 6 days. Table 5 is showing the INR values, chief complaints, and impression on each visit "if available". This is followed by the past medical history of the patient and his current medication.

No statistically significant relationship was found between any of the chief complaints and INR level (Table 6). Furthermore, no statistically significant relationship was found between past medical risk factors and INR levels (Table 5). On the other hand, there is a high statistical association between the use of warfarin and INR level (Table 7).

Discussion

The ED receives a wide range of clinical presentations. The situations in which patients present to the ED might influence the clinical course of the patient including history taking, physical examination, laboratory investigations, Interventions, type of medications, and patient disposition. Another practical obstacle is patient with difficult intravenous access e.g. children and IV drug abusers.

The initial chief complaint upon presenting to the ED might not be the complaint of concern to the attending physician e.g. a patient who comes with leg pain who is found to be on warfarin therapy for DVT and having an associated dyspnea.

Table 4. Clinical data of patients with abnormal INR level

INR	Chief complaint	Past medical history	Warfarin
5.6	Generalized body weakness	PE, oncology	Yes
4.2	Dizziness	IHD	Yes and ASA
3.7	Palpitation, fever	HTN, IHD, COPD	Yes
3.1	Chest pain, shortness of breath	DM, HTN, IHD, BA	Yes
2.6	Chest pain	DM, HTN, IHD	Yes
2.4	Ear discharge, fever	No	No
2.4	Sore throat	DM, HTN, DVT	Yes
2.1	Right sided weakness	DM, HTN	No
2.0	Decreased urine output	DM, HTN	No
1.9	Left leg pain	DVT	No
1.8	Chest pain	DM, HTN, IHD	No
1.7	Motor vehicle accident	No	No
1.6	Shortness of breath	Oncology	No

INR: International normalized ratio, PE: Pulmonary embolism, IHD: Ischemic heart disease, HTN: Hypertension, COPD: Chronic obstructive pulmonary disease, DM: Diabetes mellitus, BA: Bronchial asthma, DVT: Deep vein thrombosis, ASA: American Society of Anesthesiologists

Table 5. The likelihood ratio of abnormal INR vs historical risk factors

Risk factors	Likelihood ratio (p value)
Atherosclerosis	7.0 (0.07)
Thromboembolic	8.8 (0.01)
Lung	4.7 (0.10)
Other	3.4 (0.06)

INR: International normalized ratio

Table 6. Odds and likelihood ratios of abnormal INR vs chief complaints

Chief complaint	Odds ratio (95% CI)	Likelihood ratio (p value)
Musculoskeletal pain	1.09 (0.14-8.75)	0.01 (0.94)
Other complaints	1.14 (0.14-9.22)	0.02 (0.90)
Limb(s) weakness	1.53 (0.19-12.48)	0.14 (0.71)
Shortness of breath	1.76 (0.37-8.31)	0.45 (0.50)
Dizziness	1.76 (0.21-14.47)	0.24 (0.63)
Chest pain	2.14 (0.56-8.12)	1.10 (0.30)
Fever	2.49 (0.52-11.99)	1.08 (0.30)
Motor vehicle accident	2.78 (0.33-23.73)	0.69 (0.41)
Renal pain	3.60 (0.41-31.59)	1.01 (0.32)
Cardiac complaint	6.83 (1.68-27.83)	5.39 (0.02)
Head, eye, ear, nose and throat complaint	11.06 (1.93-63.40)	5.13 (0.02)
Abdominal pain	N/A*	3.34 (0.07)
Vomiting	N/A*	1.97 (0.16)
Other gastrointestinal complaints	N/A*	1.88 (0.17)
Other abdominal pain	N/A*	1.18 (0.28)
Obstetrics and gynecological complaint	N/A*	1.97 (0.16)
No history	N/A*	1.35 (0.25)
Epigastric pain	N/A*	1.01 (0.32)
Central nervous system	N/A*	2.51 (0.11)

*N/A indicates no abnormal INR in the category
N/A: Not available, CI: Confidence interval, INR: International normalized ratio

Table 7. Odds and likelihood ratios of abnormal INR vs drug history

Rx	Odds ratio (95 %CI)	LR (p value)
Warfarin	131.6 (22.5-770.1)	32.8 (0)
ASA	1.4 (0.2-11.7)	0.1 (0.8)
Plavix	N/A	0.7 (0.4)

INR: International normalized ratio, LR: Likelihood ratio, CI: Confidence interval, ASA: American Society of Anesthesiologists, N/A: Not available

Another point worth mentioning is, "pricking the patient a second time". Many physicians would do a coagulation profile to keep it "stand by" or "if needed" rather than a second prick. This is understandable as many patients in ED would have a disposition diagnosis different from their provisional diagnosis. The ethical and cost-effectiveness aspects should be balanced to reach an answer to the question "Prick again or not?". Further studies should evaluate these aspects and how to implement it.

Study Limitations

Our study had the limitations of small sample size, limited financial resources, time limitation.

Despite the major downside of our study i.e. sample size, our study is enforced by the similar results found in the literature.

Conclusion

EDs should develop protocols, guidelines or recommendations to improve the utilization of coagulation profile. This was found cost-effective (21-25). These guidelines should be flexible to adopt a wide range of clinical presentations to ED. Other studies have shown that obtaining a history of previous bleeding, liver disease or therapy with anticoagulants is a better predictor of abnormal coagulation profile or significant bleeding tendency (26-31).

Other authors recommend initiation of thrombolytic therapy in ischemic stroke or ST-elevation myocardial infarction, without waiting for coagulation studies results. In these studies, abnormal levels were predictable by history alone (3,32,33). Invasive procedures in the ED can be done without a baseline INR, provided that clinical information ruled out the possibility of bleeding tendency (34-36).

Ethics

Ethics Committee Approval: Since this retrospective study conducted before January 2020, and ethics committee approval was not necessary in that time, ethics committee approval was not obtained.

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

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

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. Steindel SJ, Howanitz PJ. Physician satisfaction and emergency department laboratory test turnaround time. Arch Pathol Lab Med. 2001;125:863-71.
2. Holland LL, Smith LL, Blick KE. Reducing laboratory turnaround time outliers can reduce emergency department patient length of stay. Am J Clin Pathol. 2005;124:672-4.
3. Schwartz D. Utility of routine coagulation studies in emergency department patients with suspected acute coronary syndromes. Isr Med Assoc J. 2005;7:502-6.
4. Darcy MD, Kanterman RY, Kleinhoffer MA, Vesely TM, Picus D, Pilgram TK. Evaluation of coagulation tests as predictors of angiographic bleeding complications. Radiology. 1996;198:741-4.
5. Hubbell FA, Frye EB, Akin BV, Rucker L. Routine admission laboratory testing for general medical patients. Med Care. 1988;26:619-30.
6. McKinley L, Wrenn K. Are baseline prothrombin time/partial thromboplastin time values necessary before instituting anticoagulation? Ann Emerg Med. 1993;22:697-702.
7. Mikhail J. The trauma triad of death: hypothermia, acidosis, and coagulopathy. AACN Clin Issues. 1999;10:85-94.
8. LoVecchio F, Pizon AF, Berrett C, Balls A. Outcomes after environmental hyperthermia. Am J Emerg Med. 2007;25:442-4.
9. Henzler D, Cooper DJ, Mason K. Factors contributing to fatal outcome of traumatic brain injury: a pilot case study. Crit Care Resusc. 2001;3:153-7.
10. Liu YG, Li CS. Coagulation dysfunctions in patients with systemic inflammatory response syndrome. Zhonghua Nei Ke Za Zhi. 2004;43:94-7.
11. Schreyer N, Engeler A, Leyvraz PF. [10 years experience in surgical resuscitation at a university hospital center. Determination of a criterion for identifying patients at risk for fatal irreversible coagulopathy]. Swiss Surg. 2003;9:167-72.
12. Holmes JF, Goodwin HC, Land C, Kuppermann N. Coagulation testing in pediatric blunt trauma patients. Pediatr Emerg Care. 2001;17:324-8.
13. Kanich W, Brady WJ, Huff JS, Perron AD, Holstege C, Linbeck G, et al. Altered mental status: evaluation and etiology in the ED. Am J Emerg Med. 2002;20:613-7.
14. Wang TL, Jang TN, Huang CH, Kao SJ, Lin CM, Lee FN, et al. Establishing a clinical decision rule of severe acute respiratory syndrome at the emergency department. Ann Emerg Med. 2004;43:17-22.
15. Kollef MH, O'Brien JD, Zuckerman GR, Shannon W. BLEED: A classification tool to predict outcomes in patients with acute upper and lower gastrointestinal hemorrhage. Crit Care Med. 1997;25:1125-32.
16. Popović N, Blagojević Z, Nikolić V, Arsenijević LJ, Karamarković A, Stefanović B, et al. Massive hemorrhage and mechanisms of coagulopathy in trauma. Acta Chir Iugosl. 2006;53:89-92.
17. Brooks JP, Marshall JH. Early awareness of post-traumatic coagulopathy. Injury. 1995;26:283-4.
18. Solenski NJ. Transient ischemic attacks: Part I. Diagnosis and evaluation. Am Fam Physician. 2004;69:1665-74.
19. Fabbri A, Servadei F, Marchesini G, Stein SC, Vandelli A. Early predictors of unfavorable outcome in subjects with moderate head injury in the emergency department. J Neurol Neurosurg Psychiatry. 2008;79:567-73.
20. Nuevo González JA, Ballesteros JCC, Holguín EP, Saro BB, Soler EV, Fernández JAS. Oral anticoagulation excess: analysis from an emergency department. Rev Clin Esp. 2008;208:66-70.
21. Groopman DS, Powers RD. Effect of "standard order" deletion on emergency department coagulation profile use. Ann Emerg Med. 1992;21:524-7.
22. Sucov A, Bazarian JJ, deLahunta EA, Spillane L. Test ordering guidelines can alter ordering patterns in an academic emergency department. J Emerg Med. 1999;17:391-7.
23. Auble TE, Taylor DM, Hsu EB, Yealy DM. Evaluation of guidelines for ordering prothrombin and partial thromboplastin times. Acad Emerg Med. 2002;9:567-74.
24. Barnes D. Coagulation tests in the emergency department. Aust Clin Rev. 1991;11:116.
25. Peterson P, Hayes TE, Arkin CF, Bovill EG, Fairweather RB, Rock WA Jr, et al. The preoperative bleeding time test lacks clinical benefit: College of American Pathologists' and American Society of Clinical Pathologists' position article. Arch Surg. 1998;133:134-9.
26. Kitchens CS. Preoperative PTs, PTTs, cost-effectiveness, and health care reform. Radical changes that make good sense. Chest. 1994;106:661-2.
27. Sramek A, Eikenboom JC, Briet E, Vandenbroucke JP, Rosendaal FR. Usefulness of patient interview in bleeding disorders. Arch Intern Med. 1995;155:1409-15.
28. Awan MS, Iqbal M, Imam SZ. Epistaxis: when are coagulation studies justified?. Emerg Med J. 2008;25:156-7.
29. Dizdar O, Onal IK, Ozakin E, Karakilic E, Karadag O, Kalyoncu U, et al. Research for the bleeding tendency in patients presenting with significant epistaxis. Blood Coagul Fibrinolysis. 2007;18:41-3.
30. Singer AJ, Blanda M, Cronin K, Khwaja-LoGiudice M, Gulla J, Bradshaw J, et al. Comparison of nasal tampons for the treatment of epistaxis in the emergency department: a randomized controlled trial. Ann Emerg Med. 2005;45:134-9.
31. Newman DH, Zhitomirsky I. The prevalence of nontherapeutic and dangerous international normalized ratios among patients receiving warfarin in the emergency department. Ann Emerg Med. 2006;48:182-9, 189.e1.
32. Gottesman RF, Alt J, Wityk RJ, Llinas RH. Predicting abnormal coagulation in ischemic stroke: reducing delay in rt-PA use. Neurology. 2006;67:1665-7.
33. Derhaschnig U, Laggner AN, Röggla M, Hirschl MM, Kapiotis S, Marsik C, et al. Evaluation of coagulation markers for early diagnosis of acute coronary syndromes in the emergency room. Clin Chem. 2002;48:1924-30.
34. Lin CH, Shih FY, Ma MHM, Chiang WC, Yang CW, Ko PCI. Should bleeding tendency deter abdominal paracentesis? Dig Liver Dis. 2005;37:946-51.
35. O'Connor RE, Feldstein JS, Bouzoukis JK. Thoracentesis in the emergency department. J Emerg Med. 1985;2:433-42.
36. Innes GD, Dillon EC, Holmes A. Low-molecular-weight heparin in the emergency department treatment of venous thromboembolism. J Emerg Med. 1997;15:563-6.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
DOI: 10.4274/eajem.galenos.2020.81488
Original Article
Eurasian J Emerg Med. 2020;19(4): 191-6

Knowledge Levels of Paramedic Program Senior Year Students on Frequently Used Drugs and Interventional Procedures: A Comparative Study

Tuğba Gültekin, Sinan Yenal

First and Emergency Aid Program, Health Services Vocational School, Dokuz Eylül University, İzmir, Turkey

Abstract

Aim: This study aimed to determine and compare the knowledge level of senior year students studying the paramedic program at Dokuz Eylül (DEU), Ege (EU) and İzmir Katip Çelebi (İKÇU) universities on frequently used drugs and interventional procedures.

Materials and Methods: This descriptive study was conducted with 167 students in first and emergency aid programs of three universities with DEU, EU and İKÇU in between March 30, 2019 and December 30, 2019. Descriptive findings were presented as percentage, mean, standard deviation, and median.

Results: Of the participants, 52.1% were females and the remaining 47.9% were males. The most common issues for which the paramedic students felt incompetent were drug doses (58.6%) and interventional procedure complications (60.4%). The mean total score of the knowledge level of the paramedic students on drugs and administration methods was 54.724. The total mean total score of the knowledge level of interventional procedures in paramedic students was 65.653. There was no difference in the knowledge level on drugs and administration methods in terms of the different universities ($p=0.470$). However, a significant difference was found in the knowledge level on interventional procedures between the students studying at different universities ($p=0.002$). Advanced analysis revealed that the difference was due to İKÇU students ($p<0.806$) ($p<0.004$ for DEU and EU).

Conclusion: It was determined that paramedic students had low knowledge level on drug usage and interventional procedures. Therefore, the training of paramedics who will work in pre-hospital emergency health service needs to be standardized while considering the deficiencies and including updates.

Keywords: Paramedic, drug applications, intervention skills, knowledge level, public health

Introduction

Pre-hospital emergency health services cover the emergency care services provided by specially trained and well-equipped teams given at the scene and/or during transportation until the arrival of patients or injured persons to the hospital, and emergency care services provided in health institutions and organizations (1).

This specially equipped personnel working in the harsh conditions at pre-hospital emergency health services and carrying the roles and responsibilities that may be required in the field began working in ambulances in the 1950s especially in the North American countries. On the other side in Turkey, staff training specific to the pre-hospital field began in the early 1990s (2,3).

The development of emergency medicine in Turkey began in 1990 in Dokuz Eylül University (DEU) when an American emergency medicine specialist Dr. John Fowler was invited to Turkey by DEU and began working at the Emergency Room of DEU Hospital. "Emergency Medicine" was recognized as a separate specialty in 1993 by Dr. John Fowler's active efforts and two emergency medicine departments, DEU Emergency Medicine Department and Fırat Universty Emergency Medicine Department were founded in the same year (4,5).

Within the scope of "Emergency and Rescue Services Project" initiated by the Ministry of Health in 1994, fully equipped ambulances were purchased, radio network was renewed, a

Corresponding Author: Assoc. Dr. Tuğba Gültekin, Ph.D., First and Emergency Aid Program, Health Services Vocational School, Dokuz Eylül University, İzmir, Turkey
E-mail: tugba.gultekin@deu.edu.tr **ORCID:** orcid.org/0000-0002-0574-2551

Received: 07.11.2019
Accepted: 30.04.2020

Cite this article as: Gültekin T, Yenal S. Knowledge Levels of Paramedic Program Senior Year Students on Frequently Used Drugs and Interventional Procedures: A Comparative Study. Eurasian J Emerg Med. 2020;19(4):191-6

telephone exchange was established, and new emergency aid stations were constructed. In those years, nurses started to work for the first time in ambulances next to physicians and drivers, and the first training on emergency health services was carried out (6).

Emergency Care Technician program, established for the first time in Turkey at DEU in the 1993-1994 academic year as part of the Health Services Vocational School with the Canada-Cambrian College collaboration became one of the first and most important steps taken in the field of pre-hospital emergency care in Turkey. The purpose of this program was to educate and train the personnel who can provide pre-hospital emergency care needed by the patients and the injured at a professional level (4,5).

In 2004, a new era began in Turkey when paramedics started to work in 112 ambulances. Their roles and responsibilities were determined by relevant regulations. The Regulation on Emergency Health Services was published in the Official Newspaper in 2007. In 2009, Communiqué on Working Procedures and Principles of Ambulance and Emergency Care Technicians and Emergency Medical Technicians was published in the Official Gazette, and the roles and responsibilities of the paramedics were defined in this communiqué. The Paramedic Training Coordination Board continues its meetings in parallel with scientific developments, especially medicine, and developments in the roles and responsibilities of professional members (7,8).

The most important task, power, and responsibilities of paramedics are to use emergency medications (atropine, adrenaline, amiodarone, metoprolol, midazolam, diltiazem, calcium, etc.) which are accepted in the pre-hospital period until patients reach the hospital and perform vital interventional procedures (defibrillation, intraosseous, laryngeal mask airway, capnometry, etc.).

The number of programs was less than 20 in the early 2000s. This number reached approximately 150 in 2016 and occupational members without adequate occupational competence graduating from these programs opened without concern for qualified educators or occupational training infrastructure led to a serious discussion of occupational roles and responsibilities (2,9).

After long term efforts in Turkey on standardization activities, a standard curriculum has been prepared for paramedic training. However, today's issue is not that these curricula have been standardized, but rather these standardized curricula prepared after long and arduous efforts cannot be implemented due to lack of infrastructure and a large number of students (2,10).

The paramedic profession is a different occupational group compared to others, therefore the methods to be applied in training and education also differ. One of the most important problems for today is that the instructors working in vocational education, who come from different occupational groups, do not have the sufficient knowledge and skills required by the profession.

In addition, student quotas exceeding capacity affect the quality of education and rapidly increase the number of graduates, causing employment problems. The aim of the paramedic programs today should be to train qualified paramedics who can fulfill the roles and responsibilities of the profession with the appropriate number of students.

We believe that determining the knowledge levels of paramedic program (first and emergency aid technicians) senior year students on commonly used drugs and interventional procedures in this study will contribute to the literature and all stakeholders for reviewing and restructuring pre-graduation training.

Purpose of the Study

Study was planned to determine and compare the knowledge level of senior year students studying in the paramedic programs at DEU, EU, İKÇU universities, about frequently used drugs and interventional procedures.

Materials and Methods

Study Design

This study was designed as a comparative study.

Place and Time of Study

This study was carried out in DEU, EU and İKÇU Vocational School of Health Services between March 30, 2019, and December 30, 2019.

Population and Sample of Study

The population of the study consisted of 200 senior students studying in First and Emergency Aid programs in DEU (60 students), EU (70 students) and İKÇU (70 students) Vocational School of Health Services in the 2018-2019 spring semester.

Since the information related to the research questions was homogeneous with respect to the population, the simple random sampling method was used and the entire population was reached without any sampling. The study was conducted with 167 students who accepted to participate in the study.

Although there are limited studies on this subject, the frequency of inadequate knowledge level of paramedics on drug and drug applications is reported to be 48% in another study (11).

According to these data, the minimum number of paramedic students to be included in the study within 95% confidence interval and ±5% frequency limits were calculated as 65 (12-14). Two hundred senior paramedic students between the ages of 18-27 who are enrolled in the vocational schools were planned to be included in the study.

Research Summary

Data collection was performed in March-April 2019, in the classroom, during extracurricular hours. Students were given 20-25 minutes to complete the measurement tools and then the forms were collected by the researcher.

Data Collection (Measurement) Tool

The measurement tool developed by Haytaç (11) in 2017 to determine the knowledge level of students on commonly used drugs and interventional procedures in the pre-hospital period was used in this study (11). In the first part of this measurement tool, there are a total of eight descriptive questions that identify the person. In the second part of the measurement tool, there are 32 statements about intravenous drugs commonly used in the emergency department and 112 ambulance. In the third part, there are 28 statements about interventional and other devices commonly used in an emergency room and 112 ambulances. As there are limited studied on this subject, the validity and reliability study of the form has not been conducted by the researchers. The permission for the use of the form was obtained from the responsible researcher via e-mail.

Statistical Analysis

SPSS (Statistical Package for Social Sciences) version 25.0 was used for statistical analysis of the obtained data. Descriptive findings were evaluated as percentage, mean, standard deviation, and median (12). Continuous numerical variables were analyzed by the Kolmogorov-Smirnov method and it was found that the variables were not normally distributed ($p<0.05$). Therefore, the One-way ANOVA test method was preferred for comparing one dependent and one independent group. PostHoc ANOVA test was used as an advanced analysis method in multiple comparisons which were found to be significant. In the entire study, the type-I error rate was taken as 5% and $p<0.05$ was considered statistically significant.

Ethics Committee Approval and Informed Consent

Written consent for data collection was obtained from the Research Ethics Committee of DEU and the institutions where the study was carried out. Paramedic students were informed about the study and verbal consent was obtained from those who accepted to participate in the study.

"TREND Statement Checklist" guide was used in the preparation of the article.

Results

The study was conducted with 167 senior year paramedic students. Eighty-seven (52.1%) of the participants were female and 80 (47.9%) were male. 89.2% of the participants were in the 19-21 age range, 9.0% in the 22-24 age range, and 3.0% in the 25-27 age range. The demographic data of the participants are given in Table 1.

Table 1. Distribution of paramedics according to demographic characteristics

Socio-demographic characteristics		n	%
Age	19-21 years	149	89.2
	22-24 years	15	9.0
	25-27 years	3	1.8
Gender	Male	80	47.9
	Female	87	52.1
Total		167	100

n: Number

Table 2 shows the distribution of paramedics' answers to the questions asked to investigate their competence perceptions about drug and intervention procedures.

When paramedic students were asked "Do you think that your knowledge level on drugs and drug applications is sufficient?", 47.3% replied "yes", 11.9% replied "no", and 40.8% replied "undecided". When paramedic students were asked "Do you think that your knowledge level on interventional procedures is sufficient?", 77.8% replied "yes", 4.7% replied "no", and 17.3% replied "undecided". When paramedic students were asked "Do you think you should be further trained on drugs and interventional procedures?", 67% replied "yes", 17.9% replied "no", and 14.9% replied "undecided". When participants were asked "What are the topics you feel insufficient about drugs?", 21.5% replied "drug indications", 58.6% replied "drug doses", 43.1% replied "drug contraindications", 47.9% replied "drug complications", and 7.7% replied "administration methods". When participants were asked "What are the topics you feel insufficient about interventional procedures?", 18.5% replied "indications", 43.1% replied "contraindications", and 60.4% replied "complications" (Table 2).

The comparison of the scores of paramedic students' knowledge level on drugs and administration methods according to gender and the universities they are attending is given in Table 3.

The total mean score average of paramedic students indicating their knowledge level on drugs and administration methods

Table 2. Distribution of paramedics' answers to questions about drugs and interventional procedures

Questions		University				
		1DEU	2EU	3İKÇU	n	%
Do you think that your knowledge level on drugs and drug applications is sufficient?	Yes	21	25	33	79	47.3
	No	10	5	5	20	11.9
	Undecided	23	19	26	68	40.8
Do you think that your knowledge level on interventional procedures is sufficient?	Yes	39	41	50	130	77.8
	No	5	2	1	8	4.7
	Undecided	10	6	13	29	17.3
Do you think you should be further trained on drugs and interventional procedures?	Yes	40	31	41	112	67.0
	No	4	12	14	30	17.9
	Undecided	10	6	9	25	14.9
What are the topics you feel insufficient about drugs?	Drug indications	18	6	12	36	21.5
	Drug doses	37	31	30	98	58.6
	Drug contraindications	26	19	27	72	43.1
	Drug complications	26	19	35	80	47.9
	Administration methods	4	2	7	13	7.7
What are the topics you feel insufficient about interventional procedures?	Indications	18	7	6	31	18.5
	Contraindications	30	19	23	72	43.1
	Complications	28	31	42	101	60.4
Total		54	49	64	167	100

n: Number, DEU: Dokuz Eylül University, EU: Ege Universty, İKCU: İzmir Katip Çelebi Universty

was 54.724. There was a significant difference between the knowledge level of paramedic students in terms of gender, indicated by their total scores (p=0.001). There was no difference between paramedic students' knowledge level on drugs and administration methods in terms of the universities they attended (p=0.470).

The comparison of paramedic students' knowledge level on interventional procedures according to gender and the universities they are attending is given in Table 4.

The total mean score of paramedic students on interventional procedures knowledge level was 65.653. No difference was found in the knowledge level on interventional procedures between

Table 3. Comparison of drugs and administration methods knowledge level scores of the paramedics according to gender and universities

		n	%	Mean score	p
Gender	Male	80	47.9	52.011 (10.412)	0.001
	Female	87	52.1	57.675 (10.974)	
University	1DEU	54	32.3	53.555 (13.329)	0.470
	2EU	49	29.3	54.346 (9.982)	
	3İKÇU	64	38.3	56.000 (1.198)	

n: Number, DEU: Dokuz Eylül University, EU: Ege Universty, İKCU: İzmir Katip Çelebi Universty

Table 4. Comparison of interventional procedures knowledge level scores of the paramedics according to gender and universities

		n	%	Mean score	p
Gender	Male	80	47.9	65.675 (14.774)	0.985
	Female	87	52.1	65.632 (14.044)	
University	1DEU	54	32.3	69.000 (14.467)	0.002
	2EU	49	29.3	59.795 (12.325)	
	3İKÇU	64	38.3	67.312 (14.563)	

n: Number, DEU: Dokuz Eylül University, EU: Ege Universty, İKCU: İzmir Katip Çelebi Universty

the paramedic students in terms of gender (p=0.985). However, a significant difference was found in the knowledge level on interventional procedures between the students studying at different universities (p=0.002). Advanced analysis revealed that the difference was due to EU students (p<0.019) (p<0.806 for DEU and İKÇU).

Discussion

The aim of this study was to determine the knowledge level of paramedic (ambulance and emergency care technician) students studying at health services vocational schools of three universities on commonly used drugs and interventional procedures. Drugs and interventional procedures, which are an important part of treatment, are one of the main tasks of paramedics. Errors in drug administration and interventional procedures harm patients (11).

Our study was conducted with 167 paramedic senior students. Eighty-seven (52.1%) of the participants were female and 80 (47.9%) were male. 89.2% of the participants were between 19-21 years old. In the study of Işıklı (15), the majority of the participants were in the 16-33 age group (68.6%). Similarly, in the study conducted by Haytaç (11), the majority of the participants were 18-26 years old (57%), 152 (47.9%) were female, and 162

(52.1%) were male. The older average age in these studies is thought to be due to the graduates included in the studies.

In our study, when we looked at the distribution of the answers given to the questions asked about paramedics' perceptions of their competence related to drugs and interventional procedures, we found that 47.3% of paramedic students answered "yes" to the question "Do you think that your knowledge level on drugs and drug applications is sufficient?". 77.8% answered "yes" to the question "Do you think that your knowledge level on interventional procedures is sufficient?". 67% answered "yes" to the question "Do you think you should receive further training on drugs and interventional procedures?". When asked about the topics they felt insufficient about drugs, 58.6% of the participants answered "drug doses", 47.9% answered "drug complications", 43.1% answered "drug contraindications", and only 7.7% answered "administration methods". When asked about the topics they felt insufficient about interventional procedures, the majority (60.4%) answered "complications" (Table 2). Similar to our study, in the study of Haytaç (11), 41.1% of paramedics answered "yes" to the question "Do you think that your knowledge level on drugs and drug applications is sufficient?", 66% answered "yes" to the question "Do you think that your knowledge level on interventional procedures is sufficient?", and 93.7% answered "yes" to the question "Do you think you should receive further training on drugs and interventional procedures?". Similarly, 44.3% of the participants answered "drug doses" to the question "What are the topics you feel insufficient about drugs? (You can select more than one option)" and 46.5% answered "complications" to the question "What are the topics you feel insufficient about interventional procedures? (You can select more than one option)"

Allen et al. (16) found the drug error rate as 28.2%. Eastwood et al. (17) suggested that paramedics had serious deficiencies in calculating the drug doses. Jacobsen et al. (18) found that most of the paramedics (98.9%) recognized classic anaphylaxis but less than half (46.2%) knew that epinephrine was the right drug, and made recommendations for increasing training. Kopp et al. (19) emphasized the lack of knowledge of drugs in their study. Walker et al. (20) found that the airway course increased paramedics' skills in airway maneuvers from 68% to 84%. However, no difference was observed between achievement scores at 6 and 12 months. According to studies published in the literature, one of the most common problems in terms of patient safety is drug errors. In our study, one of the most common topics paramedics felt incompetent was drug doses (58.6%) and complications of interventional procedures (60.4%).

When we looked at the comparison of mean knowledge level scores of paramedic students on drug administration methods and interventional procedures according to gender and universities;

There was a significant difference between the mean knowledge level scores of paramedic students on drugs and administration methods in terms of gender (p=0.001). There was no difference between paramedic students' knowledge level on interventional procedures in terms of gender (p=0.985). In his study, Haytaç (11) found no statistical difference between mean scores in terms of gender (male: 72.29, female: 69.19) (p>0.005).

There was no difference in paramedic students' knowledge level on drugs and administration methods in terms of the universities they attended (p=0.470). However, a significant difference was found in paramedic students' knowledge level on interventional procedures in terms of the universities they attended (p=0.002). Advanced analysis revealed that the difference was due to EU students (p<0.019) (p<0.806 for DEU and İKÇU).

Study Limitations

The research was limited to the paramedic students of only three universities.

Conclusion

In the present study, 87 (52.1%) of the paramedic students were female and 80 (47.9%) were male. 89.2% of the participants were between 19-21 years old. When paramedic students were questioned about their perception of competence on drugs and interventional procedures, 52.7% of the paramedic students stated that their knowledge level on drugs and drug applications was not sufficient and 22.2% stated that their knowledge level on interventional procedures was not sufficient. 67.0% of the paramedic students stated that they think they should be further trained about drugs and interventional procedures.

The topics where paramedic students feel most incompetent about are drug doses (58.6%) and complications of interventional procedures (60.4%). Based on the answers given to the questions, the highest score obtained by the participants was 81.0 and the lowest score was 31.0.

The mean total score of paramedic students on their knowledge level of drugs and administration methods is 54.724. The total mean total score of paramedic students on their knowledge level of interventional procedures is 65.653.

There was a significant difference between the knowledge level of paramedic students on drugs and administration methods in terms of gender (p=0.001). No difference was found between the knowledge level of paramedic students on interventional procedures in terms of gender (p=0.985).

There was no significant difference between the knowledge level of paramedic students on drugs and administration methods

(p=0.470). However, a significant difference was found between the knowledge level of paramedic students on interventional procedures according to the universities they attended (p=0.002). Advanced analysis revealed that the difference was due to EU students (p<0.019) (p<0.806 for DEU and İKÇU).

It was determined that the low knowledge level of paramedic students on drug usage and interventional procedures. Appropriate guidelines and checklists, which consider the weaknesses of the given education and include the updates, should be prepared for paramedics working in emergency care to ensure standardization for safe drug administration and to reduce the complications of interventional procedures.

Ethics

Ethics Committee Approval: This study was approved by Dokuz Eylül University Noninvasive Researches Ethics Committee (no: 2019/09-49, date: 10.04.2019).

Informed Consent: Paramedic students were informed about the study and verbal consent was obtained from those who accepted to participate in the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: T.G., S.Y., Design: T.G., S.Y., Data Collection or Processing: T.G., S.Y., Analysis or Interpretation: T.G., S.Y., Literature Search: T.G., Writing: T.G., S.Y.

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. Tabak RS, Som Yürek Hİ. First Aid and Emergency Care Book for Nurses, 1st Edition, İstanbul: Palme Publications; 2007.
2. Çelikli S. Standardization efforts and breaking points in paramedic education since its establishment. Prehosp Journal. 2016;1:39-54.
3. Caroline NL. Emergency in the Streets. Massachusetts: Jones and Bartlett Publishers; 2007.
4. Çelikli S. Ambulance and emergency care technician (paramedic) program. International Participation III. Ambulance Rally and Emergency Health Services Congress. Ankara; 2007.p.33-7.
5. Ünlüoğlu İ, Ekşi A, Anık N. A new health occupational group; Paramedics. J Contin Med Educ. 2002;11:308.
6. Sofuoğlu T, Vatansever K, Gezgin Y, Özgün S. Pre-hospital emergency care services. In: Uçan ES. Çelikli S. Üstünkarlı N. Ersoy G. Editors. Paramedic. First Edition, İzmir: Dokuz Eylül University Publication; 2000.p.139-50.
7. T.C. Ministry of Health. Implementing Regulation Amending the Regulation on Emergency Health Services, Number: 26463, March 15, 2007.
8. T.C. Ministry of Health. Communite on Procedures and Principles of Ambulance and Emergency Care Technicians and Emergency Medical Technicians. Number: 27181, 26 March 2009.
9. Ozel G, Akbuga Ozel B, Ozcan C. First and emergency technician paramedic; clinical issues, professional skills, operational practices book. Ed. Ozel G, 1st Edition. Ankara: Güneş Medical Bookstores; 2016.
10. Ekşi A, Ercal T, CelikliS, Ustunkarli N, Eroglu Aygul S, Aslan D. Pre-hospital emergency care, 1st Edition, İzmir: Kitapana; 2015.p.1-6.
11. Haytaç E. Determination of paramedics (ambulance and emergency care technician) knowledge about commonly used drugs and interventional procedures, Yıldırım Beyazıt University, Faculty of Medicine, Ankara: Master thesis; 2017.
12. Şencan H. Reliability and validity of social and behavioral measurements. 1st Edition, Ankara: Seçkin Publishing; 2005.
13. Thomas JH, Moore M, Mindell JA. Controversies in behavioral treatment of 13 sleep problems in young children. Sleep Med Clin. 2014;9:251-9.
14. Sümbüloğlu K, Sümbüloğlu V. Biostatistics. 13th Edition, Ankara: Hatipoglu Publishing; 2009.
15. Işıklı D. Evaluation of nursing knowledge of pharmacology (thesis). Konya: Selcuk University 2006.
16. Allen T, Christlieb C, Gray SL, McCormick WC, Reinhard S, Sikma SK, et al. Types, Prevalence, and Potential Clinical Significance of Medication Administration Errors in Assisted Living. J Am Geriatr Soc. 2008;56:1199-205.
17. Eastwood KJ, Boyle MJ, Williams B. Paramedics' ability to perform drug calculations. West J Emerg Med. 2009;10:240-3.
18. Jacobsen RC, Toy S, Bonham AJ. Anaphylaxis knowledge among paramedics: results of a national survey. Prehosp Emerg Care. 2012;16:527-34.
19. Kopp BJ, Erstad BL, Allen ME, Theodorou AA, Priestley G. Medication errors and adverse drug events in an intensive care unit: direct observation approach for detection. Crit Care Med. 2006;34:415-25.
20. Walker M, Jensen JL, Leroux Y. The impact of intense airway management training on paramedic knowledge and confidence measured before, immediately after and at 6 and 12 months after training. Emerg Med J. 2013;30:334-8.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Original Article
DOI: 10.4274/eajem.galenos.2020.98853
Eurasian J Emerg Med. 2020;19(4):197-202

Predictors of Mortality in Geriatric Patients with Upper Gastrointestinal Bleeding

Emine Emektar[1], Seda Dağar[1], Şeref Kerem Çorbacıoğlu[1], Hüseyin Uzunosmanoğlu[1], Metin Uzman[2], Rabia Handan Karaatlı[1], Yunsur Çevik[1]

[1]Clinic of Emergency, University of Health Sciences Turkey, Ankara Keçiören Training and Research Hospital, Ankara, Turkey
[2]Clinic of Gastroenterology, University of Health Sciences Turkey, Ankara Keçiören Training and Research Hospital, Ankara, Turkey

Abstract

Aim: Acute upper gastrointestinal (UGI) bleeding is a common gastrointestinal emergency and a cause of morbidity and mortality among the elderly. We aimed to evaluate the demographic and epidemiological characteristics of geriatric patients diagnosed with UGI bleeding in an emergency department (ED) to determine the predictors of 28-day mortality among them.

Materials and Methods: All patients aged ≥65 years admitted to ED and diagnosed with UGI bleeding were included in this retrospective study. Baseline demographic and clinical/endoscopic findings were evaluated. The primary outcome was 28-day mortality rate and its predictors, which among geriatric patients diagnosed with UGI bleeding in an ED.

Results: In total, 297 geriatric patients were included in the study; of them, 131 were women (44.1%). The median patient age was 79 (65-98) years. During endoscopy, the most common cause of bleeding was a gastric/duodenal ulcer (53.9% patients). A comparison of the patient characteristics in terms of in-hospital mortality (survivor/non-survivor) revealed significant differences in chronic renal failure; hemodynamic instability; hematocrit values; blood urea nitrogen, creatinine, and albumin levels; erythrocyte transfusion; rebleeding; and Rockall scores (for all variables, $p<0.05$). The regression analysis revealed that low albumin levels and hematocrit values as well as hemodynamic instability were the independent predictors of mortality.

Conclusion: Peptic ulcer bleeding is the main cause of acute UGI bleeding. Low albumin levels and hematocrit values as well as hemodynamic instability are the independent predictors of mortality. We believe that geriatric patients with UGI, particularly those with hemodynamic compromise at the time of hospital admission, should be closely monitored and promptly treated.

Keywords: Geriatric, upper gastrointestinal bleeding, mortality

Introduction

Because people in the twenty-first century are living longer worldwide, health problems that affect older population have been increasing (1). Additionally, the widespread usage of certain medications like anticoagulants and non-steroidal drugs (NSAIDs) has steeply increased the incidence of gastrointestinal (GI) bleeding among the older peoples (2,3). Acute upper gastrointestinal (UGI) bleeding in geriatric patients that occurs most frequently over 60 years of age is a life-threatening emergency that requires rapid evaluation and appropriate management (4-8). Although the use of endoscopic homeostasis and advancements in diagnostic and therapeutic modalities have improved clinical outcomes, GI bleeding remains an important clinical problem for geriatric patients because of their longer hospital stays and higher mortality and morbidity rates compared to those of younger patients (2,9). For patients suffering from GI bleeding, the mortality rate corresponds with increased age. Patients older than 70 years of age have a 20-30 times greater incidence of GI bleeding than patients younger than 30 years (9,10). Moreover, mortality rates are 12-25% for patients older than 60 years and below 10% for patients younger than 60 years (11). This increases the importance of UGI bleeding in the geriatric population.

Corresponding Author: Assoc. Prof. Emine Emektar, M.D., Clinic of Emergency, University of Health Sciences Turkey, Ankara Keçiören Training and Research Hospital, Ankara, Turkey
E-mail: emineakinci@yahoo.com **ORCID:** orcid.org/0000-0002-6056-4401

Received: 20.10.2019
Accepted: 15.01.2020

Cite this article as: Emektar E, Dağar S, Çorbacıoğlu ŞK, Uzunosmanoğlu H, Uzman M, Karaatlı RH, Çevik Y. Predictors of Mortality in Geriatric Patients with Upper Gastrointestinal Bleeding. Eurasian J Emerg Med. 2020;19(4):197-202

Identifying predictors of mortality in geriatric patients with GI bleeding may aid in the early recognition of high-risk patients. High-risk patients frequently require hospitalization, early resuscitation, close monitoring, and urgent endoscopic interventions, whereas low-risk patients may be discharged early in the course or managed on an outpatient basis, reducing emergency department (ED) costs and crowding (12,13).

In this study, we aimed to evaluate demographic and epidemiological properties to identify predictors of 28-day mortality among geriatric patients diagnosed with UGI bleeding in an ED.

Materials and Methods

Design and Setting

Our retrospective study was conducted in a tertiary care ED with approximately 250,000 patient admissions per year. Prior to implementation, our study's protocol was approved by the local ethics committee (decision no: 1792, date: 28/11/2018). As this is a retrospective study, the participants' informed consent was not required.

Study Population

All patients aged ≥65 years, admitted to the ED between January 1, 2015 and January 1, 2018, diagnosed with UGI bleeding, and investigated with endoscopic examination were enrolled in this study.

Patients' comorbidities, vital signs, hospital outcomes, laboratory results, endoscopic findings, demographic characteristics, and blood product replacements were obtained from the hospital automation system and their personal medical records. Patients with missing data were excluded.

Forrest classification was used as the endoscopic bleeding index, and Forrest 1a and 1b bleeding indicate active bleeding. Patients with a systolic blood pressure below 100 mmHg and a heart rate over 100/min at the time of ED admission were considered to have hemodynamic instability.

The primary outcome was the identification of a 28-day mortality rate and its mortality predictors, which included all causes of mortality that occurred within 28 days of hospitalization. Mortality data were obtained from the hospital automation system and the death certificate system.

Statistical Analysis

Data analysis was performed using SPSS for Windows 16. The normality of the distribution of the discrete and continuous variables was checked using the Kolmogorov-Smirnov test. Descriptive statistics included numbers and percentages for qualitative variables and medians (minimum-maximum) for discrete and continuous variables. Categoric variables were compared using the chi-square test, and continuous variables with the Mann-Whitney U test. Predictors of in-hospital mortality were determined using univariate tests, and statistically significant ($p<0.2$) variables were tested with a multivariate logistic regression model. The fitness of this model was tested with the Hosmer-Lemeshow test. A p value <0.05 was considered to be statistically significant.

Results

We enrolled 319 patients during the study period. Of these 319 patients, 22 patients were excluded due to missing data. In total, 297 patients were included in the final statistical analysis. The median age of the patients was 79 years (65-98), and 131 patients were women (44.1%).

The most common comorbidity was hypertension (n=147, 49.5%). The 28-day mortality rate was 14.1% (n=42).The most common causes of death were multiorgan failure (n=12, 28.5%), sepsis (n=9, 21.5%)., and acute renal failure (n=9, 21.5%).The mean time from admission to death was 11 days (0 day-28 days). Patient demographics and laboratory results are shown in Table 1.

The endoscopic findings, Forest classifications, and endoscopic interventions are summarized in Table 2. The most common bleeding etiologies were gastric and duodenal ulcers (n=160, 53.9%). Active bleeding was present in 20.5% of patients (n=61), and 56 of these patients (18.8%) underwent sclerotherapy. Five patients (1.7%) could not receive sclerotherapy because they could not tolerate the procedure and/or had their vital signs deteriorate during endoscopy. One patient underwent subtotal gastrectomy. The Rockall scores of the patients were calculated and divided into three risk groups (Table 3). 21.5% of the patients (n=64) were in the mild group, while 48.8% (n=145) were in the high-risk group. Re-bleeding was detected in seven patients (2.4%). Four patients were treated with sclerotherapy, and three patients could not tolerate the procedure of endoscopy and sclerotherapy.

A comparison of the in-hospital mortality factors for the patients (survivors/non-survivors) revealed significant differences related to chronic renal failure, hemodynamic instability, hematocrit, blood urea nitrogen (BUN), creatinine, albumin, erythrocyte suspension transfusion, re-bleeding, and Rockall score ($p=0.007$, $p<0.001$, $p<0.001$, $p<0.001$, $p=0.005$, $p<0.001$, $p=0.014$, $p<0.001$, $p<0.001$, respectively; Table 4).

Univariate regression analysis was performed to investigate the mortality variables (Table 5). Next, a multivariate logistic

Table 1. Demographic data of patients	
All patients, n (%)	297 (%)
Female, n (%)	131 (44.1%)
Age, years, median (minimum-maximum)	79 (65-98)
***Comorbidity, n (%)**	
Hypertension	147 (49.5%)
Diabetes mellitus	80 (26.9%)
Coronary heart disease	75 (25.3%)
Chronic heart failure	32 (10.8%)
Chronic renal failure	39 (13.1%)
Liver disease	25 (8.4%)
Other	32 (10.8%)
NSAID drugs use n (%)	103 (34.7%)
Oral anticoagulant drugs use n (%)	70 (23.6 %)
Presenting symptoms, n (%)	
Hematemesis	160 (53.9%)
Melena	100 (33.7%)
Syncope	9 (3%)
Others	28 (9.4%)
Hemodynamic status (%)	
Unstable	109 (36.7%)
Stable	188 (63.3%)
Rockall score, median (minimum-maximum)	4 (1-10)
Laboratory results, median (minimum-maximum)	
Hematocrit %	31 (10-57)
Platelet x10^3/µL	253.75 (32-910)
BUN mg/dL	32 (6-324)
Creatinine mg/dL	1.1 (0.5-9,6)
AST U/L	18.5 (16-363)
ALT U/L	13 (12-264)
Albumin g/dL	3.4 (1.38-6.30)
Replacement of blood products, n (%)	
Erythrocyte suspension	132 (44.4%)
Unit, median (minimum-maximum)	2 (1-11)
Re-bleeding, n (%)	7 (2.4%)
Hospital stay duration median (minimum-maximum)	4 (2-32)
28-day mortality n (%)	42 (14.1%)
Causes of death, n (%)	
Multiorgan failure	12 (28.5%)
Sepsis	9 (21.5%)
Acute renal failure	9 (21.5%)
Acute coronary syndromes	8 (19%)
Others	4 (9.5%)

NSAID: Non-steroidal anti-inflammatory drug, ALT: Alanine amino transferase, AST: Aspartate transaminase, BUN: Blood urea nitrogen, n: Number
*Some patients had multiple comorbid diseases

Table 2. The endoscopic findings, Forest classification and endoscopic interventions	
Endoscopic diagnoses	**n (%)**
Gastric/duodenal ulcer	160 (53.9%)
Gastric erosion/gastritis	131 (44.1%)
Cancer stomach	32 (10.8%)
Esophageal varices	18 (6.1%)
Dieulafoy's lesion	5 (1.7%)
Mallory-Weiss tear	5 (1.7%)
Forrest classification for gastric/duodenal ulcer	
1a	3 (1.8%)
1b	29 (18.1%)
2a	12 (7.5%)
2b	34 (21.3%)
2c	32 (20%)
3	50 (31.3%)
Active bleeding	61 (20.5%)
Endoscopic intervention	
Sclerotherapy	44 (14.8%)
Hemoclip + sclerotherapy	6 (2%)
Endoscopic band ligation	6 (2%)

n: Number
Some patients presented with more than 1 endoscopic finding

Table 3. Rockall score stratification into three groups with percentage of re-bleeding and mortality of patients			
Group		**Re-bleeding (%)**	**Mortality (%)**
Low risk	64 (21.5%)	0 (0%)	0 (0%)
Moderate risk	88 (29.6%)	0 (0%)	8 (9.1%)
High risk	145 (48.8%)	7 (4.8%)	34 (23.4%)

regression analysis was conducted. Because BUN and creatinine levels correlate with albumin, Rockall score correlates with hypotension, and ES replacement correlates with hematocrit levels, these properties were not included in the model. The multivariate model included chronic renal failure, syncope, hemodynamic instability, hematocrit, albumin, rebleeding, age, and sex (Table 5), which had a p value <0.2. The model was found to be fit using the Hosmer-Lemeshow test. Low albumin and hematocrit levels as well as hemodynamic instability at the time of admission were found to have adverse effects on mortality (Table 6).

Discussion

The present study which we investigated the characteristics of geriatric patients with UGI bleeding and the factors that affected their 28-day mortality provided two important results. First,

Eurasian J Emerg Med.
2020;19(4): 197-202

Table 4. A comparison of the patient characteristics regarding in 28-day mortality (survivor/nonsurvivor)

	Survivor (n= 255)	Dead (n=42)	p
Age	79 (65-98)	79.4 (67-96)	0.581
Gender, n (%)			
Female	111 (66.3%)	20 (47.6%)	0.621
Male	144 (56.5%)	22 (52.4%)	
Comorbidity			
Hypertension	124 (48.6%)	23 (54.8%)	0.461
Diabetes mellitus	67 (26.3%)	13 (31%)	0.527
Coronary heart disease	67 (26.3%)	8 (19%)	0.318
Chronic renal failure	28 (11%)	4 (26.2%)	0.007
Liver disease	21 (8.2%)	4 (9.5%)	0.765
Drugs, n (%)			
NSAID	90 (35.3%)	13 (31%)	0.584
Oral anticoagulant	61 (23.9%)	9 (21.4%)	0.724
Hemodynamic Instability, n (%)	72 (28.2%)	37 (88.1%)	<0.001
Rockall score, median (minimum-maximum)	4 (1-10)	6 (3-10)	<0.001
Presenting symptoms, n (%)			
Hematemesis	137 (53.7%)	23 (54.8%)	0.901
Melena	88 (34.5%)	12 (28.6%)	0.450
Syncope	6 (2.4%)	3 (7.1%)	0.093
Endoscopic diagnosis, n (%)			
Gastric/duodenal ulcer	139 (54.5%)	21 (50%)	>0.05
Gastric erosion/ gastritis	111 (43.5%)	20 (47.6%)	
Esophageal varices	14 (5.5%)	4 (9.5%)	
Dieulafoy's lesion	5 (2%)	0 (0%)	
Mallory-Weiss tear	5 (2%)	0 (0%)	
Laboratory results, median (minimum-maximum)			
Hematocrit %	32 (10-57)	26.75 (15.7-42)	<0.001
Platelet x10^3/µL	245 (32-910)	250 (55-507)	0.562
BUN mg/dL	30 (6-324)	44 (13-125)	<0.001
Creatinine mg/dL	1.03 (0.5-9.6)	1.42 (0.5-6.5)	0.005
AST U/L	18 (6-363)	19.5 (10-154)	0.507
ALT U/L	13 (3-264)	13 (6-217)	0.954
Albumin g/dL	3.45 (1.38-6.30)	3 (1.8-4)	<0.001
Active bleeding in endoscopy, n (%)	50 (19.6%)	11 (26.2%)	0.328
Endoscopic intervention	45 (15%)	11 (26.2%)	0.679
Re-bleeding	1 (0.4%)	6 (14.3%)	<0.001
Replacement of blood products, n (%) Erythrocyte suspension	106 (41.6%)	26 (61.9%)	0.014
Unit, median (minimum-maximum)	2 (1-11)	2 (1-9)	0.361

NSAID: Non-steroidal anti-inflammatory drug, ALT: Alanine amino transferase, AST: Aspartate transaminase, BUN: Blood urea nitrogen, n: Number

Table 5. Univariate analysis of factors associated with 28-day mortality

	p value	Odds ratio	(95% CIs)
Age	0.574	1.01	0.9-1.05
Gender	0.621	0.84	0.4-1.6
Chronic renal failure	0.009	2.87	1.3-6.3
Syncope	0.111	3.19	0.7-13.2
Hemodynamic instability	<0.001	18.8	7.1-49.7
Albumin	<0.001	0.24	0.12-0.4
Hematocrit	<0.001	0.92	0.8-0.9
Rockall scores	<0.001	1.55	1.3-1.85
Erythrocyte suspension	0.016	2.28	1.1-4.4
Re-bleeding	<0.001	42.32	4.9-361.8

CI: Confidence interval

Table 6. Multivariate regression model to predict in 28-day mortality

	p value	Odds ratio	(95% CIs)
Age	0.82	0.99	0.9-1.06
Gender	0.092	0.42	0.1-1.1
Chronic renal failure	0.297	1.84	0.5-5.7
Syncope	0.139	4.97	0.5-41.8
Hemodynamic instability	<0.001	26.2	6.1-111.4
Albumin	0.003	0.26	0.1-0.6
Hematocrit	0.015	1.11	1.02-1.2
Re-bleeding	0.088	12.47	0.68-225.6

CI: Confidence interval

we determined that the most common cause of GI bleeding was peptic ulcer, which had a 28-day mortality rate of 14%. We revealed that the deceased patients were more hemodynamically unstable, had lower hematocrit and albumin levels, had higher BUN and creatinine levels, and had greater needs for blood product transfusions. Second, we demonstrated that the most important predictors of in-hospital mortality for geriatric patients with GI bleeding were hemodynamic instability at the time of ED admission and low albumin and hematocrit levels.

The increased incidence of UGI bleeding in the older population has been linked to various causes, such as increased NSAIDs usage, *Helicobacter* pylori incidence, and gastroesophageal reflux disease (14,15). Kawaguchi et al. (3) evaluated nonvariceal UGI bleeding in the geriatric patients. They found that 41% of their patients were using NSAIDs and 34% were using anticoagulants, and they determined that these rates were higher in geriatric patients than in patients under 65 years of age. According to our results, 34.7% of the patients were using NSAIDs and 23.6%

were using anticoagulants. A systematic review indicated that the relative risk of GI bleeding was 2.7-33.9 for NSAIDs users (16). Notably, NSAIDs use in the geriatric patients is often overlooked. In addition to a greater prevalence of rheumatologic disorders in the geriatric population, many patients from developing countries, where medication regulation is inadequate, use these drugs without prescriptions or adequate oversight. NSAIDs users also frequently take one or more antiplatelet agents to combat cardiac or cerebrovascular comorbidities. A meta-analysis reported that taking low-dose aspirin increases the risk of UGI bleeding (17). This risk is even more pronounced among patients with a history of GI bleeding, extended aspirin usage, or simultaneous clopidogrel or anticoagulant usage (17). In the older patients, the risk of developing ulcers is increased due to their frequent NSAID and anticoagulant usage. The most common etiology of UGI bleeding in the geriatric population is peptic ulcer disease (4). In the geriatric patients, hospital admissions due to peptic ulcer disease, along with esophagitis and gastritis, comprise of 70-91% of all admissions due to UGI bleeding (18). In previous studies, the prevalence of UGI bleeding ranges from 5-43% for stomach/duodenum ulcers, 6-42% for gastritis, and 1-20% for esophageal varices (16,17,19). Similar to literature, our endoscopic findings also revealed gastric or duodenal ulcer at a rate of 53.9%. Our rate for esophageal variceal bleeding was 6.1%. The rate of UGI bleeding episodes due to esophageal varices is around 10% in the previous studies (12). Chronic liver diseases and their associated GI complications are less common in Turkey than in other countries, and this may have contributed to the low rate of esophageal varices in our study.

Rockall scoring considers age, comorbid diseases, presence of shock, and endoscopic findings, and it is the most widely used GI bleeding scoring system (7,13). In our study, 21.5% of the patients were in the mild group, while 48.8% were in the high-risk group. The Rockall scores were lower for the survivors than the non-survivors, and this difference was statistically significant.

Previous studies have reported in-hospital mortality rates ranging from 8.7-11.2% for geriatric patients (4,20). Mortality rates are affected by the cause of the bleeding and the presence of comorbidities. Our mortality rate was 14.3%. Our relatively high mortality rate may be related to our greater comorbidity rate and the extreme age of our study population. Similar to previous studies, we found low re-bleeding rates. Although these prior studies on geriatric patients with GI bleeding have linked increased mortality with the coexistence of coronary artery disease, we could not detect any significant differences (10). Chronic renal disorders were more common among deceased patients. Hence, we identified higher BUN and creatinine levels in our deceased patients. In addition, our deceased patients had lower hematocrit levels at the time of ED admission and needed more blood product transfusions.

Recent studies on GI bleeding in the older people report heterogeneous findings on the predictors of in-hospital mortality. A study reported that high age, being hypotensive at admission, failure to achieve endoscopic hemostasis, and the presence of comorbidities, particularly liver cirrhosis associated with other comorbidities, were independent predictors of mortality (18). However, we did not find any difference in liver disease status between survivors and non-survivors. Cirrhosis is associated with many potential complications, notably the development of portal hypertension. Portal hypertension with the production of ascites, hepatic and gastric varices bleeding in the upper part of the GI tract is associated with a considerably worse prognosis and an increased risk of mortality (21). This risk may be reduced by using modern pharmacotherapeutic agents and therapeutic endoscopic methods (e.g., esophageal stents and transjugular intrahepatic portosystemic shunt) to treat acute bleeding in cirrhosis patients who have experienced GIS bleeding.

Thongbai et al. (13) associated hemodynamic instability, bright red bleeding upon nasogastric aspiration, creatinine <1.5 mg/dL, and, crucially, coexisting coronary artery disease with mortality (10). In contrast, our study found that admission hemodynamic instability and low albumin and hematocrit levels negatively affected our patients' survival rates. Among patients with UGI bleeding, admission hemoglobin and hematocrit levels are critical for determining prognosis and managing treatment (22). A low admission hematocrit should inform an emergency specialist about the severity of the bleeding and the presence of active bleeding. Prior studies have reported that the serum albumin level has an important role in the prognosis of patients with GI bleeding (23,24). González-González et al. (25) recently argued that the albumin level was the sole independent predictor of mortality. They showed that it had a negative predictive value as high as 97% for geriatric patients with a serum albumin level below 2.35 g/dL, and they reported that it was quite effective for discriminating between survivors and non-survivors (25). We assert that being hypotensive at the time of ED admission is a strong predictor of mortality. The hemodynamic status of geriatric patients who are initially hypotensive may suddenly deteriorate and require aggressive therapy. Therefore, care should be taken to rapidly stabilize their hemodynamic status, begin pharmacological treatment, and schedule endoscopy.

Study Limitations

Our study has some limitations. As a single-center study, its findings cannot be generalized to other centers. Notably, since our study was retrospective and some patients were referred,

patient information such as smoking status, alcohol and drug usage, and treatment management could not be obtained. Moreover, there were five patients who could not undergo endoscopic treatment due to various reasons and we could not include to regression analysis. This situation may have affected the mortality of patients.

Conclusion

As conclusion, in the present study, hemodynamic instability, low hematocrit levels, and low albumin levels were independent predictors of mortality. It is possible to stabilize geriatric patients and prevent mortality by diagnosing high-risk patients and applying appropriate therapies. To improve outcomes, such patients should be closely monitored, resuscitative procedures should be rapidly initiated, and endoscopic interventions should be performed as soon as possible.

Ethics

Ethics Committee Approval: Prior to implementation, this study's protocol was approved by Ankara Keçiören Training and Research Hospital Ethics Committee (decision no: 1792, date: 28/11/2018).

Informed Consent: As this is a retrospective study, the participants' informed consent was not required.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: E.E., S.D., S.K.Ç., Design: E.E., S.D., Y.Ç., Data Collection or Processing: E.E., H.U., M.U., R.H.K., Analysis or Interpretation: E.E., S.K.Ç., Y.Ç., Literature Search: H.U., M.U., R.H.K., Writing: E.E., S.D.

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. Kalkan Ç, Soykan I, Karakaya F, Tüzün A, Gençtürk ZB. Comparison of three scoring systems for risk stratification in elderly patients with acute upper gastrointestinal bleeding.Geriatr Gerontol Int. 2017;17:575-83.
2. Alkhatib AA, Elkhatib FA. Acute upper gastrointestinal bleeding among early and late elderly patients. Dig Dis Sci. 2010;55:3007-9.
3. Kawaguchi K, Kurumi H, Takeda Y, Yashima K, Isomoto H. Management for non-variceal upper gastrointestinal bleeding in elderly patients: the experience of a tertiary university hospital. Ann Transl Med. 2017;5:181.
4. Elsebaey MA, Elashry H, Elbedewy TA, Elhadidy AA, Esheba NE, Ezat S, et al. Predictors of in-hospital mortality in a cohort of elderly Egyptian patients with acute upper gastrointestinal bleeding.Medicine (Baltimore). 2018;97:e0403.
5. Doğan NÖ, Akıncı E, Gümüş H, Akıllı NB, Aksel G. Predictors of inhospital mortality in geriatric patients presenting to the emergency department with ischemic stroke. Clin Appl Thromb Hemost. 2016;22:280-4.
6. Wang CY, Qin J, Wang J, Sun CY, Cao T, Zhu DD. Rockall score in predicting outcomes of elderly patients with acute upper gastrointestinal bleeding. World J Gastroenterol. 2013;19:3466-72.
7. Rockall TA, Logan RF, Devlin HB, Northfield TC. Incidence of and mortality from acute upper gastrointestinal haemorrhage in the United Kingdom. Steering Committee and members of the National Audit of Acute Upper Gastrointestinal Haemorrhage. BMJ. 1995;311:222-6.
8. Laine L, Yang H, Chang SC, Datto C. Trends for incidence of hospitalization and death due to GI complications in the United States from 2001 to 2009. Am J Gastroenterol 2012;107:1190-5; quiz 1196.
9. Gostout CJ. Gastrointestinal bleeding in the elderly patient. Am J Gastroenterol. 2000;95:590-5.
10. Pilotto A, Ferrucci L, Scarcelli C, Niro V, Di Mario F, Seripa D, et al. Usefulness of the comprehensive geriatric assessment in older patients with upper gastrointestinal bleeding: a two-year follow-up study. Dig Dis. 2007;25:124-8.
11. Farrell JJ, Friedman LS. Gastrointestinal bleeding in the elderly. Gastroenterol Clin North Am. 2001;30:377-407.
12. Mahajan P, Chandail VS. Etiological and endoscopic profile of middle aged and elderly patients with upper gastrointestinal bleeding in a tertiary care hospital in North India: a retrospective analysis. J Midlife Health. 2017;8:137-41.
13. Thongbai T, Thanapirom K, Ridtitid W, Rerknimitr R, Thungsuk R, Noophun P, et al. Factors predicting mortality of elderly patients with acute upper gastrointestinal bleeding. Asian Biomedicine. 2016;10:115-22.
14. Thomopoulos KC, Vagenas KA, Vagianos CE, Margaritis VG, Blikas AP, Katsakoulis EC, et al. Changes in aetiology and clinical outcome of acute upper gastrointestinal bleeding during the last 15 years. Eur J Gastroenterol Hepatol. 2004;16:177-82.
15. van Leerdam ME, Vreeburg EM, Rauws EA, Geraedts AAM, Tijssen JGP, Reitsma JB, et al. Acute upper GI bleeding: Did anything change? Time trend analysis of incidence and outcome of acute upper GI bleeding between 1993/1994 and 2000. Am J Gastroenterol. 2003;98:1494-9.
16. Lau JY, Sung J, Hill C, Henderson C, Howden CW, Metz DC. Systematic review of the epidemiology of complicated peptic ulcer disease: incidence, recurrence, risk factors and mortality. Digestion. 2011;84:102-13.
17. Lanas A, Wu P, Medin J, Mills EJ. Low doses of acetylsalicylic acid increase risk of gastrointestinal bleeding in a meta-analysis. Clin Gastroenterol Hepatol. 2011;9:762-8.e6.
18. Charatcharoenwitthaya P, Pausawasdi N, Laosanguaneak N, Bubthamala J, Tanwandee T, Leelakusolvong S. Characteristics and outcomes of acute upper gastrointestinal bleeding after therapeutic endoscopy in the elderly. World J Gastroenterol. 2011;28;17:3724-32.
19. Tariq SH, Mekhjian G. Gastrointestinal bleeding in older adults. Clin Geriatr Med. 2007;23:769-84.
20. Lei Gu, Fei Xu, Jie Yuan. Comparison of AIMS65, Glasgow–Blatchford and Rockall scoring approaches in predicting the risk of in-hospital death among emergency hospitalized patients with upper gastrointestinal bleeding: a retrospective observational study in Nanjing, China. BMC Gastroenterol. 2018;18:98.
21. Hejda V. Late complications of liver cirrhosis - management of gastrointestinal bleeding in the presence of portal hypertension. Vnitr Lek. 2016;62:10-7.
22. Villanueva C, Colomo A, Bosch A, Concepción M, Hernandez-Gea V, Aracil C, et al. Transfusion strategies for acute upper gastrointestinal bleeding. N Engl J Med. 2013;368:11-21.
23. Tung CF, Chow WK, Chang CS, Peng YC, Hu WH. The prevalence and significance of hypoalbuminemia in non-variceal upper gastrointestinal bleeding. Hepatogastroenterology. 2007;54:1153-6.
24. González-González JA, Vázquez-Elizondo G, García-Compeán D, Gaytán-Torres JO, Flores-Rendón AR, Jáquez-Quintana JO, et al. Predictors of in-hospital mortality in patients with non-variceal uppergastrointestinal bleeding. Rev EspEnferm Dig. 2011;103:196-203.
25. González-González JA, Monreal-Robles R, García-Compean D, Paz-Delgadillo J, Wah-Suárez M, Maldonado-Garza HJ. Nonvariceal upper gastrointestinal bleeding in elderly people: Clinical outcomes and prognostic factors. J Dig Dis. 2017;18:212-21.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Original Article
DOI: 10.4274/eajem.galenos.2019.25743
Eurasian J Emerg Med. 2020;19(4): 203-9

Effects of the Schedule and Duration of the Posts for Emergency Medicine Residents on Their Social Life and Practice

İsmail Ağı[1], Bedriye Müge Sönmez[2], Murat Doğan İşcanlı[2], Sultan Erdil Ülgen[3]

[1]Clinic of Emergency Medicine, Yozgat City Hospital, Yozgat, Turkey
[2]Clinic of Emergency Medicine, University of Health Sciences Turkey, Ankara Numune Training and Research Hospital, Ankara, Turkey
[3]Clinic of Emergency Medicine, Sorgun State Hospital, Yozgat, Turkey

Abstract

Aim: To determine the working order of the emergency medicine (EM) residents, their individual preferences, and the effects of their working order on their practice and social lives.

Materials and Methods: A total of 182 EM residents were included in this study. A two-stage questionnaire study was designed, including a questionnaire on demographics and on the residents' thoughts regarding their practice and social lives. This study included EM residents who were actively on duty with shifts and volunteered to participate. All data were analyzed using SPSS software.

Results: The most common shift type practiced among the residents was the 8/16 duty system. Most of the residents were working on 24-hour shifts (42.1%). Of the residents, 54.9% stated that their concentration levels were negatively affected after 8-10 hours of duty. Although 102 (56.1%) of the physicians were glad to be EM residents and 19 (10.4%) believed that they had enough time for themselves, 22 (12.1%) stated that they were only able to sufficiently study when they were off duty. Sleeping issues were statistically lower in EM residents working on 24-hour shifts. A higher percentage of residents on duty in a periodical order stated that they could get sufficient rest. Meanwhile, an unstable relationship with patients and negative views on medical practice were observed more frequently among residents who were on duty with irregular shifts.

Conclusion: Shift systems and the regularity of shifts affect not only the residents' social lives but also their approach to patients.

Keywords: Duty, emergency medicine, practice-social life

Introduction

Physicians practicing emergency medicine (EM) are under constant duress due to the workload, continuous confrontation with patients in critical condition, andworking in shifts. Only working in shifts has been sufficient reason for stress (1). Increase in the duration of shifts based on lack of staff also damages the already fragile social, familial and peer relations of the residents (2). This condition has been known as "burn-out syndrome"(3).

Increasing stress, along with the discontent at work and the loss of eagerness lead to a depres-sive emotional state/mood especially at the end of the 40s and decrease the quality of patient care (3,4). Beyond, shift patterns have a strong effect on balancing stres of emergency physicians (5). The most convenient shift pattern defined worldwide has been the arrangement of day, evening and night shifts. Usually a 24-hour episode is necessary in every night duty for the in-dividual to restore his/her strength and social life (4).

In the present study we aimed to identify the practice patterns of EM residents, and how these patterns effect the residents' work lives and social lives.

Materials and Methods

Study Design

This prospective study was performed with the Institutional Review Board protocol approval date: 01/06/2016 and number: E-16-938 in the emergency department of Ankara Numune

Corresponding Author: İsmail Ağı, M.D., Clinic of Emergency Medicine, Yozgat City Hospital, Yozgat, Turkey
E-mail: ismailagi@gmail.com **ORCID:** orcid.org/0000-0002-4568-0965

Received: 24.02.2019
Accepted: 07.08.2019

Cite this article as: Ağı İ, Sönmez BM, İşcanlı MD, Erdil Ülgen S. Effects of the Schedule and Duration of the Posts for Emergency Medicine Residents on Their Social Life and Practice. Eurasian J Emerg Med. 2020;19(4):203-9

Training and Research hospital. This study has been conducted in compliance with the latestversion of "Helsinki Declaration" and the "Good Clinical Practice Directive".

Data Collection

Survey has been performed through a questionnaire study applied to residents practicing in emergency services of random hospitals. One hundred and eighty-two EM residents have participated the questionnaire study. Questionnaire study was designed as a two-stage survey. Survey was applied the day after the post. Demografic data evaluated in the first group comprises of the duration of residency, age, gender, diseases, height, weight, use of alcohol and/or cigarettes, category of hospital (training and research hospital/ university hospital), number of posts, type of shifts, and the pattern of shifts. Second group of questions on the other hand, concentrates on investigating the thoughts of participants on their Professional lives and on their social lives.

Shift patterns have been categorized as: 8/16 shift system comprising of 8 hours of day and 16 hours of nightduty; 12/12 shift system comprising of 12-hour periods of duty; and 24 hours shift system for 24 hours non-stop duty. Study included residents in ER units who were actively engaged, who were on duty with shifts, and who were volunteer to participate in the study. Any resident who were not practicing actively or not on duty shifts for any reason (e.g. maternity leave, sickleave), who did not volunteer to participate, and who did not complete the questionnaire form were excluded from present study.

Data Analysis

All data were analyzed with SPSS (Statistical Package for the Social Sciences) software for Windows (v21.0; IBM, Armonk, NY, USA). Individual and aggregate data were summarized using descriptive statistics including mean, standart deviations, medians (min-max), frequency distributions and percentages. Initial evaluations and comparison of the data for normal distribu-tion was made via Kolmogorov-Smirnov and Shapiro-Wilk tests. Comparison of the dependent variables with normal distribution was made with Student t-test and ANOVA. For the continuous variables that were not normally distributed, the Kruskall-Wallis and Mann-Whitney U test were conducted to compare between groups. Presence of correlation was analyzed with Spear-man's Rho and Pearson tests. P values of <0.05 were considered statistically significant.

Results

Socio-demographic features and the practice patterns of the resident physicians included in the study has been shown in Table 1 and Table 2. As well as the most common type of shifts practiced were 8/16 duty systems among the residents who

Table 1. Socio-demographic features and the work order of the participants

	Mean ± SD (Median)/n (%)
Age	30.1±3.9 (30)
Gender	
Male	109 (59.9)
Female	73 (40.1)
Duration	
<13 months	32 (17.6)
13-24 months	42 (23.1)
25-36 months	40 (22.0)
≥36 months	68 (37.4)
Chronic diseases	25 (13.7)
Cigarettes	85 (46.7)
Alcohol	96 (52.7)
Type of hospital	
Training and research hospital	77 (42.3)
Medical hospital	105 (57.7)
Monthly average hours of work	213.4±26.8 (216)
Monthly average number of nightposts	8.9±1.1 (9)

SD: Standard deviation, n: Number

Table 2. Practiced shifts and preferences

	Total	**Female**	**Male**
	(n=182)	**(n=73)**	**(n=109)**
Type of shift practiced			
8/16 (n=104)	104 (57.1%)	42 (57.5%)	62 (56.9%)
12/12 (n=13)	13 (7.1%)	8 (11%)	5 (4.6%)
24 (n=47)	47 (25.8%)	14 (19.2%)	33 (30.3%)
8/8/8 (n=1)	1 (0.5%)	1 (1.4%)	0 (0%)
Other (n=17)	17 (9.3%)	8 (11%)	9 (8.3%)
Preferred shift type			
8/16 (n=104)	57 (31.3%)	31 (42.5%)	26 (23.9%)
12/12 (n=13)	20 (11%)	8 (11%)	12 (11%)
24 (n=47)	55 (30.2%)	14 (19.2%)	41 (37.6%)
8/8/8 (n=1)	46 (25.3%)	19 (26%)	27 (24.8%)
Other (n=17)	4 (2.2%)	1 (1.4%)	3 (2.8%)
Content with the type of shift			
8/16 (n=104)	39 (37.5%)	21 (50.0%)	18 (29.0%)
12/12 (n=13)	5 (38.5%)	1 (12.5%)	2 (40.0%)
24 (n=47)	20 (42.1%)	3 (21.4%)	16 (48.5%)
8/8/8 (n=1)	-	-	-
Other (n=17)	2 (11.8%)	1 (12.5%)	1 (11.1%)

have participated in the study, 8/16 shift has been also the most commonly preferred duty system by them (31.3%). As to the residents' content with their shift pattern, the highest level of satisfaction belonged to the residents work-ing with 24-hour shifts (42.1); as this percentage was typical for the male residents in 8/16 shift pattern, also female residents who practiced in 24-hour shift pattern were content with their pattern.

Of the residents participating in the study 54.9% were indicated that their concentration levels was affected negatively after 8-10 hours of practice. Also after 8-10 hours of work, 39% of the participants think that they may decide incorrectly in the treatment process; 36.3 of them consid-er that the frequency of occupational accidents increases; 47,8% of them state that they start to feel tired; 28% of them say that they feel exhausted; 41.2% declare that their relations with the patients and patient relatives have been effected negatively; and 34.1% of them point out that they begin to view their profession negatively (Table 3).

It has been established by the study that the 102 (56.1%) of the participants have been content to be emergency medicine residents, while 38 (20.9%) of them were not. As 28 (15.3) of them have the idea that they spend enough time with their families, 100 (55%) of them think that they do not. As 20 (11%) of residents think they have enough time for their friends and 19 (10.4%) of residents have the idea that they have enough time for themselves. While 21 (11.5%) of the residents consider that they have enough spare time for their hobbies, 132 (72.6) of them think that they do not. As 22 (12.1%) of them are convinced that they can study enough in their off-duty period, 136 (74.7%) of them think that they can not study sufficiently in their off-duty time. As 38 (20.8%) of the residents stated that they have no problems like having difficulty in falling asleep, waking up frequently, or not having enough sleep; whereas 114 (62.7%) of them reported as having one of the problems like having difficulty in falling asleep, waking up frequently, or not having enough sleep. As 126 (69.2%) of the residents are of the opinion that being on duty for a long period of time has a negative effect on health, 39 (21.4%) of them think that being on duty for a long period of time has no negative effect on health. While 129 (70.9%) of the residents were convinced that frequent posts effected their health negatively, 33 (18.1) of them were convinced that frequent posts had no negative effect on their health. As 31 (17%) of the residents think that they can get enough rest between their posts, 107 (58.8%) of them think they can not get enough rest between the posts. While 72 (39.5%) of the residents consider that they are not depressed, 67 (36.8%) of them consider themselves to have depression. As 94 (51.6%) of the residents think that their performance would be higher in a regular post schedule than in an irregular post schedule; 48 (26.3%) of them do not think that their performance would be higher in a regular post schedulethan in an irregular post schedule. While 83 (45.6%) of the residents are convinced that they can use their spare time more efficiently between their posts in a regular post schedule, 47 (25.8%) of them are convinced that they can not use their spare time between their posts more efficiently in a regular post schedule than in an irregular post schedule. As 106 (58%) of the residents consider practicing in an EM service more advantageous compared to other services, 35 (19.2%) of them do not consider practicing in an EM service as more advantageous compared to other services (Table 4).

No statistically significant relationship has found between the regularity and/or irregularity of the post schedules and the absence of any sleeping problems as difficulty in falling asleep, waking up frequently, or not getting enough sleep among emergency medical residents (p=0.825). The absence of any sleeping problems such as difficulty in falling asleep, waking up frequently, or not getting enough sleep among emergency

Table 3. Comparison of theresidents' thoughts on fatigue, error-occupational accidents, exhaustion, relations with patients and relatives through time spent on duty

	8-10 hours	11-12 hours	13-14 hours	15-16 hours	≥17 hours
	n (%)				
After how many hours of practice during your post do you think your concentration on patients is affected negatively?	100 (54.9)	26 (14.3)	20 (11)	16 (8.8)	20 (11)
After how many hours duringy our post possibility of major/minor errors in the process of diagnosis-treatment may increase?	71 (39)	33 (18.1)	31 (17)	21 (11.5)	26 (14.3)
After how many hours during your post, rate of occupational accidents may increase?	66 (36.3)	34 (18.7)	35 (19.2)	20 (11)	27 (14.8)
After how many hours during your post do you begin to feel tired?	87 (47.8)	37 (20.3)	21 (11.5)	21 (11.5)	16 (8.8)
After how many hours during your post do you begin tofeel exhausted?	51 (28)	29 (15.9)	33 (18.1)	32 (17.6)	37 (20.3)
Compared to initial hours of your post. after how many hours of practice do you think your relations with the patient and the relatives are affected negatively?	75 (41.2)	32 (17.6)	29 (15.9)	28 (15.4)	18 (9.9)
After how many hours of your post do you begin to think negatively on your profession?	62 (34.1)	27 (14.8)	17 (9.3)	31 (17)	45 (24.7)

Tablo 4. Effects of shift system among residents on their health and social life					
	1	2	3	4	5
	n (%)				
I am glad to be an EM resident	16 (8.8)	22 (12.1)	42 (23.1)	62 (34.1)	40 (22)
I can spend enough time with my family	50 (27.5)	50 (27.5)	54 (29.7)	15 (8.2)	13 (7.1)
I think I have enough time for my friends	49 (26.9)	65 (35.7)	48 (26.4)	10 (5.5)	10 (5.5)
I think I have enough time for myself	57 (31.3)	62 (34.1)	44 (24.2)	11 (6)	8 (4.4)
I think I have enough spare time for my hobbies	74 (40.7)	58 (31.9)	29 (15.9)	15 (8.2)	6 (3.3)
I can study enough in my off-duty time	75 (41.2)	61 (33.5)	24 (13.2)	16 (8.8)	6 (3.3)
I do not have any sleeping problems as difficulty in falling a sleep, waking up frequently, not having enough sleep	68 (37.4)	46 (25.3)	30 (16.5)	19 (10.4)	19 (10.4)
I think long duration posts affect my health negatively	20 (11)	19 (10.4)	17 (9.3)	45 (24.7)	81 (44.5)
I think frequent posts affect my health negatively	17 (9.3)	16 (8.8)	20 (11)	44 (24.2)	85 (46.7)
I can get enough rest between the shifts	45 (24.7)	62 (34.1)	44 (24.2)	23 (12.6)	8 (4.4)
I don't think I have depression	32 (17.6)	35 (19.2)	43 (23.6)	41 (22.5)	31 (17)
I think my performance in a regular periodical shift system would be higher compared to an irregular shift system	29 (15.9)	19 (10.4)	40 (22)	47 (25.8)	47 (25.8)
I think I may spend my off-duty time better in a regular periodical shift system compared to irregular shift system	26 (14.3)	21 (11.5)	52 (28.6)	44 (24.2)	39 (21.4)
I think the EM service is more advantageous compared to other services as type of practice	19 (10.4)	16 (8.8)	41 (22.5)	62 (34.1)	44 (24.2)
EM: Emergency medicine. 1: Certainly disagree. 2: Disagree. 3: Hesitant. 4: Agree. 5: Completely agree					

medical residents were significantly higher among the ones practicing 24-hour posts (p=0.040) (Table 5).

There was no statistically significant association found between the idea that the residents get enough rest between the posts, and the regularity/irregularity of the post schedule; however, the thought that participants get enough rest was significantly higher among the residents working 24-hour posts (Table 5).

Higher rate of residents who practice periodical posts in constant order, have reported being able to rest enough (p<0.001). Also, changes in the relations with the patients and patient relatives, and a negative attitude towards the profession has been observed more among the residents practicing irregular posts (p<0.001).

Discussion

EM services cause exhaustion in their staff rapidly because of the heavy work load, for this rea-son they operate with a different system compared to other medical services and ifferent systems of working order have been put to use in these 24-hour services, for attaining highest efficiency with minimal complications and minimal malpractice (6). Studies on emergency services establish that the attending physicians frequently prefer night posts, and the patients' need for the physicians during night posts increase their professional contentment (7).

It has been declared that the inconvenient conditions increase the risk of substance abuse among emergency medical service staff (8). Higher use of drugs and alcohol have been reported on shift systems (9). During our study although alcohol and cigarettes have been asked, no drug related questions have been included because of the reservation of the physiciansfor the legislation concerning civil servants. However, among the residents, the ratio of smoking as 46.7%, and consumption of alcohol as 52.7%, has been established in this study. It has been considered that residents are prone to substance abuse because of inconvenient hours of work, intense workload and other stress factors.

Shift patterns are associated with higher rates of comorbidity (10,11). In this study rates of chronic diseases have been documented as 13.7%. Considering the age range of our study, this ratio can be considered to be high. It may be stated that frequency of chronic diseases increases depending on the cumulating stress factors, chronic fatigue and irregular hours of work. Although it has been shown to increase individuals' quality of life, irregular work and shift patterns have been stated to be major stress factors (6,8).

Although 12-hour shift systems are utilised commonly, it has been documented that 12-hour shift systems are exhausting, and for that reason 8-hour shift patterns are preferred due to fact that errors and occupational accidents increase in the last

Tablo 5. Relation of shift order and type of shift with the sleeping patern. getting enough rest. change in relations with patient and relatives on different shifts and negative view on profession						
	Shift order		**Type of shift**			
	Regular	**Irregular**	**8/16**	**12/12**	**24**	**Other**
Sleeping problem						
Present	16 (80%)	98 (60.4%)	70 (67.3%)	6 (46.1%)	25 (53.1%)	13 (72.2%)
Neutral	2 (10%)	28 (17.2%)	17 (16.3%)	4 (30.7%)	4 (8.5%)	5 (27.7%)
None	2 (10%)	36 (22.2%)	17 (16.3%)	3 (23%)	18 (38.2%)	-
p value	0.825		**0.040**			
Can get enough rest?						
Yes	18 (47.4)	15 (10.2)	13 (50)	3 (11.5)	7 (26.9)	3 (11.5)
Neutral	10 (26.3)	10 (6.8)	13 (56.5)	2 (8.7)	6 (26.1)	2 (8.7)
No	10 (26.3)	123 (83)	78 (58.6)	8 (6)	34 (25.6)	13 (9.8)
p value	**<0.001**		>0.999			
Change in relations with patient and relatives on different shifts						
Yes	11 (28.9)	122 (81.4)	76 (58.5)	6 (4.6)	35 (26.9)	13 (10)
Neutral	12 (31.6)	17 (11.3)	18 (54.5)	5 (15.2)	8 (24.2)	2 (6.1)
No	15 (39.5)	11 (7.3)	10 (52.6)	2 (10.5)	4 (21.1)	3 (15.8)
p value	**<0.001**		0.782			
Negative view on profession						
Thinking badly	15 (6.3)	112 (93.7)	76 (59.8)	9 (7.1)	31 (24.4)	11 (8.7)
Neutral	5 (10.3)	21 (89.7)	14 (48.3)	2 (6.9)	9 (31)	4 (13.8)
Not thinking badly	18 (34.6)	16 (65.4)	14 (53.8)	2 (7.7)	7 (26.9)	3 (11.5)
p value	**0.001**		0.805			

few hours of 12-hour shifts and shiftswhich are regular and in patterns of less than 12 hours can prevent health problems and experiencing problems in social environment (8,12,13). In our study, 71.4% of the residents were convinced that posts had to be regular. While the most frequent shift pattern practiced by the residents included in this study has been 8/16 post system, shift pattern preferred the most was also 8/16 post system (31.3%). As to the residents' content with the shift pattern they prac-tice, highest ratio of contentment belonged to the residents practicing 24-hour post systems (42.1%). Although pysicians have preferred 8-hour shift systems in many studies, in our study physicians practicing 24-hour shift systems were content with their existing working order.

Working in shifts lead to exhaustion in physicians working in emergency services mostly due to working in shift systems and prolonged shifts, and a short nap at night can decrease the amount of exhaustion (14,15). In our study it has been demonstrated that physicians are getting tired after 8 hours of duty, they start to get exhausted and begin to lose their concentration, the possibility of malpractice and occupational accidents increase, and they are prone to have negative views regarding their profession. We convinced that the possibility of malftunction and occupational accidents increases on behalf of the physicians because of their lessening amount of energy and concentration, increasing need of sleep and stress. We consider that the physician faces with instant and/or long-termoccupational problems as a result of the process and we have concerns on the matter.

Majority of the EM service staff resist sleeping idea during the day due toparticipate their familial or social life. This might cause negative attitudes during individuals' interaction with their family and social environment (8). Irregularity of the duty hours,serious loss of energy after night shifts, longer shifts, frequent posts, and weekend duties, subsequent night duties insuffi-cient control over the working hours and the flexibility of the schedule have caused the physicians to think that they can not allocate enough time for their family, social environments, maintain their life style so problems have a profound effect on the physicians' balance of work and social life, level of exhaustion, and their professional contentment, psychological and health is-sues. (16-21). In our study it was a prevalent thought that physicians could not spare enough time for themselves, their families, thieir social circles, and hobbies. No significant relation

has been established between the post order, type of shift, number of posts, working hours, and the physicians' ability to have spare time for themselves, their families, and their social circles. No significant relations were found between the time for hobbies and the post order, num-ber of posts, and working hours. However, the conviction to have enough time for hobbies was significantly higher among physicians practicing 24-hour shifts. In our opinion working with shifts for 24 hours during the same working day by compressing the posts, creates more free days for hobbies. Thus, the time allocated to other individuals in the family and social environment may be restricted due to the fact that physicians with 24-hour posts spent this leisure time into hobbies.

Sleeping problems are common among staff practicing shifts in EM services (22). Posts shorter than 24 hours result with a higher quality of sleep, and fall asleep more easily on especially short naps during night posts not only makes it easier to tolerate the difficulties of working at night, but also makes it safer for both the physicians and the patients (23,24). However, the physician has to have at least a 24-hour rest after a night post, and that, it's the only way to keep his/her circadian rhythm in order (3,8). Studies on sleep deprivation have demonstrated that lack of sleep slows down the ability of the physician to perform compelling routine intellectual tasks, and also decreases the motivation of the physician (8). In accordance with published data, our study demonstrated an extensive sleeping problems among residents working with shift pattern systems; while no significant relation found between sleeping problems and order of posts, number of posts, and hours of practice, but sleeping problems were significantly less among residents having 24-hour posts. These findings interpreted as; the physicians with 24-hour posts find opportunity to sleep even if it is for short periods time; they need to come to their work-place less frequently, and they have enough time after their night posts to have their circadian rhythm recuperate itself.

There are limited data on the association between working hours and a depressive mood. It has been stated that inconvenient working conditions increase the risk of greater number of individuals needing psychiatric therapies among Emergency Service staff (8). Shift paterns are associ-ated with an increase in depression, psychological changes, divorce rates, social malfunction and psychological defects among staff maybe due to the (25,26). Working in night shifts –compared to regular day work-, increases the depressive psychological mood due to the result of work load and the capacity to work (27). In our study, the thought that "physicians working in shifts fall into depression" was more prevalent. However, no significant relationship was found between this thought and the order of posts, type of shifts, number of posts, and working hours. We consider that, since the resident physicians are at the beginning of their EM practice, they have relatively less patient responsibility and they have senior physicians who may be involved in any problem they might face with the patient in the process; for that reason depressive stage has not yet begun.

A significant difference of emergency services from other branches is that most of the opera-tions conducted are observed by the patient relatives; and that leads to an extra amount of stress on the physician (3). Also, irregular and shift pattern working hours has been stated as one of the major causes of stress in literature (8). In our study, the thought that relations with the pa-tient and patient relatives display no difference among posts in regular shift patterns, whereas they display a fluctuation from post to post in irregular shift patterns, was prevalent. No significant relationship was established between shift patterns, number of posts, working hours and therelations with patients and patient relatives; however, there was a significant relationship between the order of posts and the relationship with patient and patient relatives.

The exhaustion and sleeping problems caused by the shift systems and frequent night posts, lead to weaker decision process and weaker cognitive functions, a decrease in psychomotor performance, and an increase in negative psychological states (confusion, stress and irritability) (28-30). In our study it has been observed that shift pattern post systems lead the physicians to have negative thoughts on their profession. Although no significant relationship between negative thoughts on profession and the shift pattern of the posts, number of posts and work hours has found, it has been confirmed that residents practicing in irregular shift patterns had more negative thoughts on their profession.

Study Limitations

This study depends on a national basis so the results have to be validated with international results. The sleeping problem was only asked to the participant, we did not apply a guideline, the data about sleeping problem is subjective.

Conclusion

Proper arrangement of the shift pattern systems and the number of posts which have been indispensable for emergency medicine systems not only effect the physicians' social life, but also effect thetherapeutic approach to the patients and patient relations.

Ethics

Ethics Committee Approval: This prospective study was performed with the Institutional Review Board of Ankara Numune Training and Research Hospital protocol approval date: 01/06/2016 and number: E-16-938.

Informed Consent: Before the survey, the participants were informed about the study and those who accepted were asked to participate in the survey online.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: İ.A., B.M.S., Design: İ.A., B.M.S., Data Collection or Processing: İ.A., M.D.İ., S.E.Ü., Analysis or Interpretation: İ.A., B.M.S., Literature Search: İ.A., M.D.İ., S.E.Ü., Writing: İ.A., B.M.S., M.D.İ., S.E.Ü.

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. Houry D, Shockley LW, Markovchick V. Wellness issues and the emergency medicine resident. Ann Emerg Med. 2000;35:394-7.
2. Butterfield PS. The stress of residency: a review of the literature. Arch Int Med. 1988;148:1428-35.
3. Cevik AA, Holliman CJ, Yanturali S. Emergency physicians and "burn out" syndrome. Ulus Travma Acil Cerrahi Derg. 2003;9:85-9.
4. McNamara RM. Physician Wellness. Web site. Available at: http://www.emedicine.medscape.com/emerg/topic678.html (Accessed December 12, 2016).
5. Krakow B, Hauswald M, Tandberg D, Sklar D. Floating nights: a 5-year experience with an innovative ED schedule. Am J Emerg Med. 1994;12:517-20.
6. Takakuwa KM, Biros MH, Ruddy RM, Fitz Gerald M, Shofer FS. A national survey of academic emergency medicine leaders on the physician workforce and institutional workforce and aging policies. Acad Med. 2013;88:269-75.
7. Steele MT, McNamara RM, Smith-Coggins R, Watson WA. Morningness-eveningness preferences of emergency medicine residents are skewed toward eveningness. Acad Emerg Med. 1997;4:699-705.
8. Whitehead DC, Thomas H, Slapper DR. A rational approach to shift work in emergency medicine. Ann Emerg Med. 1992;21:1250-8.
9. Gordon NP, Cleary PD, Parker CE, Czeisler CA. The prevalence and health impact of shiftwork. Am J Public Health. 1986;76:1225-8.
10. Chau NP, Mallion JM, de Gaudemaris R, Ruche E, Siche JP, Pelen O, et al. Twenty-four-hour ambulatory blood pressure in shift workers. Circulation. 1989;80:341-7.
11. Binder LS, Allison EJ, Prosser R, Robinson W, Spaite D, Hamilton GC. 24-hour coverage in academic emergency medicine: ways of dealing with the issue. Ann Emerg Med. 1990;19:430-4.
12. Steele MT, Watson WA. Emergency medicine residency faculty scheduling: current practice and recent changes. Ann Emerg Med. 1995;25:321-4.
13. Steele MT, Ma OJ, Watson WA, Thomas HA Jr. Emergency medicine residents' shiftwork tolerance and preference. Acad Emerg Med. 2000;7:670-3.
14. Tucker P, Bejerot E, Kecklund G, Aronsson G, Åkerstedt T. Doctors' work hours in Sweden: their impact on sleep, health, work-family balance, patient care and thoughts about work. Available at: https://www.stressforskning.su.se/polopoly_fs/1.127787.1363088730!/menu/standard/file/Forskningsaktuellt_2.pdf (Accessed December 17, 2018).
15. Nijp HH, Beckers DG, Geurts SA, Tucker P, Kompier MA. Systematic review on the association between employee worktime control and work-non-work balance, health and well-being, and job-related outcomes. Scand J Work Environ Health. 2012:299-313.
16. Blachowicz E, Letizia M. The challenges of shift work. Med Surg Nursing. 2006;15:274-80.
17. Tucker P, Bejerot E, Kecklund G, Aronsson G, Åkerstedt T. The impact of work time control on physicians' sleep and well-being. Appl Ergon. 2015;47:109-16.
18. Brown M, Tucker P, Rapport F, Hutchings H, Dahlgren A, Davies G, et al. The impact of shift patterns on junior doctors' perceptions of fatigue, training, work/life balance and the role of social support. Qual Saf Health Care. 2010;19:e36.
19. Heponiemi T, Kouvonen A, Vänskä J, Halila H, Sinervo T, Kivimäki M, et al. Effects of active on-call hours on physicians' turnover intentions and well-being. Scand J Work Environ Health. 2008:356-63.
20. Smith A, Morris P, Rowell K, Clarke S, Jones T, Channer K. Junior doctors and the full shift rota–psychological and hormonal changes: a comparative cross-sectional study. Clin Med. 2006;6:174-7.
21. Clem KJ, Promes SB, Glickman SW, Shah A, Finkel MA, Pietrobon R, et al. Factors enhancing career satisfaction among female emergency physicians. Ann Emerg Med. 2008;51:723-8.e8.
22. Sack R, Auckley D, Auger R, Carskadon M, Wright K, Vitiello M, et al. Circadian rhythm sleep disorders: Part I, basic prin-ciples, shift work and jet lag disorders. Sleep. 2007;30:1460-83.
23. Landrigan CP, Rothschild JM, Cronin JW, Kaushal R, Burdick E, Katz JT, et al. Effect of reducing interns' work hours on serious medical errors in intensive care units. N Eng J Med. 2004;351:1838-48.
24. Lockley SW, Cronin JW, Evans EE, Cade BE, Lee CJ, Landrigan CP, et al. Effect of reducing interns' weekly work hours on sleep and attentional failures. N Eng J Med. 2004;351:1829-37.
25. Frese M, Okonek K. Reasons to leave shiftwork and psychological and psychosomatic complaints of former shiftworkers. J Appl Psychol. 1984;69:509-14.
26. Florida-James G, Wallymahmed A, Reilly T. Effects of nocturnal shiftwork on mood states of student nurses. Chronobiol Int. 1996;13:59-69.
27. Driesen K, Jansen NW, Kant I, Mohren DC, van Amelsvoort LG. Depressed mood in the working population: associations with work schedules and working hours. Chronobiol Int. 2010;27:1062-79.
28. Cheng YH, Roach GD, Petrilli R. Current and future directions in clinical fatigue management: An update for emergency medicine practitioners. Emerg Med Australas. 2014;26:640-4.
29. Lamond N, Dorrian J, Roach G, McCulloch K, Holmes A, Burgess H, et al. The impact of a week of simulated night work on sleep, circadian phase, and performance. Occup Environ Med. 2003;60:e13.
30. Bonnet MH, Arand DL. Clinical effects of sleep fragmentation versus sleep deprivation. Sleep Med Rev. 2003;7:297-310.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
DOI: 10.4274/eajem.galenos.2017.91885
Original Article
Eurasian J Emerg Med. 2020;19(4): 210-2

Effect of Symptomatic Treatment Given to Patients Diagnosed with Upper Respiratory Tract Infection in Emergency Department to Prescription Drug Use

Abdullah Osman Koçak[1], Ayça Çalbay[1], Hülya Sevil[2], Atıf Bayramoğlu[1], İlker Akbaş[1], Alparslan Ünlü[1], Burak Katipoğlu[3]

[1]Department of Emergency Medicine, Atatürk University, Erzurum, Turkey
[2]Clinic of Emergency Medicine, Erzurum Training and Research Hospital, Erzurum, Turkey
[3]Clinic of Emergency Medicine, Ankara Training and Research Hospital, Ankara, Turkey

Abstract

Aim: This study aimed to investigate the effect of symptomatic treatment administered in the emergency department on the purchasing behavior for prescribed medicines among patients diagnosed with an emergency upper respiratory tract infection (URTI).

Materials and Methods: This retrospective study was conducted among patients admitted to the emergency department clinic of Atatürk University in March 2016 who were discharged with a diagnosis of URTI. In total, 1,104 patients were included in the study. Using the pharmacy medulla system of the Turkish Social Security Institution, cases of patients taking prescriptions written to them were recorded. Data entry and statistical analysis were performed using SPSS statistical data program.

Results: A total of 1,104 patients were examined; of them, 553 received an intervention (50.09%), 543 (49.18%) received no intervention, and eight patients (0.72%) were identified as having missing data. It was determined that 336 (60.75%) of the patients receiving an intervention received a prescription written for them, whereas 207 (37.43%) did not.

Conclusion: Patients who are discharged from the emergency service with a diagnosis of URI do not receive prescriptions that will help with their actual treatment if they received any interventional therapy on arrival.

Keywords: Upper respiratory tract infection, symptomatic treatment, emergency department

Introduction

Upper respiratory tract consists of nose, tonsillar, adenoid, farinx, larinx, paranasal sinuses and ear which are above the larynx. Pharyngitis, rhinosinusitis, and flu are the most common causes of upper respiratory tract infections (URIs) as well as the most frequent causes of adulthood (1,2). Infections can be viral, bacterial or mixed infections and/or acute or chronic (3).

Flu is the most common cause of acute illness in the United States of America (USA) and the world (4). Among the underlying causes, many virus families can be blamed. It may be a single factor or may be multifactorial (5). Every year in the USA, 3% of the patients are referred to the clinic and 30% of these patients are prescribed antibiotics (5).

Pharyngitis causes an annual hospitalization of nearly 12 million people in the US. It constitutes 1 to 2% of remote care patients (6). This disease is prescribed in each of the clinical applications. Most antibiotics are unnecessary in most patients, but prescriptions often include antibiotics (7).

Acute rhinosinusitis occurs in the presence of viral infections, allergies, or irritants that cause mucosal tissue inflammation in the nasal and paranasal sinus cavities. More than 4.3 million patients are diagnosed with sinusitis per year. More than 80% of these patients are receiving prescription treatment (8).

Among the most common preliminary diagnoses and complaints in a study conducted in 214,010 patients in a 6.5-year period in a

Corresponding Author: Ayça Çalbay, M.D., Department of Emergency Medicine, Atatürk University, Erzurum, Turkey
E-mail: drycshn@gmail.com **ORCID:** orcid.org/0000-0002-7031-2689
Cite this article as: Koçak AO, Çalbay A, Sevil H, Bayramoğlu A, Akbaş İ, Ünlü A, Katipoğlu B. Effect of Symptomatic Treatment Given to Patients Diagnosed with Upper Respiratory Tract Infection in Emergency Department to Prescription Drug Use. Eurasian J Emerg Med. 2020;19(4):210-8

Received: 12.09.2017
Accepted: 30.10.2017

university emergency room in İzmir, acute nasopharyngitis, sore throat and dizziness were detected (9).

Our purpose in this study is; to investigate the effect of the symptomatic treatments we give our patients with the URI of the emergency department to the official prescriptions which include the actual treatment of the patients.

Materials and Methods

Study Design

This retrospective study was planned between 01 March and 31 March 2016 by taking 1,104 patients who were admitted to the emergency department of Atatürk University with complaints such as fatigue, fever, sore throat, earache, headache, dizziness, cough and discharge with URI. Patients' vital signs, treatments given from the emergency room intramuscular and intravenous (im, iv), duration of stay and prescriptions were recorded after the investigation of these patients' file. Turkish Social Security Institution pharmacy medulla tracking system has been checked whether the patients have taken the T.C. ID numbers and received prescription drug treatment written to them.

Data Collection

Patients who were admitted with complaints such as fatigue, fever, sore throat, earache, headache, dizziness, cough, over 18 years of age and discharged with a URI were included in the study.

Identification of "Missed Cases"

Eight patients (0.72%) with missing information about the treatment given to the patient and six patients (0.54%) who were unable to obtain information from the pharmacy system were accepted as missing data in the patient files filled in the emergency service.

Statistical Analysis

Statistical analysis of the study was performed with the SPSS Version 20.0 program (SPSS Inc., Chicago, Illinois, USA). Chi-square (x^2) test was used for comparison of categorical data. Student's t-test was used to compare numerical data between groups. A value of $p<0.05$ was considered statistically significant.

Results

Five hundred and forty-three (49.1%) of the 1,104 patients who were included from the study were treated from emergency room and 336 (34.3%) of these population took their prescription (Table 1).

The relationship between the groups was statistically significant ($p=0$, $p<0.05$).

Table 1. Demographic characteristics of groups

	ER therapy (-)	ER therapy (+)	ER therapy missing	Total
Prescription (+)	379	336	2	717
Prescription (-)	173	207	1	381
Prescription missing	1	0	5	6
Total	**553**	**543**	**8**	**1,104**

ER: Estrogen receptor

Discussion

Emergency service is being used improperly by patients with complaints of URIs, those who want to prescribe, and patients with simple pain (10). Emergency service is the most frequent cause of the first three diseases; J03/acute tonsillitis, J39/other upper respiratory tract diseases and J02/acute pharyngitis, respectively. Similarly, although our clinic is a tertiary health care organization, only about 10% of all urgent care applications are attributable to patients with URI complaints only. In addition, this patient group asks for urgent symptomatic treatment when the emergency department visits. Such demands, which are the immediate urgency of emergency service employees and steal a life-threatening illness-care time, both reduce the work and maintenance of service workers and increase work intensity (11). Our study showed that clinicians' attempts at this group of patients negatively affected the use of prescribed medicines, which constituted the main component of the treatment. Whether this condition is beneficial for the patient is questionable.

URI's include infections of anatomical structures that are above the larynx. Rhinitis, acute tonsillopharyngitis, acute rhinosinusitis, colds are mostly caused by viruses; The most common cause of acute otitis media is *Streptococcus pneumoniae* (30-50%), H. influenzae (15-30%) and M. catarrhalis (5-20%) (12). Patients are admitted to emergency services with a number of nonspecific symptoms such as headache, weakness, sore throat, fever, sensation of fullness in the forehead and ear, nasal discharge, discomfort and general body pain (13). Intervention is expected in these complaints, which is the emergency department where the treatment of many diseases is given and many different symptoms are relieved (10).

There are many life-threatening diseases such as pulmonary embolism and heart failure, and some criteria such as light criteria are used in the management of pulmonary embolism. Biomarkers are sometimes used in the diagnosis of these diseases, among which NT-pro-BNP is one of the ideal biomarkers to be used clinically in the diagnosis of pulmonary embolism (14).

Edirne et al. (15) Showed that emergency medical service referral criteria consisted of short-term medical observation, intervention, supportive treatment and inpatient treatment.

Special diagnostic methods of emergency departments, strong perception of emergencies, special care for treatment, and the ability to direct them to other health care providers are important reasons for their improper use (16,17).

Conclusion

As a result, patients with URIs receiving emergency services and/or iv treatments increase the workload of emergency services that are already intensively working and reduce the rate of prescription of medicines that will provide the actual treatment of the patients. Imbalance and im or iv treatments for symptoms do not constitute the actual treatment of the diseases and are not superior to the prescribed treatments. Patients with temporary relief in their symptoms do not get their prescriptions written. And the data obtained in this study supports us.

Ethics

Ethics Committee Approval: Since this retrospective study was conducted between 01 March and 31 March 2016, and ethics committee approval was not necessary for retrospective studies in that time, ethics committee approval was not taken.

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.Ü., İ.A., Concept: A.O.K., H.S., Design: A.Ç., İ.A., Data Collection or Processing: İ.A., A.B., Analysis or Interpretation: H.S., A.O.K., Literature Search: A.B., Writing: B.K., A.Ç.

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. Parri FM, Neu HC, Connelly JV. Infectious diseases. In: Rakel RE, editor. Textbook of Family Practice. 5th ed. Philadelphia: W.B. Saunders Company; 1995.p.317-92.
2. Purssell E. Upper respiratory tract infection in infants from a nutritional perspective. J Fam Health Care. 2009;19:164-8.
3. Seçmeer G, Devrim İ. Üst solunum yolu infeksiyonlarında medikal tedavideki yenilikler. Hacettepe Tıp Derg. 2006;37:194-201.
4. Gonzales R, Bartlett JG, Besser RE, Hickner JM, Hoffman JR, Sande MA. American Academy of Family Physicians Principles of appropriate antibiotic use for treatment of nonspecific upper respiratory tract infections in adults: background. Ann Intern Med. 2001;134:490-4.
5. Heikkinen T, Järvinen A. The common cold. Lancet. 2003;361:51-9.
6. Schappert SM, Rechtsteiner EA. Ambulatory medical care utilization estimates for 2006. Natl Health Stat Report. 2008;1-29.
7. Barnett ML, Linder JA. Antibiotic prescribing to adults with sore throat in the United States. 1997-2010. JAMA Intern Med. 2014:174;138-40.
8. Fairlie T, Shapiro DJ, Hersh AL, Hicks LA. National trends in visit rates and antibiotic prescribing for adults with acute sinusitis [Letter]. Arch Intern Med. 2012;172:1513-4.
9. İzmir Tabip Odası Acil Sağlık Hizmetleri Çalıştayı 26.02.2014 Çalıştay Raporu https://docplayer.biz.tr/1940729-Izmir-tabip-odasi-acil-saglik-hizmetleri-calistayi-26-02-2014-calistay-raporu.html
10. Simsek P, Gursoy A. Turkish health care providers' views on inappropriate use of emergency department: Who, when and why? Int Emerg Nurs. 2016;27:31-6. doi: 10.1016/j.ienj.2015.11.004. [Epub 2015 Dec 31].
11. Brim C. A descriptiveanalysis of thenon-urgentuse of emergencydepartments. J Nurs Res. 2008;15:72-88.
12. Leblebicioglu H. Üst solunum yolu enfeksiyonları. Akılcı Antibiyotik Kullanımı ve Erişkinde Toplumdan Edinilmiş Enfeksiyonlar Sempozyum Dizisi No: 31, Nov 2002; p.167-82.
13. Harris AM, Hicks LA, Qaseem A, for the High Value Care Task Force of the American College of Physicians and for the Centers for Disease Control and Prevention. Appropriate Antibiotic Use for Acute Respiratory Tract Infection in Adults: Advice for High-Value Care From the American College of Physicians and the Centers for Disease Control and Prevention. Ann Int Med. 2016;64:425-34.
14. Teke T, Yesildag K. The New Biomarkers Used in the Differentiation Between Transudate and Exudate Pleural Effusions. Eurasian J Crit Care. 2019;1:105-10.
15. Edirne T, Edirne Y, Atmaca B, Keskin S. Characteristics of the patients who visited Emergency Department of Yüzüncü Yıl University Medicine Faculty Hospital. Van Med J. 2008;15:107-11.
16. Callen JL, Blundell L, Prgomet M. Emergency department use in a rural Australian setting: are the factors prompting attendance. Aust Health Rev. 2008;32:710-20.
17. Carret MLV, Anaclaudia G, Fassa AG, Kawachi I. Demand for emergency health service: factors associated with inappropriate use. BMC Health Serv Res. 2007;7:131.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Original Article
DOI: 10.4274/eajem.galenos.2020.00821
Eurasian J Emerg Med. 2020;19(4): 213-8

Investigation of the Patients with Angioedema who Applied to the Emergency Department

Ayşe Ertekin[1], Şerife Özdinç[1], Ömer Levent Avşaroğulları[2]

[1]Department of Emergency Medicine, Afyonkarahisar Health Sciences University Faculty of Medicine, Afyonkarahisar, Turkey
[2]Department of Emergency Medicine, Erciyes University Faculty of Medicine, Kayseri, Turkey

Abstract

Aim: This study aimed to describe the demographic and clinical characteristics of patients with angioedema admitted to the emergency department.

Materials and Methods: This prospective study was conducted in the Emergency Medicine Department of Erciyes University Medical School between April 15 and November 30, 2016. Patients older than 18 years presenting with angioedema were included in the study. The demographic and clinical data of the patients were then analyzed.

Results: This study included 100 patients with angioedema and the mean age of 41.48±14.10 years. Forty-five percent of the patients were experiencing their first attack. The most frequent complaints were swelling (93%) and itching and redness (54%). Edema was typically observed in the periorbital region and on the lips. Drug use (52%) was the most frequent cause of angioedema, with the use of nonsteroidal anti-inflammatory drugs being the most common drug-related cause (23%). All the patients received antihistamine and steroid therapy. Although most patients were administered adrenaline (67%), some were administered fresh frozen plasma and complement 1 inhibitor concentrate (3%). Furthermore, the dermatology department was consulted for most of the patients (89%).

Conclusion: Angioedema is a medical condition that requires hospitalization in most cases and has the potential to rapidly progress into a life-threatening stage. Therefore, the timely recognition and appropriate management of this clinical condition in the emergency department is of great importance.

Keywords: Angioedema, emergency department, urticaria, complement 1 inhibitor

Introduction

Angioedema (AE) is a clinical presentation that usually manifests itself as a transient, localised, subcutaneous or submucosal non-pitting edema in the tongue, mouth, lips, larynx, and face (1,2). Tissue swelling is caused by a sudden increase in wall permeability of the vessels in the skin and submucosa (3). AE is a non-pitting type of edema, is not affected by gravity and is often asymmetrical. This type of edema is not itchy, usually no pain, but a feeling of burning or tingling might be observed (4). It may progress very quickly and may lead to swelling of the mouth, tongue, and larynx, leading to a respiratory-tract obstruction, thus might evolve into a life-threatening condition (5). If the gastrointestinal tract is affected, severe nausea, vomiting, and abdominal pain may be seen (1,6). Imaging methods can be used in patients with acute symptoms affecting the neck and abdominopelvic region (7). It is categorised as allergic (mast cell or immunoglobulin E (IgE) mediated) or non-allergic (mediated by bradykinin) (8). Allergic AE is usually accompanied by urticaria. Different types of food, insecticides and drugs are the allergens that cause this type of IgE-mediated reactions (9). Non-allergic AE can be classified as; hereditary AE (HAE), acquired AE, angiotensin-converting enzyme inhibitor (ACEI)-related AE, pseudoallergic AE, and idiopathic AE (8).

AE is an urgent clinical condition which requires visiting emergency departments (ED). Emergency physicians may encounter various presentations of this clinical entity which

Corresponding Author: Asst. Prof. Ayşe Ertekin, M.D., Department of Emergency Medicine, Afyonkarahisar Health Sciences University Faculty of Medicine, Afyonkarahisar, Turkey
E-mail: doktorayse6@yahoo.com **ORCID:** orcid.org/0000-0002-9947-9917

Received: 04.02.2020
Accepted: 17.06.2020

Cite this article as: Ertekin A, Özdinç Ş, Avşaroğulları ÖL. Investigation of the Patients with Angioedema who Applied to the Emergency Department. Eurasian J Emerg Med. 2020;19(4):213-8

may have life-threatening potential. The aim of this study is to investigate clinical and demographic properties of the patients presenting to the ED due to AE in particular and to detect the outcomes.

Materials and Methods

This prospective study was carried out in the Emergency Medicine Department of Erciyes University Medical School between April 15, 2016 and November 30, 2016. The study was approved by the Ethics Comittee of Erciyes University (protocol no: 2016/212). Those patients older than 18 years and presenting with AE were included in the study. The patients that were involved in the study, were informed about the scope of this study, and their informed consents were obtained. A total of 100 patients was included in the study. The following data were recorded in prepared forms: age, sex, occupation, time of the first episode, the number of attacks, medical history, history, medications used regularly by the patient, chief complaint, vital signs, and other conditions that might have an association with AE (eg pregnancy, menstruation, hormone replacement, drug use, smoking, alcohol use, trauma, infection, anxiety, physical stress, food intake, operation, tooth extraction, insect bite, contrast agent exposure), physical examination findings, consultations, treatment in the ED, response to the treatment, and outcome (admission or discharge).

Statistical Analysis

Descriptive statistics (mean, median, percent, standard deviation) was used in the analysis of the data. Normal distribution of the continuous data was assessed by the Kolmogorov-Smirnov and Shapiro-Wilk tests. The Mann-Withney U test was used to compare the median values of the two independent groups, and the Kruskal-Wallis test was used to compare the median values of the multiple independent groups. The chi-square test was used to compare the per cent distributions of the categorical data. The evaluations were performed in the SPSS V20 program and $p<0.05$ value was considered significant.

Results

Between 15.04.2016 and 30.11.2016, patients older than 18 years of age who were admitted to the ED with AE among all adult admissions were investigated. The mean age of the patients was 41.48±14.097 years (19-86), 46 of the 100 patients were female. The most frequent of the ED visits were in April (28%) and May (23%), especially during the seasonal transition periods (April-May and September) (Table 1).

Forty-nine percent of the patients were employed, and 51% of them were not working in a job. The most frequent occupational group in the working group was civil servant (23%), and among the non-working group was housewife (35%). Urticaria was not present in the 78% of the patients with AE who were referred to the ED. When the effect of the gender on this parameter was investigated, urticaria was detected in 45.5% of male patients and 54.5% of female patients. There was no statistically significant difference between genders with respect to the presence or absence of urticaria in the patients with AE in the study (p=0.363), (Table 2).

When the effects of the seasonal differences are assessed on the occurrence of urticaria in patients with AE, no statistically significant difference was found between the seasons (p=0.40). Admission time of the patients in the study group to the ED is

Table 1. The frequency of angioedema by months

Months	Percentage value of the number of patients (%)
April	28
May	23
June	18
July	7
August	2
September	12
October	5
November	5
Total	**100**

Table 2. Dermographic data in angioedema groups with or without urticaria

Demography	AE Total (n=100)	AE without urticaria (n=78)	AE with urticaria (n=22)	p
Gender (number, %)				
Female	46 (46)	34 (43.6)	12 (54.5)	0.363
Male	54 (54)	44 (56.4)	10 (45.5)	
Month of admission				
Spring	51 (51)	40 (51.3)	11 (50.0)	0.403
Summer	27 (27)	19 (24.4)	8 (36.4)	
Autumn	22 (22)	19 (24.4)	3 (13.6)	
Admission time				
24-12	51 (51)	38 (48.7)	13 (59.1)	0.390
12-24	49 (49)	40 (51.3)	9 (40.9)	
Age (mean ± SD)	41.48±14.09	42.59±14.54	37.55±11.85	0.134
Number of attacks ± SD	4.06±7.53	3.39±6.72	6.40 ±9.70	0.005

AE: Angioedema, SD: Standard deviation, n: Number

classified into two groups; between 12:00 p.m. - 12:00 a.m. and 12:00 a.m. - 24:00 p.m. There was no statistically significant effect of the admission time on the presence or absence of urticaria complaints in the patients with AE (p=0.39), (Table 2).

It was found that 45% of the patients were experiencing their first attack on the initial admission. The mean number of attacks in all AE patients was calculated as 4.06±7.53. When the number of attacks was evaluated according to the presence of urticaria, the average number of attacks was 6.40±9.70 for patients with urticaria and 3.39±6.72 for patients without urticaria. A statistically significant difference was noted between the two groups (p=0.005) (Table 2). The mean number of AE episodes in patients with anxiety-related AE was found to be higher than that of the ones without it (p=0.002).

The most frequent chronic diseases in the patients' medical history were atopy (31%), urticaria (22%) and hypertension (12%). There were 4 cases with the history of HAE. The most frequent complaints in our study were swellings in the body. Edema was most frequently detected in the periorbital region and lips (48%), (Table 3). We identified the most frequent cause among the factors leading to the development of the onset as medications by 52%. No triggering factor was identified in 34% of the cases. The most common type of drug (23%) in drug-induced AE were non stereoidal anti inflammatory drugs (NSAID)s (Table 4). Dexketoprofen (7%) was the most common cause of the AE among the NSAID's (Table 5). Ten percent of the patients in the study were experiencing tachypnea, 2% was hypotensive, and in 12 of the patients, eosinophilia was detected in the laboratory findings.

All patients received antihistamine and steroid therapy. Adrenalin was administered in 67% of patients whereas fresh frozen plasma and complement 1 inhibitor (C1 INH) were given in 3% of patients. 89% of the patients were consulted the dermatology department. Seventy-three of the patients who were consulted were hospitalised. None of the patients' clinical prognosis was critical or mortal.

Discussion

Rapid admission and evaluation of the AE patients by an Emergency Medicine Physician along with identification of the coincidental findings and initiation of the treatment as soon as possible are of utmost importance. The most appropriate treatment should be determined by the clinical presentation and underlying pathophysiological mechanism (4). Zingale et al.

Table 3. Symptoms and findings of physical examination associated with angioedema

Symptoms	AE Total (n=100)	AE without urticaria (n=78)	AE with urticaria (n=22)	p
Itching	54 (54)	40 (51.3)	14 (63.6)	0.304
Erythema	53 (53)	37 (47.4)	16 (72.7)	0.036
Swelling	93 (93)	72 (92.3)	21 (95.5)	0.609
Shortness of breath	28 (28)	22 (28.2)	6 (27.3)	0.931
Abdominal pain	4 (4)	1 (1.3)	3 (13.6)	0.009
Nausea	4 (4)	4 (5.1)	0 (0)	0.278
Vomiting	1 (1)	1 (1.3)	0 (0)	-
Diarrhea	0 (0)	0 (0)	0 (0)	-
Anaphylaxis	2 (2)	2 (2.6)	0 (0)	0.128
Changes in consciousness	0 (0)	0 (0)	0 (0)	-
Physical examination				
Periorbital edema	48 (48)	39 (50.0)	9 (40.9)	0.451
Edema in the lips	48 (48)	38 (48.7)	10 (45.5)	0.787
Macroglossia	4 (4)	3 (3.8)	1 (4.5)	0.882
Edema of the uvula	43 (43)	37 (47.4)	6 (27.3)	0.092
Extremity findings	37 (37)	25 (32.1)	12 (54.5)	0.050
Abdominal findings	1 (1)	1 (1.3)	0 (0)	0.594
Genital findings	0 (0)	0 (0)	0 (0)	-
Respiratory system findings	2 (2)	2 (2.6)	0 (0)	0.448

AE: Angioedema, n: Number

Table 4. Conditions associated with angioedema	
Situation	**%**
Drug use (n=52)	
NSAIDs	23
Antibiotic	11
Analgesic (paracetamol)	6
Angiotensin II receptor antagonist	2
Antivirals	2
Antidepressant	2
Contrast medium	2
ACEI	1
Cold medications	1
Hormone replacement	1
Iron preparation	1
Cigarettes	10
Anxiety	8
Food intake	6
Infection	4
Tooth extraction	4
Insect bite	4
Physical stress	2
Menstruation	1
Hair dye	1
Epilation	1
Alcohol	1
Surgery	0
Trauma	0
Unknown	34
NSAID: Nonsteroidal anti-inflammatory drugs, ACEI: Angiotensin-converting enzyme, n: Number	

Table 5. Percentage of the drugs that cause angioedema compared to the active ingredients	
Drug-active substance	**%**
Analgesics	
Etodolac	1
Metamizole sodium	1
Naproxen sodium	1
Parasetamolklorfeniraminmaleat	1
Acetamidine	1
Acetylsalicylic acid	2
Feniramidol HCL	2
Diclofenac sodium	2
Flurbiprofen	3
Ibuprofen	3
Paracetamol	6
Dexketoprofen	7
Antibiotics	
Doxycycline	1
Sefuroximeacetyl	1
Amoxicillin	1
Gemifloxacin	1
Moxifloxacin	1
Trimethoprim sulfamethoxazole	2
Penicillin	2
Ciprofloxacin	2
Antihypertensives	
Fosinopril	1
Olmesartanmedoxomil	1
Olmesartanmedoximilhydrochlorothiazide	1
Iron preparation	1
Progesterone	1
Bupropion HCL	1
Escitalopram	1
Acyiclovir	1
HCL: Hydrochloride	

(10) conducted a study between 1993 and 2003, classifying 776 patients with AE who were admitted to the hospital, according to the different causes of their AE. They reported triggering causes of the AE as following: due to external causes (medications, insect bite or food intake) was seen in 124 patients (16%), due to ACEI usage was observed in 85 patients (11%), AE due to autoimmunity or infections in 55 patients (7%), due to C1 INH deficiency in 197 patients (25%), and in 315 patients (41%) there was not any identified cause (10). According to our study, patients with AE due to allergies, were found to have the following triggering factors, insect stings (bee) 4%, food intake (fish and spice consumption) 6%, drug use 24% (antibiotics 11%, analgesics 6%, antivirals and antidepressants 2%, cold medications 1%, hormone replacement and iron preparation 1%), and in 1% of the patients there was the history of application of hair dye and epilation. In patients without allergies the causative agents were classified as, ACEI usage in 1%, ARB2 antagonists in 2%, NSAIDs in 23%, contrast dye in 2%. In 34% of the patients, there was no identified agent and they were classified as idiopathic. Four patients had a history of HAE. 4% of the patients who admitted concurrently had a history of infection and/or tooth extraction. We think that the differences between our study and the causes of the AE in other studies are due to the differences in the cultural structure

(nutrition habits, education levels), the time and duration of the study, the geographical conditions in which the studies have been made, and the way of life of the societies (village and city type life).

Bork et al. (11) reported that 221 patients with C1 INH deficiency were presented with edema in the extremities, face, genitalia or trunk in 97.4% of the time. Edema in the periorbital area (48%) and the lip (48%) was the most common locations in our study, whereas uvula edema was seen in 43%, edema in the extremities was observed in 37%, macroglossia was found in 4%, respiratory system findings in 2%, and findings in the abdomen in 1%. Genital involvement was not detected in any patient. We think that the differences between the studies are due to individual reasons.

In a study conducted by Champion et al. (12), it was found that 49% of 554 urticaria patients were accompanied by AE, and 11% of patients had AE alone. In our study, 22% of the patients were accompanied by urticaria. There are differences in the presence or absence of urticaria in patients with AE in these studies. We think that this difference is due to the fact that the causes of AE (allergic or non-allergic) are different. It has been reported in the literature that the co-occurrence rate of urticaria and AE caused by allergies, is higher (8).

The most common medications in the drug-related AE are; NSAIDs, ACEI, angiotensin II receptor antagonists, antibiotics, radiocontrast agents, proton pump inhibitors, statins, fibrinolytic agents, estrogens, diuretics, calcium channel blockers and psychotropic drugs. Acetylsalicylic acid and ibuprofen are appeared to be at the forefront of the NSAIDs. NSAID and acetylsalicylic acid intolerance are seen in 0.3-0.9 % of the population. However, there are no exact figures for the incidence of AE due to NSAIDs and acetylsalicylic acid (13). In our study, it was determined that the most common cause of AE was drug use, with 52%. The use of dexketoprofen (7%) was the most common cause of the AE among the NSAID's. Among other NSAID drugs as AE triggers, the following percentages were recorded: flurbiprofen and ibuprofen 3%, diclofenac sodium, acetylsalicylic acid and feranimadol HCl 2%, etodolac, metamizole sodium, naproxen sodium and acetaminin 1%.

ACEI-related AE is independent of the dose, can be seen with the initial administration of ACEI's, as well as months or years later. They are the most frequent cause of the recurrent drug-related AE (13,14). Banerji et al. (15) found that 30% of the 220 AE patients who applied for emergency services was due to ACEI usage. The most common findings in these patients were reported as: shortness of breath, lip and tongue swelling and laryngeal edema. In our study; the ACEI Fosinopril (1%) and the angiotensin II receptor antagonist Olmesartanmedoxomil (2%) were found to cause AE clinical signs and symptoms after many years of usage. Patients were admitted to our ED between 6.00 p.m. and 9.00 p.m. with complaints of lipedema, macroglossia, uvula edema. One of the patient's AE was accompanied by urticarial lesions. Two of our patients were admitted to the dermatology department. Our other patient, whose clinical signs and symptoms were regressed, and was discharged after observation (<24 hours).

Iwamoto et al. (16) studied the patients with HAE in Japan in 2009; 54% of patients with HAE type I and II had swelling, 42% had a feeling of discomfort in the throat, and 37% had abdominal complaints. In the European Hereditary Angioedema Burden Research's survey conducted with HAE patients, it was determined that 73 of the patients were working full-time, 21 of the patients were working part-time, seven of the patients were studying, and 19 of the patients were both studying and working (17). Huang (18) reported in a study that was conducted with 63 patients with HAE in 2004 that, the patients were admitted to the ED with an average of 4.7 times per year, and in one-quarter of the patients, anaphylaxis was seen in the ED. Iwamoto et al. (16) conducted a study in HAE patients in Japan and reported that: 54% of patients with HAI type I and II had swelling, 42% had a feeling of discomfort in the throat, and 37% had abdominal complaints. In another study, C1 INH concentrate therapy was administered to 29% of patients who applied with an acute exacerbation of HAE (13,16). There were only four male patients with a history of HAE with the mean age of 36.75 in the 100 AE patients included in our study. All of our patients with HAE also had an HAE history in their family. Two patients were admitted to the hospital ED with twenty-fifth acute exacerbation of AE, the other two patients were admitted with their third attack. It was learned that C1 INH concentrate was available in the patients' home. Two patients with lip edema, one patient with uvula edema and one patient with periorbital edema were admitted to our ED. A patient with edema on the lips also had urticarial lesions. The clinical presentation of two HAE patients was triggered by anxiety, and the triggering causes of the other two were unknown. Only one patient was treated with C1 INH concentrate. Three patients were admitted to the dermatology department, and one patient was discharged after 24 hours of observation in the ED. When we looked at the occupational status of these four patients, we learned that two of them are civil servants and the others were tradesmen with their own business. At least 24 hours of daily activity and workforce productivity were lost after the ED admissions of these patients. When our patients with HAE were evaluated; were consistent with the literature concerning the loss of workforce, symptom similarity at the time of application, methods applied during treatment, follow-up time in the hospital, and results (13,16,17).

In the AHRQ-HCUP 2007 National Emergency Service Example, the number of patients referred to the Emergency Service with AE was 112,105 per year. It has been reported that 45% of HAE patients and 18.3 % of AE patients are admitted to the inpatient clinic (19). During our 7-month study in 2016 in the Emergency Medicine Department of Erciyes University Medical School only 4% of AE patients had an HAE history during this time period. Seventy-three per cent of the 100 AE patients that are included in the study group were hospitalized, and 27% were treated and discharged within the emergency care.

Conclusion

In the light of all these findings, even though AE patients are not frequently encountered in emergency services, patients' clinical signs and symptoms may worsen rapidly, and AE can be mortal. Simultaneous evaluation and treatment of the patients would be life-saving. The deepening of information about the anamnesis, personal and family medical history of AE patients by emergency medicine physicians can help to classify the disease, thus allowing to determine the most appropriate treatment approach. In addition to this, the factors such as medication use, anxiety, and taking preventive measures during the transition seasons can cause great benefit in protecting patients from attacks.

Acknowledgements

This research was produced from Ayşe Ertekin's thesis of expertise in medicine named "Evaluation of The Patients Who Apply to The Emergency Department with Angioedema".

Ethics

Ethics Committee Approval: The study was approved by Ethics Comittee of Erciyes University and was conducted in accordance with the principles of the Declaration of Helsinki (protocol no: 2016/212).

Informed Consent: An informed consent form was obtained from each patient.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.E., Concept: A.E., Ö.L.A., Design: Ö.L.A., Data Collection or Processing: A.E., Ö.L.A., Ş.Ö., Analysis or Interpretation: A.E., Ş.Ö., Literature Search: A.E., Writing: A.E., Ş.Ö.

Conflict of Interest: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Financial Disclosure: The authors received no financial support for the research, authorship, and/or publication of this article.

References

1. Satkiene D, Kavoliuniene A, Petrauskiene I, Sirvyte R. Tongue angioedema associated with angiotensin-converting enzyme inhibitor (diagnosis, differential diagnosis, treatment). Medicina (Kaunas). 2003;39:570-3.
2. Wilkerson RG. Angioedema in the emergency department: an evidence-based review. Emerg Med Pract. 2012;14:1-21.
3. Bernstein JA, Moellman J. Emerging concepts in the diagnosis and treatment of patients with undifferentiated angioedema. Int J Emerg Med. 2012;6;5:39.
4. Jaiganesh T, Wiese M, Hollingsworth J, Hughan C, Kamara M, Wood P, et al. Acute angioedema: recognition and management in the emergency department. Eur J Emerg Med. 2013;20:10-7.
5. Cicardi M, Bellis P, Bertazzoni G, Cancian M, Chiesa M, Cremonesi P, et al. Guidance for diagnosis and treatment of acute angioedema in the emergency department: consensus statement by a panel of Italian experts. Intern Emerg Med. 2014;9:85-92.
6. Vázquez Nava F, Almeida Arvizu VM, Sánchez Nuncio HR, de los Angeles Villanueva Carreto M, Fogelbach Guidos GA. Prevalence and potential triggering factors of chronic urticaria and angioedema in an urban area of northeastern Mexico. Rev Alerg Mex. 2004;51:181-8.
7. Gakhal MS, Marcotte GV. Hereditary angioedema: imaging manifestations and clinical management. Emerg Radiol. 2015;22:83-90.
8. Lewis LM. Angioedema: etiology, pathophysiology, current and emerging therapies. J Emerg Med. 2013;45:789-96.
9. Sin A. Acute urticaria and angioedema. 7th National Internal Medicine Congress. 2005; 16-20 September.
10. Zingale LC, Beltrami L, Zanichelli A, Maggioni L, Pappalardo E, Cicardi B, et al. Angioedema without urticaria: a large clinical survey. CMAJ. 2006;175:1065-70.
11. Bork K, Meng G, Staubach P, Hardt J. Hereditary angioedema: new findings concerning symptoms, affected organs, and course. Am J Med. 2006;119:267-74.
12. Champion RH, Roberts SOB, Carpenter RG, Roger JH. Urticaria and angioedema: a review of 554 patients. Br J Dermatol. 1969;588-97.
13. Inomata N. Recent Advances in Drug-InducedAngioedema. Allergol Int. 2012;61:545-57.
14. Kaplan AP, Greaves MW. Angioedema. Am Acad Dermatol. 2005;53:373-88.
15. Banerji A, Clark S, Blanda M, LoVecchio F, Synder B, Camargo CA Jr. Multicenter study of patients with angiotensin-converting enzyme inhibitorinduced angioedema who present to the emergency department. Ann Allergy Asthma Immunol. 2008;100:327-32.
16. Iwamoto K, Mihara S, Ikezawa Z, Hide M. National prevalence survey of hereditary angioedema in Japan. Arerugi. 2011;60:26-32.
17. Aygören-Pürsün E, Bygum A, Beusterien K, Hautamaki E, Sisic Z, Wait S, et al. Socioeconomic burden of hereditaryangioedema: results from the hereditary angioedema burden of illness study in Europe. J Orphanet J Rare Dis. 2014;9:99.
18. Huang SW. Results of an on-line survey of patients with hereditary angioedema. Allergy Asthma Proc. 2004;25:127-31.
19. Zilberberg MD, Jacobsen T, Tillotson G. The burden of hospitalizations and emergency department visits with hereditary angioedema and angioedema in the United States, 2007. Allergy Asthma Proc. 2010; 31:511-9.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Original Article
DOI: 10.4274/eajem.galenos.2020.67689
Eurasian J Emerg Med. 2020;19(4): 219-25

The Effect of Low Dose Ketamine on the Need for Morphine in Patients with Multiple Trauma in Emergency Department

Farhad Heydari, Reza Azarian, Babak Masoumi, Alireza Abootalebi Ghahnavieh

Department of Emergency Medicine, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Aim: There are a few analgesic drugs (morphine, ketamine, Paracetamol, etc.) used for pain control in injury patients. Previous studies showed that low-dose ketamine (doses less than 1 mg/kg) promptly and satisfactorily resolved pain. This study aimed to compare the analgesic effects of morphine with placebo (MP group) to that of a combination of morphine with ketamine (MK group) for patients with multiple trauma (MT) in the emergency department (ED).

Materials and Methods: This randomized, controlled, double-blinded clinical trial was conducted in the ED of two university teaching hospitals. Seventy multiple trauma patients aged between 16 and 50 years with a severe acute pain defined as a visual analog scale (VAS) score of at least 70 (between 0 and 100) were enrolled. Patients were randomly assigned to receive intravenous morphine (0.1 mg/kg) with placebo or morphine (0.05 mg/kg) with low-dose ketamine (0.3 mg/kg) for pain control. The pain intensity was evaluated before and 10th, 20th, 30th, and 60th minutes after the intervention, and probable side effects were recorded. Efficient analgesia was defined as a VAS score not exceeding 30. If the VAS score was still above 30, additional morphine (3 mg) was administered for both groups. The primary outcome was the VAS score at 30 minutes.

Results: Seventy patients were enrolled in this study. There was no difference between the groups in terms of demographic characteristics or vital signs and baseline pain scores. The pain intensity decreased significantly in both groups 30 minutes after the intervention. However, there was no significant difference between the mean VAS scores of the two groups before and after the intervention. Morphine consumption was significantly lower in the MK group versus the MP group (9.3±2.2 vs 6.1±2.7, p=0.01). In addition, there was no significant difference between the two groups in terms of complications (p>0.05).

Conclusion: Low-dose ketamine in combination with morphine significantly reduced the need for an additional dose of morphine without increasing the complication rate related to morphine alone.

Keywords: Analgesic, emergency department, ketamine, morphine, multiple trauma, pain

Introduction

Pain is one of the most frequent problems in patients visiting emergency departments (EDs) so that 70% of emergency visits are due to pain (1-3). Adequate analgesia following trauma is a central aspect of emergency medical treatment before and after hospital admission (4). Acute pain and trauma are often closely related to one another, as pain is induced by noxious stimuli at the site of tissue damage (1). Pain is also the main complaint of patients seeking help in emergency care. As a consequence, patients suffer pain unnecessarily, and adverse physiological and psychological effects occur (2). Trauma patients, report low satisfaction with their pain management (5). In addition, trauma patients who present with multiple injuries, substance abuse, delayed care, as well as psychological and emotional issues complicate the care process (5,6). Improved pain management is not only the patient right, but also it prompts early healing, reduces patient's stress response, shortens hospital length of stay, lowers costs, diminishes risk of chronic pain due to neuroplasticity, and ultimately reduces morbidity and improve long-term outcomes (5-8).

Corresponding Author: Asst. Prof. Farhad Heydari, M.D., Department of Emergency Medicine, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran
E-mail: farhad_heidari@med.mui.ac.ir **ORCID:** orcid.org/0000-0002-6296-0045

Received: 09.01.2020
Accepted: 22.06.2020

Cite this article as: Heydari F, Azarian R, Masoumi B, Ghahnavieh AA. The Effect of Low Dose Ketamine on the Need for Morphine in Patients with Multiple Trauma. Eurasian J Emerg Med. 2020;19(4):219-25

There are several pain control medications (morphine, ketamine, paracetamol, etc.) for trauma patients. Opioid analgesics are commonly administered and prescribed from the ED. Morphine is the first choice in the treatment of severe nociceptive pain. (3,5). Owing to its few complications and relatively rapid and effective analgesic effects, it is widely administered (5,8,9). However, adverse effects of opioids are nausea, vomiting, dizziness, constipation, reduced blood pressure, reduced heart rate, and reduced oxygen saturation. Sometimes these complications occur before sufficient pain relief (5-10). Ketamine is an N-methyl-D-aspartate receptor antagonist, which has been utilized since the 1970s for anesthesia (8). Ketamine comparably potentiate opioid analgesia, and reducing opioid need in postoperative settings (11). Adverse effects include increased secretions, blurred vision, agitation on emergence, elevated pulse and blood pressure, disturbed sleep and hallucinations (5-8,12). Low dose ketamine, by definition, is applied to doses less than 1 mg/kg (13). Low dose ketamine provides analgesic effectiveness and apparent safety comparable to that of intravenous morphine for short-term treatment of acute pain in the ED (12,13) and in trauma patients with severe acute pain reduces morphine requirements (14).

Various dosage protocols for morphine have been developed, producing contradictory results (1, 9, and 15). For example, Bijur et al. (9) conducted a study on 119 patients with acute and severe pain and found that approximately 67% of the patients receiving normal dosage (0.1 mg/kg) reported a reduction of pain of less than 50%. They concluded that this dosage is insufficient for pain control. Although there is no standard dose for morphine, the majority of references have used a single dose of 0.1 mg/kg, or 0.05-0.15 mg/kg (15,16).

There are few studies comparing the analgesic effect of morphine alone with the morphine-ketamine combination. To the best of our knowledge, this is the first study that compared the combination of intravenous Low dose ketamine at a dose of 0.3 mg/kg with morphine at a dose of 0.05 mg/kg in trauma patients with a large sample size.

We intended to test the hypothesis that the combination of low dose ketamine with morphine would promptly reduce pain perception and morphine consumption compared with morphine alone in multiple trauma patients with severe acute pain at the ED.

Materials and Methods

Study Design and Participants

This prospective, randomized, double-blinded clinical trial was conducted in the adult ED of Isfahan University, two university educational hospitals, affiliated with Isfahan University of Medical Sciences in Iran from December, 2016 to December, 2017. The study protocol was approved by the ethics committee of Isfahan University of Medical Sciences (IR.MUI.REC.1395.3.824). The trial was registered in the Iranian Registry of Clinical Trials under the number (IRCT20180129038549N3). Before the study, written informed consent was obtained from all parents, before enrolment into the study.

All the patients between 16 to 50 years with multiple trauma referring to ED were eligible for inclusion. Patients with a severe acute pain defined as a visual analog scale (VAS) (5,14) score of at least 70/100; and without acute respiratory, hemodynamic, or neurologic compromise (respiratory distress signs, heart rate lower than 60, and systolic blood pressure lower than 90 mm Hg, Glasgow Coma Score less than 15) were enrolled in this study.

Exclusion criteria were patients with psychiatric illness; history of cardiac disease; chronic respiratory, renal, or hepatic failure; known allergy to morphine or ketamine; treatment of chronic pain or treatment with opioids; incapacity to understand the VAS; pregnant or breast-feeding and presence of acute ocular or head trauma. Patients who had already received an opioid analgesic were also excluded.

The participants were randomly allocated to two groups using a statistical software to ensure roughly equal numbers in each group.

Pain measurement was accomplished using a 100-mm ruler with tick marks spaced 10-mm apart that the patient points to the point indicating his or her pain intensity. The patient's pain intensity was represented by a point between "0" and means "no pain at all" and "100" and means "the worst pain imaginable".

Intervention

Eligible patients (70) were randomly allocated to receive either morphine and placebo (MP group) or morphine and ketamine (MK group), each with 35 patients. The first group (MP group) received 0.1 mg/kg intravenous morphine with 5 cc isotonic sodium chloride solution as placebo for pain control. The second group (MK group) received 0.05 mg/kg intravenous morphine with 0.3 mg/kg intravenous ketamine (Ketamine hydrochloride 50 mg/mL vials, Rotexmedica, Trittau, Germany). Ketamine and placebo were administered from syringes of similar appearances prepared by a nurse who was otherwise not involved in the study. In addition, morphine in the second group was diluted to obtain an equal volume as the first group. The medications were administered intravenously by a nurse who was blinded to the study protocol.

Patients were asked to assess the intensity of their pain level based on VAS score on inclusion (T0) and then every 5 minutes

after arrival at hospital. The patients' VAS scores were recorded at 0th, 10th, 20th, 30th and 60th minutes after intervention. Sufficient pain reduction was obtained as defined by a VAS score, not exceeding 30% or 50% below the initial score. If the pain relief was not obtained, at those moments, additional morphine dose (3 mg) every 10 minutes was administered for each group. The safety evaluation included non-invasive monitoring of blood pressure, heart rate, oxygen saturation by pulse oximetry (Spo_2), and respiratory rate, at these periods. The presence of adverse effects was likewise recorded. These data were recorded at T0 and T30.

Sixty minutes after the first injection (T60), patients' satisfaction regarding analgesia (pain relief classified as excellent, good, mild, or weak) was recorded. Morphine consumption at T60 was recorded too.

The primary outcome was VAS at 30 minutes and morphine consumption and side effects were the secondary outcomes.

Statistical Analysis

Data were analyzed by the SPSS 22 software. Results were presented as the mean ± standard deviation for quantitative variables. Pain scores were compared with independent t-test and qualitative variables were analyzed by the chi-square test except for patient satisfaction, which was analyzed by Fisher's exact test. Power analysis determined that a sample size of at least 30 subjects per group would achieve 90% power to detect a VAS difference of more than 13/100 (13) between treatment groups, with an α level of 0.05. We chose to include 35 patients in each group to increase the power of this study. A p value of less than 0.05 was considered statistically significant.

Results

Between December 01, 2016, and December 30, 2017, seventy patients were enrolled in the study (Figure 1). Two and one patients were excluded because of unwillingness to receive an additional dosage of morphine and being severely restless, respectively. Thus, data from 67 patients were completed and analyzed, 33 in the MP group and 34 in the MK group. Patients' demographic characteristics are shown in Table 1. The patients' mean ages were 38.5±14.3 and 37.0±12.5 years in MK and MP groups, respectively. There was no difference between the groups in terms of demographic characteristics or vital signs and baseline pain scores.

In both groups, 30 minutes after injection (T30), the mean VAS score when compared to the initial VAS score (T0) had a statistically significant reduction (p=0.01) (Figure 2). This reduction was slightly higher in the MK group than the MP group (56 versus 51 units); Moreover, the VAS score was not significantly different between MK and MP groups at T0, T10, T20, and T30 (Table 2).

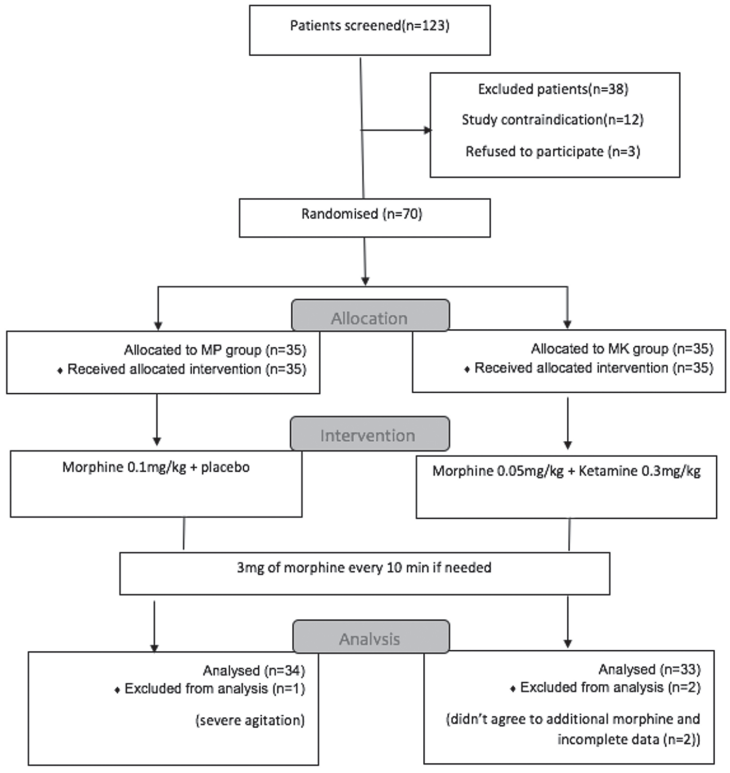

Figure 1. CONSORT flow diagram of the study

CONSORT: Consolidated Standards of Reporting Trials, MP: Morphine with placebo, MK: Morphine with ketamine, n: Number

Table 1. The baseline characteristics of patients from MK and MP groups

Variables	MP group, (n=33)	MK group, (n=34)	p value
Age, mean (SD), year	37.03±12.48	38.47±14.28	0.112
Sex ratio (male-female)	25:8	24:10	0.611
Weight, kg	78.3±7.1	76.9±8.3	0.534
Mechanism of injury			
Road traffic accidents (%)	16 (48.48)	18 (52.94)	0.831
Fall (%)	8 (24.24)	9 (26.47)	
Assault (%)	6 (18.18)	4 11.77)	
Others (%)	3 (9.10)	3 (8.82)	
Final diagnosis, n (%)			
Fracture	14 (42.42)	17 (50.00)	0.684
Soft tissue injury	19 (57.58)	17 (50.00)	

MP: Morphine with placebo, MK: Morphine with ketamine, SD: Standard deviation, n: Number

According to the results, the VAS score at T30 was higher than 30 in 4 patients (6%) in the MP group and 5 patients (7.5%) in the MK group, representing a nonsignificant difference (p=0.81).

There were no differences between groups with regard to blood pressure, heart rate, or the respiratory rate at T0 and T30 (Table 3). Also, the oxygen saturation at T0 and T30 was not significantly different between groups; whereas, reduction in oxygen saturation was higher in the MP group. There was no clinically significant change of vital signs after enrolment.

No life-threatening complication was observed in both groups. There was no significant difference between groups in the incidence of adverse effects (p>0.05). The frequency of nausea and vomiting was higher in the MP group than the MK group; whereas, the frequency of restlessness and delusion was higher in the MK group. However, this difference was not significant (Table 3).

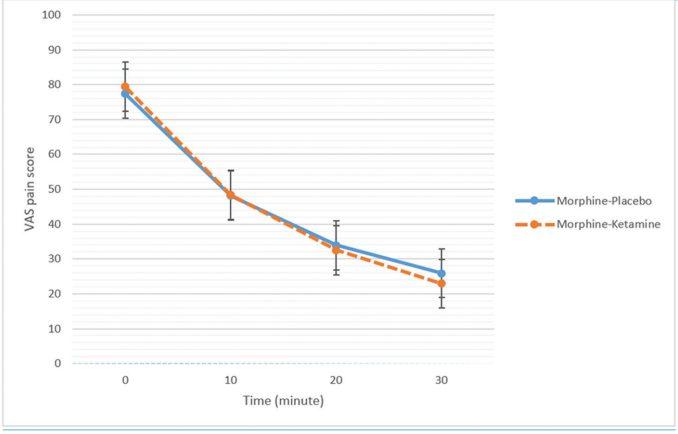

Figure 2. Mean score of pain before injection and 10th, 20th, and 30th minutes after it in both groups
VAS: Visual analog scale

Sixty minutes (T60) after injection, when the sedation effect of drugs has subsided, the patients' satisfaction was evaluated. A total of, 25 patients (75.7%) in the MP group and 22 patients (64.7%) in the MK group were satisfied with the analgesic (excellent and good). The satisfaction of patients was not significantly different between the two groups (p=0.31) (Table 4).

We divided the patients into two subgroups, with and without fractures. Fourteen patients (42.4%) in the MP group and 17 patients (50%) in the MK group did not have a fracture. There was a significant relationship between the lack of fracture and satisfaction of analgesics in both groups (p=0.01 in MP group and p=0.026 in MK group). Also, in both subgroups, there was no significant difference between MP and MK groups regarding the patients' satisfaction (p=0.668 in with fracture and p=0.236 in without fracture subgroup).

The mean dose of morphine in MK and MP group was 9.3±2.2 mg and 6.1±2.7 mg, respectively. At T60, morphine consumption was significantly lower in the MK group than that in the MP group, corresponding to significantly fewer morphine boluses in the MK group than those in the MP group (Table 4).

Table 2. Reduction in VAS score in MP and MK groups

	MP group			MK group			b-a	p value**
Time (minutes)	VAS score	Reduction in VAS score (a)	p value*	VAS score	Reduction in VAS score (b)	p value*		
0	77.42	-	-	79.41	-	-	-	-
10	48.18	29.24	<0.001	48.24	31.17	<0.001	1.93	0.312
20	33.93	43.49	<0.001	32.50	46.91	<0.001	3.42	0.111
30	25.91	51.51	<0.001	22.94	56.47	<0.001	4.96	0.564

*The p value for the recent VAS score from the baseline VAS score.
**The p value for the difference in the VAS score reduction between the MP and MK groups
VAS: Visual analog scale, MP: Morphine with placebo, MK: Morphine with ketamine, n: Number

Table 3. Effect of treatment on clinical parameters in MP and MK groups

	MP group				MK group				b-a	p value**
Parameter	T0	T30	Reduction (a)	p value*	T0	T30	Reduction (b)	p value*		
Systolic blood pressure (mm Hg, mean)	124.21	113.06	11.15	<0.001	128.47	118.52	9.95	<0.001	1.2	0.565
Heart rate (beats/minute, mean)	81.21	74.75	6.46	<0.001	83.55	77.55	6.00	<0.001	0.46	0.711
Respiratory rate (breaths/minute, mean)	21.09	20.00	1.09	<0.001	20.64	19.82	0.82	<0.001	0.27	0.344
Pulse oximetry (%, mean)	98.45	94.63	3.82	<0.001	98.79	98.02	0.77	0.056	3.05	0.302

*The p value for the reduction in parameters by 30 minutes within each group
**The p value for the contrast in the reduction between the
MK: Morphine with ketamine, n: Number, MP: Morphine with placebo

Table 4. Comparison of morphine consumption, and patient satisfaction between MP and MK groups

Variables		MP group (n=33)	MK group (n=34)	p value
Patient satisfaction T60 [n (%)]	Weak	1 (3%)	2 (5.9%)	0.311
	Mild	7 (21.2%)	10 (38.2%)	
	Good	18 (54.5%)	15 (44.1%)	
	Excellent	7 (21.2%)	7 (20.6%)	
Morphine consumption				
T60 (mg, mean ± SD)		9.31±2.24	6.14±2.74	0.010

MP: Morphine with placebo, MK: Morphine with ketamine, n: Number, SD: Standard deviation

Discussion

In our study, we compared low dose ketamine plus morphine with morphine alone for ED multiple trauma patients experiencing acute severe pain. Our study suggests that low dose ketamine is as effective as morphine in relieving pain at 10th, 20th and 30th minutes. Low dose ketamine has been shown to be safe and effective for the treatment of severe acute pain in the ED. We found that the association of low dose ketamine with reduced morphine consumption. At T60, morphine consumption was significantly lower in the MK group than that in the MP group. Significant reduction in pain intensity measured on a VAS at T30 was observed in both groups. This reduction was slightly higher in the MK group than the MP group; however, this difference was not significant. The side effects were also comparable between the two study groups.

Many studies have shown reductions in morphine requirements when ketamine is administered concomitantly (12,14). Galinski et al. (14) performed the first study on the effect of morphine - low dose ketamine combination on trauma patients with acute and severe pain and have shown reductions in morphine requirements when ketamine is administered concomitantly.

There have been several published trials examining ketamine used for analgesia in ED patients. But there are few studies comparing the analgesic effect of morphine and combination of the morphine at a dose 0.05 mg/kg with low dose ketamine at a dose of 0.3 mg/kg in multiple trauma patients.

There are different doses of morphine, the majority of references have used a single dose of 0.1 mg/kg, or 0.05-0.15 mg/kg (15,16). Bounes et al. (16) performed a study on 106 patients, who received either 0.05 mg/kg morphine then 0.025 mg/kg, every 5 minutes or 0.1 mg/kg morphine then 0.05 mg/kg every 5 minutes intravenously. They have reported that the high-dose morphine regimen showed a similar analgesic response pattern to the low dose one in severe acute pain in a prehospital setting. But in the interests of achieving rapid pain relief, an initial dose of 0.05 mg/kg should no longer be recommended for treating severe acute pain in a prehospital setting. So, we decided to demonstrate low dose ketamine with low dose morphine in trauma patients for pain control in the emergency setting.

Farsi et al. (15) were showed that using two doses of morphine instead of one is a safe and effective method for pain reduction in isolated limb trauma. They recommend performing a second injection of 0.05 mg/kg morphine 30 minutes after the initial standard dose of 0.10 mg/kg to decrease pain in these patients.

Like our study, Galinski et al. (14) found that the VAS pain measure was not statistically different between the morphine and ketamine intervention group and the morphine alone control group. At the 30-minute period, a larger proportion of the ketamine group had had their pain reduced to below 30 mm than the morphine group; however, this difference did not reach statistical significance.

In a study by Majidinejad et al. (17) ketamine 0.5 mg/kg was compared to morphine 0.1 mg/kg in 126 emergency patients with long bone fractures. Ketamine was found to have a significant decrease in the severity of acute pain at 10 minutes after the dose. This study reported that this onset of effect was similar to the morphine group. This study noted that adverse events were higher in the ketamine group but concluded that these complications should not preclude the use of ketamine as all effects resolved spontaneously without therapeutic intervention.

Miller et al. (18) performed a study on 45 patients, 21 patients received 0.1 mg/kg morphine and 24 patients received 0.3 mg/kg ketamine. They showed low-dose ketamine did not produce a greater reduction in pain scores compared with morphine for acute pain in the ED. However, low-dose ketamine induced a significant analgesic effect within 5 minutes (15 minutes later the effect of ketamine was reduced) and provided a moderate reduction in pain for 2 hours. Adverse events, and nurse satisfaction scores were similar between groups. Our study and all three of these studies concurred that ketamine, although not superior to morphine, provides similar and significant pain reduction with a reasonably safe adverse effect profile (14,17,18).

Several prospective randomized trials examined the analgesic effect of low dose ketamine and morphine combination on patients with acute severe pain. Their results were similar whatever their designs, namely, that low dose ketamine reduced morphine requirements and pain intensity (11,12,14,19). Beaudoin et al. (19) evaluated two different doses of low dose ketamine-morphine combinations compared with morphine alone for ED analgesia showed a clinically significant decrease

in pain intensity for more than 50% of patients who received morphine (0.1 mg/kg) and ketamine (0.15 or 0.3 mg/kg) combination compared with the morphine-only group. In addition, the authors concluded that morphine combined with ketamine at a dose of 0.3 mg/kg had more efficacious analgesic effect than a combination using a ketamine dose of 0.15 mg/kg.

Weinbroum (12) evaluated the effects of postoperative co-administration of small doses of ketamine (0.250 mg/kg) and morphine on pain intensity in surgical patients who complained of pain of at least 6/10 on a VAS despite more than 0.1 mg/kg of IV morphine administration within 30 minutes. This study demonstrated that IV administration of a combined small dose of MK promptly and satisfactorily resolved pain that had been unresponsive to IV morphine, whereas a threefold dose of MS only partially attenuated it. Pain intensity was still less in the former group after two hours (12).

Abbasi et al. (20) compared morphine 0.1 mg/kg and placebo (MP group) and morphine 0.1 mg/kg and ketamine 0.15 mg/kg (MK group) in patients with severe renal colic pain. Assessment of the average pain during 120 minutes at 10th and 30th minutes after the start of the drug, MK group was significantly lower than the MP group. They showed that, given that combinations of morphine with low doses of ketamine in patients with renal colic pain causes more pain and morphine consumption reduction.

Several studies have also compared the analgesic effects and safety of ketamine in pre-hospital. Jennings et al. (21) in a systematic review of the effects of ketamine on reducing pain in pre-hospital trauma showed that ketamine is a safe and effective analgesic agent. The addition of ketamine as an analgesic agent may improve the management of patients presenting with acute traumatic pain in the pre-hospital setting. A systematic review, too, showed that the use of ketamine as a supplementary medication results in a decrease in the need for morphine, preventing unfavorable complications (22).

In our study, all adverse effects were weak and brief because no one needed treatment and patients' satisfaction was not different between the two groups. There was no clinically significant change of vital signs after enrolment, nor were there any clinically significant differences between study groups. These findings are consistent with those of previous trials of ketamine and opioid combination regimens (11-19). Jennings et al. (21) reported similar findings but emphasized that more minor complications are seen with a combination of morphine/ketamine.

The follow-up period of our trial is a limitation because the patients were observed for 60 minutes. Increasing patients' follow-up time provided the possibility of obtaining valuable results. Indeed, Weinbroum (12) demonstrated that the analgesic effects of the ketamine group were clearly evident throughout the 120-minute observation period.

Conclusion

This study showed that adding low-dose ketamine (0.3 mg/kg) to low-dose morphine (0.05 mg/kg) in the MK group results in a significant decrease in the severity of acute pain in trauma patients and significantly reduced the need for additional dose of morphine without increasing complications; whereas, the difference in pain reduction between the two groups was not significant. We demonstrated that combinations of low-dose morphine and low-dose ketamine is an effective and safe method of pain control in trauma patients.

Acknowledgment

The authors would like to acknowledge Azadeh Javaherpour from McGill University, Montreal, Quebec, Canada for her collaboration in this study.

Ethics

Ethics Committee Approval: The study protocol was approved by the ethics committee of Isfahan University of Medical Sciences (IR.MUI.REC.1395.3.824). The trial was registered in the Iranian Registry of Clinical Trials under the number (IRCT20180129038549N3).

Informed Consent: Before the study, written informed consent was obtained from all parents, before enrolment into the study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: F.H., R.A., B.M., A.A.G., Concept: F.H., R.A., Design: F.H., R.A., B.M., A.A.G., Data Collection or Processing: F.H., R.A., B.M., A.A.G., Analysis or Interpretation: F.H., R.A., Literature Search: F.H., R.A., B.M., A.A.G., Writing: F.H., R.A., B.M., A.A.G.

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. Scholten AC, Berben SA, Westmaas AH, Van Grunsven PM, de Vaal ET, Rood PP, et al. Pain management in trauma patients in (pre) hospital based emergency care: current practice versus new guideline. Injury. 2015;46:798-806.
2. Berben SA, Meijs TH, van Grunsven PM, Schoonhoven L, van Achterberg T. Facilitators and barriers in pain management for trauma patients in the chain of emergency care. Injury. 2012;43:1397-402.

3. Jahanian F, Hosseininejad SM, Ahidashti HA, Bozorgi F, Khatir IG, Montazar SH, et al. Efficacy and safety of morphine and low dose ketamine for pain control of patients with long bone fractures: a randomized, double-blind, clinical trial. Bull Emerg Trauma. 2018;6:31-6.
4. Häske D, Böttiger BW, Bouillon B, Fischer M, Gaier G, Gliwitzky B, et al. Analgesia in patients with trauma in emergency medicine: a systematic review and meta-analysis. Deutsches Ärzteblatt Int. 2017;114:785-92.
5. Ahmadi A, Bazargan-Hejazi S, Zadie ZH, Euasobhon P, Ketumarn P, Karbasfrushan A, et al. Pain management in trauma: A review study. J Inj Violence Res. 2016;8:89-98.
6. Gausche-Hill M, Brown KM, Oliver ZJ, Sasson C, Dayan PS, Eschmann NM, et al. An evidence-based guideline for prehospital analgesia in trauma. Prehosp Emerg Care. 2014;18(Supl 1):25-34.
7. Malchow RJ, Black IH. The evolution of pain management in the critically ill trauma patient: emerging concepts from the global war on terrorism. Crit Care Med. 2008;36:S346-57.
8. Masoumi B, Farzaneh B, Ahmadi O, Heidari F. Effect of intravenous morphine and ketorolac on pain control in long bones fractures. Adv Biomed Res. 2017;6.91.
9. Bijur PE, Kenny MK, Gallagher EJ. Intravenous morphine at 0.1 mg/kg is not effective for controlling severe acute pain in the majority of patients. Ann Emergency Med. 2005;46:362-7. [Epub 2005/09/29].
10. Heydari F, Gholamian A, Zamani M, Majidinejad S. Effect of intramuscular ketamine versus haloperidol on short-term control of severe agitated patients in emergency department: a randomized clinical trial. Bull Emerg Trauma. 2018;6:292-9.
11. Kapfer B, Alfonsi P, Guignard B, Sessler DI, Chauvin M. Nefopam and ketamine comparably enhance postoperative analgesia. Anesth Analg. 2005;100:169-74.
12. Weinbroum AA. A single small dose of postoperative ketamine provides rapid an sustained improvement in morphine analgesia in the presence of morphine-resistant pain. Anesth Analg. 2003;96:789-95.
13. Sin B, Ternas T, Motov SM. The use of subdissociative-dose ketamine for acute pain in the emergency department. Acad Emerg Med. 2015;22:251-7.
14. Galinski M, Dolveck F, Combes X, Limoges V, Smail N, Pommier V, et al. Management of severe acute pain in emergency settings: ketamine reduces morphine consumption. Am J Emerg Med. 2007;25:385-90.
15. Farsi D, Movahedi M, Hafezimoghadam P, Abbasi S, Shahlaee A, Rahimi-Movaghar V. Acute pain management with intravenous 0.10 mg/kg vs. 0.15 mg/kg morphine sulfate in limb traumatized patients: a randomized double-blinded placebo-controlled trial. TJTES. 2013;19:398-404. [Epub 2013/11/12].
16. Bounes V, Charpentier S, Houze-Cerfon CH, Bellard C, Ducassé JL. Is there an ideal morphine dose for prehospital treatment of severe acute pain? A randomized, double-blind comparison of 2 doses. Am J Emerg Med. 2008;26:148-54.
17. Majidinejad S, Esmailian M, Emadi M. Comparison of intravenous ketamine with morphine in pain relief of long bones fractures: a double blind randomized clinical trial. Emergency. 2014;2:77-80.
18. Miller JP, Schauer SG, Ganem VJ, Bebarta VS. Low-dose ketamine vs morphine for acute pain in the ED: a randomized controlled trial. Am J Emerg Med. 2015;33:402-8.
19. Beaudoin FL, Lin C, Guan W, Merchant RC. Low-dose ketamine improves pain relief in patients receiving intravenous opioids for acute pain in the emergency department: results of a randomized, double-blind, clinical trial. Acad Emerg Med. 2014;21:1193-202.
20. Abbasi S, Bidi N, Mahshidfar B, Hafezimoghadam P, Rezai M, Mofidi M, et al. Can low-dose of ketamine reduce the need for morphine in renal colic? A double-blind randomized clinical trial. Am J Emerg Med. 2018;36:376-9.
21. Jennings PA, Cameron P, Bernard S. Ketamine as an analgesic in the pre-hospital setting: a systematic review. Acta Anaesthesiologica Scandinavica. 2011;55:638-43.
22. Subramaniam K, Subramaniam B, Steinbrook RA. Ketamine as adjuvant analgesic to opioids: a quantitative and qualitative systematic review. Anesth Analg. 2004;99:482-95.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Original Article
DOI: 10.4274/eajem.galenos.2020.72602
Eurasian J Emerg Med. 2020;19(4): 226-31

Cardiopulmonary Resuscitation Knowledge and Experience Among Dentists in Turkey

Ömer Ekici

Department of Oral and Maxillofacial Surgery, Afyonkarahisar Health Sciences University, Faculty of Dentistry, Afyonkarahisar, Turkey

Abstract

Aim: Cardiopulmonary resuscitation (CPR) is an essential skill that all health care professionals are advised to acquire. Dentists, as health professionals, should be able to recognize cardiac arrest and effectively perform CPR. This study aimed to evaluate the knowledge and experiences of general dentists in Turkey on CPR.

Materials and Methods: A cross-sectional study was conducted among 152 general dentists working in Turkey. Data were obtained through an electronic survey including the knowledge and attitude of dentists on CPR based on the 2015 American Heart Association guidelines update. Data were evaluated using the statistical package for social sciences (SPSS version 22).

Results: A total of 152 general dentists participated in the present study, giving a response rate of 76%. While 44% of the dentists answered more than half of the questions, none of the dentists answered all the questions correctly. Although only 1.3% of the dentists stated that they had encountered a cardiac arrest case, 34.2% of them stated that they could evaluate a cardiac arrest case. In addition, although 73.7% of the dentists had previously received cardiopulmonary resuscitation training, only 6.6% of them considered themselves adequate in CPR administration. Of the dentists, 11.8% were aware of the 2015 CPR guidelines. Among the dentists, 88.2% of them stated that they should be skilled in CPR as a dentist, while 90.8% of them wanted to undergo CPR training.

Conclusion: This study showed that the majority of general dentists in Turkey had insufficient knowledge on CPR. Therefore, CPR training should be regularly provided to general dentists in the country.

Keywords: Cardiopulmonary resuscitation, basic life support, medical emergencies, dentistry

Introduction

Heart disease is one of the most common diseases in the world, resulting in high morbidity and high cost to health. Cardiac arrest is a common cause of death in developed countries (1). According to the American Heart Association (AHA), cardiac arrest is described as "discontinuation of cardiac mechanical activity, verified by lack of measurable pulse, apnea, and loss of awareness" (2). The heart's resistance to anoxia is fairly strong however if the anoxia persists more than 3 or 4 minutes, the central nervous system may show permanent lesions. Cardiopulmonary resuscitation (CPR) is the provision of blood and oxygen to these organs to satisfy the metabolic needs of the myocardium and brain when sudden cardiac arrest occurs due to reversible reasons. CPR is an emergency procedure that aims to restore spontaneous circulation by performing compressions of the chest with or without ventilation (3). According to the AHA, CPR is a component of the "chain of survival". The chain is a series of actions that help provide a person with a heart attack the highest chance of survival (4).

The success of CPR depends on how quickly the scene of an accident can be reached and how effective CPR can be performed. Recent studies on the efficacy of CPR have shown that the best way to achieve resuscitation in cardiac arrest is high-quality CPR with minimal interruptions and early defibrillation (5). Guidelines for CPR are updated by AHA and the European Resuscitation Council in various time frames. Although there are some differences in resuscitation practices, each guide emphasizes the importance of early diagnosis and rapid intervention. Patients resuscitated

Corresponding Author: Asst. Prof. Ömer Ekici, M.D., Department of Oral and Maxillofacial Surgery, Afyonkarahisar Health Sciences University, Faculty of Dentistry, Afyonkarahisar, Turkey
E-mail: dromerekici@hotmail.com **ORCID:** orcid.org/0000-0002-7902-9601

Received: 14.02.2020
Accepted: 02.07.2020

Cite this article as: Ekici Ö. Cardiopulmonary Resuscitation (CPR) Knowledge and Experience Among Dentists in Turkey. Eurasian J Emerg Med. 2020;19(4):226-31

immediately after cardiac arrest have a two to three-fold higher survival rate (patients who did not receive CPR were 2.5% and those receiving 8.2%) (6). Furthermore, if CPR does not start immediately after cardiac arrest, the survival rate would be decreased by 7-10% per minute after initiation of an event (7).

Although the incidence of medical emergencies in dentistry is rare, there may be emergency conditions for the patient, staff, or even the patient attendant (8). The most important medical emergency for a dentist is a cardiopulmonary arrest (CPA), so a diagnosis and treatment should be made as soon as possible. Although unusual, there are reports of CPA-related death in dentistry during dental treatment (9-10). In most patients with CPA, the only way to save lives is to immediately initiate CPR. Approximately 92% of out-of-hospital cardiac arrest cases die due to the absence of emergency CPR (4). Therefore, as a health professional, dentists should be able to recognize CPA and perform CPR. CPR, including the use of an automated external defibrillator, is one of the basic skills necessary for the management of emergencies in dentistry. There are not enough studies that have evaluated the dentists' knowledge and skills to perform CPR in Turkey. The aim of this study was to evaluate the knowledge and skill levels of dentists related to CPR.

Materials and Methods

This cross-sectional survey was carried out from January 2019 to September 2019 in Turkey. General dental practitioners who work in the ministry of health and private dental offices were included in this study. This study was approved by the Ethical Committee of the Faculty of Medicine, Afyonkarahisar Health Sciences University (no: 2019/10-316, date: 04.10.2019), and was performed in full compliance with the Helsinki Declaration of the World Medical Association.

The structured questionnaire consisting of 29 questions was prepared by the author for use in the study. Four of the questions were related to demographic data while the other 25 questions were related to CPR knowledge and experience of dentists. In this study, the knowledge of dentists was evaluated according to the CPR guidelines, which was last updated in 2015. The validity and reliability of the questions were confirmed with the pre-test method by a pilot group of 25 dentists. The questionnaire sent to dentists working in various hospitals in Turkey via e-mail.

Statistical Analysis

Survey data were analyzed using the Statistical Package for Social Sciences (SPSS-22). Descriptive statistics have been provided using the number, percentage. For questions measuring levels of knowledge, the participants were given "1 point" for each correct answer and "0 points" for each wrong answer. In the total score, 0-4 points were evaluated as an insufficient level of knowledge and 5-10 points as sufficient level of knowledge. Pearson chi-square test was used to determine the score differences between the groups. The mean difference was considered significant at 0.05 level.

Results

One hundred and fifty-two valid questionnaires were attained from dentists (response rate of 76%). The demographic characteristics of the participants were given in Table 1. It was seen in this table that half of the participants were between the ages of 25-34, 56.6% were women and 68.4% were married. The majority of the participants (42.1%) had a working experienced period of 1-5 years and most participants (43.4%) had worked under the Ministry of Health.

Table 2 was summarized the respondent dentists' knowledge of CPR. The first two questions concerned opening the airway method. While the dentist who correctly answered the maneuver applied in patients without a cervical injury is 71.2%, it decreased to 25% in patients with a cervical injury. Half of the dentists correctly answered the duration of the assessment of the casualty. 69.7% of the dentists correctly answered how to apply rescue breathing in infants, while 1.3% correctly answered to the location of cardiac massage in infants and adults. 13.2% of the dentists answered the "ventilation rate", 27.6% of the "rate of chest compression", 64.5% of the "depth of chest compression",

Table 1. Demographic characteristics of the participants

		Number, n	Percentage, %
Gender	Female	86	56.6
	Male	66	43.4
Age groups	<25	12	7.9
	25-34	76	50
	35-44	56	36.8
	45 and over	8	5.3
Marital status	Married	104	68.4
	Single	48	31.6
Working experience	1-5 years	64	42.1
	6-10 years	28	18.4
	11-15 years	36	23.7
	15-20 years	20	13.2
	20 years and more	4	2.6
Working places	Ministry of Health	66	43.4
	University	32	21.1
	Private sector	54	35.5

n: Number

42.1% of the "compression/ventilation ratio" was answered correctly. The number of people who know the drug and dose that should be applied to the patient during a cardiac arrest was 51.3%.

Figure 1 showed the percentage distribution of the participant scores. Accordingly, there were no participants who answered all questions correctly (10 points). The percentage of participants who got 7 and 8 points was only 5.3%. 26.3% of the participants answered half of the questions correctly. While 10.5% of the participants could answer only one question, 7.9% had been answered two questions. While the knowledge level of 44.7% of dentists about CPR was "sufficient (5-10 point)", 55.3% of the dentists were found to be "insufficient (0-4 point)" in this study.

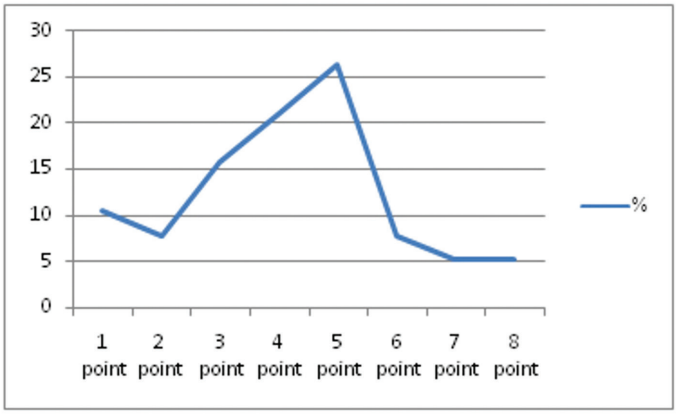

Figure 1. Distribution of participant points (%)

Dentists' skills and experiences related to CPR were given Table 3. While 1.3% of dentists stated that they had encountered cardiac arrest, 34.2% stated that they could evaluate the cardiac arrest case. In an emergency, 30.3% of dentists stated that they could place an oro-pharyngeal airway, 35.5% could ventilate with a balloon-mask and 25% could perform vascular access and IV drug implementation. Half of the dentists stated that they had applied CPR on mannequins, 5.3% had applied CPR on the patient. 10.5% of dentists knew how to use an automatic external defibrillator. 73.7% of dentists previously had received CPR training, only 6.6% of them considered themselves adequate for CPR administration. 11.8% of the dentist was knowledgeable about the 2015 CPR guideline.

88.2% of dentists stated that they should know CPR as a dentist. 90.8% of dentists stated to want to get CPR training. 86.8% of the dentists stated that they could face legal problems due to CPR application as a dentist. 42.1% of the dentists stated that they could avoid applying CPR because of the possibility of legal problems. In the study, whether there was a difference in theoretical knowledge level between those who received CPR training and those who did not were compared with Pearson's chi-square test t-test. While the average scores of those who stated that they had received CPR training before were 4.16, the average scores of those who did not receive CPR were found to be 4.15. Accordingly, there was no significant difference between the two groups (p=1.98132).

Discussion

This is the first study in Turkey to assess the knowledge and experience of CPR among dentists, to the best of our knowledge. In this study, it can be said that 44% of the participants had a theoretical level of knowledge because they answered more than half of the questions. Similar results (46%, 37%, 36%) were found by Gonzaga et al. (10) Kavari and Choedri (11) and Alkandari et al. (12) for Brazilian, Iranian, and Kuwaiti dentists respectively. Jamalpour et al. (13) reported that nearly 39% of Iranian dentists were not able to answer any question correctly and nearly only 4% were able to perform CPR properly on the manikin. In the present study, while 10.5% of the participants could answer only one question, 7.9% could answer two questions. These findings of the study are in line with other studies (13-15) which concluded that CPR's knowledge and experience need improvement and updating.

Only two out of 152 (1.3%) dentists in this study reported that they had encountered cardiac arrest. Gonzaga et al. (10) found that 12% of Brazilian dentists referred to the occurrence of CPA outside the dental office, but only 3% reported to having witnessed CPA in their dental office. Alkandari et al. (12) 4.3% of Kuwaiti dentists reported having encountered cardiac arrest in dental practices. In a study to evaluate the knowledge of CPR among dentists in Iran, it was reported that though 4% stated that they had witnessed CPA in their clinics, none of them had received any practical training (11).

In this study, while 73.7 % of dentists previously had received CPR training, only 6.6% of them considered themselves adequate for CPR administration. However, the knowledge of those who received CPR training was found similar to those who did not. This indicates that CPR training information needs to be updated. Sopka et al. (16) and Laurent et al. (17) stated that near to 50% of dentists believed they could perform CPR. Gonzaga et al. (10) reported that 54% of dentists in Brazil believed they were capable of performing CPR, but although 86% had received CPR education, most had not received practical resuscitation training. Chapman (14) reported that almost two-thirds of Australian dentists claimed that they were skilled in performing CPR, while less than two-thirds had undergone practical training in CPR since graduation. Singh et al. (15) demonstrated that although 75.9% of Indian dentists had received CPR knowledge, 56.0% had the correct concept of skilled and only 12% had practical

Table 2. Distribution of participants' answers to questions regarding CPR			
Questions	**Answers**	**Number, n**	**Percentage, %**
1. What maneuver is provided by airway patency in patients without a cervical injury?	Jaw forward push-mouth opening movement	32	21.1
	Turn to head sideways movement	12	7.9
	Head back-jaw tip up movement	**108**	**71.1***
2. What maneuver is provided by airway patency in patients with cervical injury?	Head tilting backwards	4	2.6
	Jaw thrust	**38**	**25.0***
	Tilting the head backward, lifting the chin up	16	10.5
	Immobilization	78	51.3
	I am not sure	16	10.5
3. How long should the breathing and pulse be checked?	**10 seconds**	**76**	**50***
	20 seconds	34	22.4
	30 seconds	36	23.7
	40 seconds	4	2.6
	I am not sure	2	1.3
4. How is rescue breath given to infants?	Closing the nose and mouth to mouth	14	9.2
	Mouth and nose at the same time	**106**	**69.7***
	Mouth to nose	22	14.5
	Mouth to mouth	2	1.3
	I am not sure	8	5.3
5. Where is the place of application of chest compression in adults and infants in CPR?	The lower part of the sternum 1/3 in adults The width of a finger under the nipple in infants	74	48.7
	The lower part of the sternum 1/3 in adults Inter-breast line in infants	72	47.4
	The lower part of the sternum 1/2 in adults **The width of a finger under the nipple in infants**	**2**	**1.3***
	I am not sure	4	2.6
6. What should be the ventilation rate in adult CPR?	1 breath every 3 seconds (20 breaths/min)	28	18.4
	1 breath every 4 seconds (15 breaths/min)	66	43.4
	1 breath every 6 seconds (10 breaths/min)	**20**	**13.2***
	1 breath every 10 seconds (6 breaths/min)	20	13.2
	I am not sure	18	11.8
7. What should be the compression/ ventilation ratio in adult CPR?	5/1	14	9.2
	15/2	58	38.2
	30/2	**64**	**42.1***
	I am not sure	16	10.5
8. What should be the rate of chest compression in adult CPR?	50-70/min	42	27.6
	70-90/min	28	18.4
	80-100/min	28	18.4
	100-120/min	**42**	**27.6***
	I am not sure	12	7.9
9. What should be the depth of chest compression in adult CPR?	3 cm	38	25.0
	5 cm	98	64.5*
	7 cm	4	2.6
	I am not sure	12	7.9
10. What medication and dose could be administered to the patient during cardiac arrest?	Atropine, 1 mg IV every 3-5 minutes	6	3.9
	Adrenaline, 1/2 mg IV every 3-5 minutes	42	27.6
	Adrenaline, 1 mg IV every 3-5 minutes	78	51.3*
	Atropine, 1/2 mg IV every 3-5 minutes	12	7.9
	I am not sure	14	9.2
Total		**152**	**100**

CPR: Cardiopulmonary resuscitation, n: Number
*: Correct answers

Table 3. Knowledge, skill, and experiences of dentists related to CPR		
	Yes (n, %)	**No (n, %)**
1. Have you ever encountered a cardiac arrest case?	2 (1.3)	150 (98.7)
2. Do you know how to evaluate a person with cardiac arrest?	52 (34.2)	96 (63.2)
3. Have you ever been performed CPR on the patient?	8 (5.3)	144 (94.7)
4. In the event of an emergency, please indicate whether you can do or not the following if necessary		
Can you place an oropharyngeal airway?	46 (30.3)	102 (67.1)
Can you provide ventilation with a balloon-mask technique?	54 (35.5)	98 (64.5)
Can you perform vascular access and IV drug implementation?	38 (25)	110 (72.4)
5. Have you ever been received cardio-pulmonary resuscitation (CPR) training?	112 (73.7)	40 (26.3)
6. Have you ever been performed CPR on mannequins?	76 (50)	76 (50)
7. Do you know the use of an automatic external defibrillator?	16 (10.5)	116 (89.5)
8. Do you consider yourself sufficient to apply CPR?	10 (6.6)	142 (93.4)
9. Are you aware of the 2015 CPR Guideline?	18 (11.8)	134 (88.2)
10. Do you think you should know CPR as a dentist?	134 (88.2)	8 (5.3)
11. Would you like to receive training on CPR?	138 (90.8)	10 (6.6)
12. Do you think that as a dentist, you may have legal problems due to your performed CPR?	132 (86.8)	20 (13.2)
13. If yes, would you refrain from performing CPR because of the possibility of a legal problem?	64 (42.1)	80 (52.6)
CPR: Cardiopulmonary resuscitation, n: Number		

CPR training. Arsati et al. (18) reported that dentists are not fully prepared to manage medical emergencies and have inadequate training in CPR. Greenwood et al. (19) reported that 81% of participant dentists believed that they were able to manage CPA. However, participants had only one year of experience in dentistry and also they had not met any cardiac arrest during that year. Differences in the findings of the studies may be related to the different methods of research. It appears that practical application is more correct than a self-assessment questionnaire for assesment of CPR skills.

In the present study, while 88.2% of dentists stated that they should know CPR as a dentist, 90.8% of them stated that want to get CPR training. To ensure better and safer healthcare, dentists, as a health professional, should be able to recognize CPA and must be trained to perform in high- quality CPR. In some countries, there are many opportunities for dental students to learn medical emergencies; for example; in the United States of America, the teaching of medical emergencies is compulsory in more than 95% of dental schools and 60 hours are dedicated to training medical emergencies (20). In Iran, while before 2013, only 4 hours had been dedicated to the instruction of medical emergencies without any practical training. But now, 26 hours are dedicated to both theoretical and practical medical emergency training for dental students (13). In Turkey, emergency and first aid courses are taught to dental students in the last year of dental education in only 1 hour per week for one semester. However, theoretical courses are not enough in medical emergency training. So, this course should cover both theoretical and practical training. Recently, some universities in Turkey took this lesson to 1st grade curriculum. It can be said that it is more appropriate to give this course in the 1st grade. However, it should be stressed that for improving the CPR knowledge and skills of dentists, it is necessary for dentists to participate in medical emergency courses regularly after graduation.

Study Limitations

This research has some limitations. The small sample size may limit the generalization of the findings. In addition, determining only the level of theoretical knowledge without hands-on training is insufficient in evaluating the CPR skill.

Conclusion

Study findings reveal that there is insufficient knowledge of dentists on CPR in Turkey. Therefore, CPR training should be given to dentists in the country regularly. Dentists should be qualified in the use of laryngoscope, Ambu mask, oropharyngeal tube, and medications such as adrenaline. To increase the dentists' knowledge and skills to recognition and management of medical emergencies, there should be adequate training hours for both theoretical and practical courses in the undergraduate dental curriculum. We propose that dentists should update their CPR

knowledge and skills periodically, at least every 2 years, and preferably more frequently.

Ethics

Ethics Committee Approval: This study was approved by the Ethical Committee of the Faculty of Medicine, Afyonkarahisar Health Sciences University (no: 2019/10-316, date: 04.10.2019), and was performed in full compliance with the Helsinki Declaration of the World Medical Association.

Informed Consent: Written informed consent was obtained from all participants.

Peer-review: Externally peer-reviewed.

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

References

1. Futterman LG, Lemberg L. Cardiopulmonary resuscitation review: critical role of chest compressions. Am J Crit Care. 2005;14:81-4.
2. Cummins RO, Chamberlain DA, Abramson NS, Allen M, Baskett PJ, Becker L, et al. Recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest: the utstein style: a statement for health professionals from a task force of the American Heart Association, the European Resuscitation Council, and Heart and Stroke Foundation of Canada, and the Australian Resuscitation Council. Circulation. 1991;84:960-75.
3. Jacobs I, Nadkarni V, Bahr J, Berg RA, Billi JE, Bossaert L, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: Update and simplification of the Utstein templates for resuscitation registries. A statement for healthcare professionals from a task force of the International Liaison Committee on Resuscitation (American Heart Association, European Resuscitation Council, Australian Resuscitation Council, New Zealand Resuscitation Council. Circulation. 2004;110:3385-97.
4. Cardiopulmonary resuscitation (CPR): First Aid Steps [Internet]. [cited 2019 December 22]. https://www.emedicinehealth.com/cardiopulmonary_resuscitation_cpr/article_em.htm
5. Scapigliati A, Ristagno G, Cavaliere F. The best timing for defibrillation in shockable cardiac arrest. Minerva Anestesiol. 2013;79:92-101.
6. Fredriksson M, Herlitz J, Nichol G. Variation in outcome in studies of out-of-hospital cardiac arrest: a review of studies conforming to the Utstein guidelines. Am J Emerg Med. 2003;21:276-81.
7. Handley AJ, Koster R, Monsieurs K, Perkins GD, Davies S, Bossaert L. European Resuscitation Council Guidelines for Resuscitation 2005: Section 2. Adult basic life support and use of automated external defibrillators. Resuscitation. 2010;81:1277-92.
8. Anders PL, Comeau RL, Hatton M, Neiders ME. The nature and frequency of medical emergencies among patients in a dental school setting. J Dent Educ. 2010;74:392-6.
9. Hunter PL. Cardiac arrest in the dental surgery. Br Dent J. 1991;170:284.
10. Gonzaga HF de S, Buso L, Jorge MA, Gonzaga LH de S, Chaves MD, Almeida OP de. Evaluation of knowledge and experience of dentists of São Paulo State, Brazil about cardiopulmonary resuscitation. Braz Dent J. 2003;14:220-2.
11. Kavari SH, Chohedri AH. Cardiopulmonary resuscitation: Knowledge and personal experience in Iranian dentists. Pak J Med Sci. 2007;23:296-7.
12. Alkandari SA, Alyahya L, Abdulwahab M. Cardiopulmonary resuscitation knowledge and attitude among general dentists in Kuwait. World J Emerg Med. 2017;8:19-24.
13. Jamalpour M, Asadi H, Zarei K. Basic life support knowledge and skills of Iranian general dental practitioners to perform cardiopulmonary resuscitation. Niger Med J. 2015;56:148-52.
14. Chapman PJ. Medical emergencies in dental practice and choice of emergency drugs and equipment: A survey of Australian dentists. Aust Dent J. 1997;42:103-8.
15. Singh K, Bhat N, Ramesh N, Sharda A, Asawa K, Agrawal A, et al. Cardiopulmonary resuscitation: Knowledge and personal experience among dentists in Udaipur, India. J Dent Sci. 2011;6:72-5.
16. Sopka S, Biermann H, Druener S, Skorning M, Knops A, Fitzner C, et al. Practical skills training influences knowledge and attitude of dental students towards emergency medical care. Eur J Dent Educ. 2012;16:179-86.
17. Laurent F, Augustin P, Nabet C, Ackers S, Zamaroczy D, Maman L. Managing a cardiac arrest: Evaluation of final-year predoctoral dental students. J Dent Educ. 2009;73:211-7.
18. Arsati F, Montalli V, Flório FM, Ramacciato J, Cunha F, Cecanho R, et al. Brazilian dentists' attitudes about medical emergencies during dental treatment. J Dent Educ. 2010;74:661-6
19. Greenwood M, Beattie A, Green R, Durham J. Aspects of training in clinical medical sciences in dentistry (human disease): Recent graduates' perspectives from a UK dental school. Eur J Dent Educ. 2013;17:114-21.
20. Clark MS, Wall BE, Tholström TC, Christensen EH, Payne BC. A twenty-year follow-up survey of medical emergency education in U.S. dental schools. J Dent Educ. 2006;70:1316-9.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
DOI: 10.4274/eajem.galenos.2019.46362
Original Article
Eurasian J Emerg Med. 2020;19(4): 232-5

Vertebral Fracture Detection Differences of Axial Section Computed Tomography Images and Coronal Sagittal Reformat Images in Trauma Cases

Figen Tunalı Türkdoğan[1], Selçuk Eren Çanakçı[2], Özüm Tunçyürek[1], Ersen Ertekin[1]

[1]Department of Radiology, Aydın Adnan Menderes University Faculty of Medicine, Aydın, Turkey
[2]Clinic of Emergency Medicine, Tavşanlı Doç. Dr. Mustafa Kalemli State Hospital, Kütahya, Turkey

Abstract

Aim: To investigate the contribution of multiplanar sections to vertebral fracture detection by examining the multislice computed tomography (CT) images of patients who were referred to our emergency department (ED) with trauma.

Materials and Methods: We scanned 896 patients who were referred to our ED between 01.06.2016 and 01.06.2018 and whose multislice CTs were taken with a vertebral fracture pre-diagnosis made by the ED physician. The differences between axial and coronal sagittal reformat images in the detection of vertebral fractures were compared in 78 cases that were found with a fracture in their tomographies.

Results: The average age of the 78 cases was 55.93±23.23 years. In total, 145 fractures were detected in the 78 cases. Twenty-four fractures were detected in 12 cases in the cervical area, 67 were detected in 36 cases in the thoracic area, and 54 fractures were detected in 30 cases in the lumbar area. While there were no significant differences between axial and coronal sagittal reformat imaging techniques in the differentiation of cervical fractures, differences were found between the techniques for thoracic and lumbar fractures ($p=0.636$, $p<0.001$, $p=0.001$, respectively). When the fracture detection rates of the axial and coronal sagittal imaging techniques were assessed in terms of the anatomic region, there were significant differences in corpus assessment ($p<0.001$), while there were no significant differences in transverse process and lamina fractures ($p=0.127$, $p=0.083$).

Conclusion: In post-trauma physical examination, coronal sagittal reformat imaging is more sensitive when compared with axial imaging in patients having pain in the thoracic and lumbar region, and we believe that it will useful to physicians in differentiating especially corpus fractures.

Keywords: Trauma, coronal sagittal reformat imaging, axial imaging, vertebral fracture

Introduction

Helical computed tomography (CT) has a significant place in the comparison of bone lesions due to having high resolution. Two and three dimensional reformat images obtained with multislice CT (MSCT), which came out with a two-sliced scanner in 1992 for the first time, found a place in the distinction between muscle and skeletal system (1).

The use of MSCT in trauma, which is a cause of morbidity and mortality in middle and advanced ages, has been increasing gradually (1,2). The purpose of CT use is to be certain of or to exclude a fracture that is suspicious in direct X-ray or to guide the treatment by determining the extent of an established fracture. In addition, it shows the bone anatomy in anatomically complex structures such as pelvis, scapula and spine where direct radiography is limited in showing fractures (1).

The combination of three-dimensional (3D) reconstruction formed by using volume rendering (VR) technique and helical CT enables a more detailed analysis of musculoskeletal system and proves to be valuable in the diagnosis and treatment planning of

Corresponding Author: Asst. Prof. Selçuk Eren Çanakçı, M.D., Clinic of Emergency Medicine, Tavşanlı Doç. Dr. Mustafa Kalemli State Hospital, Kütahya, Turkey
E-mail: selcuk.eren.canakci@gmail.com **ORCID:** orcid.org/0000-0002-2795-0714

Received: 02.06.2019
Accepted: 07.08.2019

Cite this article as: Tunalı Türkdoğan F, Çanakçı SE, Tunçyürek Ö, Ertekin E. Vertebral Fracture Detection Differences of Axial Section Computed Tomography Images and Coronal Sagittal Reformat Images in Trauma Cases. Eurasian J Emerg Med. 2020;19(4):232-5

a large number of pathologies, especially trauma. This method changes clinical approach in a significant number of cases due to findings that can be assessed only with 3D images or that can be demonstrated better with these images and it is useful in transferring complex spatial information to clinicians correctly and sufficiently (1,3-5). The aim of this study was to investigate the contribution of multiplanar reformat (MPR) sections to the determination of vertebral fracture by reviewing MSCT of the patients presenting with trauma.

Materials and Methods

Permission was taken from local ethical committee (Adnan Menderes University, 53046469-050,04,04) for this study. Eight hundred and ninety-six cases who referred to the emergency service with trauma between 01.06.2016 and 01.06.2018 and for whom the emergency service physician requested MSCT were scanned. Of these patients, 148 patients whose thoracic CT was performed were included in the study. In all patients, CT scans were performed on a 150-digit Toshiba Acquisition CT device with a 120-KV, automatic mAs selection (115-195 mAs). The field of vision was scanned 2 cm below the diaphragm from the thorax entrance, completely including the thorax. The section thickness was determined as 3 mm in axial images and the pitch value was determined as 0.75 mm. From the obtained raw data, sagittal and coronal reformat images of 5 mm thickness were created. CT images for the fracture scan were evaluated in the bone window (W/L=2500/500). To avoid bias in the CT assessment, MPR images and axial sections were viewed at different times, unaware of the results, through high-resolution imaging screens. By using the data, vertebral fracture detection differences of axial section CT images and coronal sagittal reformat images were compared.

Results

Seventy-eight cases who were admitted to the emergency service due to trauma and who were found to have a fracture in their CT were included in the study. Average age of 78 cases was found as 55.93±23.23 years. Thirty-six (46.2%) of the trauma cases were female. A total of 145 fractures were found in 78 cases. Of these 145 fractures, 24 were detected in 12 cases and in cervical area, 67 were detected in 36 cases and in thoracic area and 54 fractures were detected in 30 cases and in lumbar area (Table 1). When the average ages of the cases were analysed in terms of the area where fracture was found, average age of the cases who were found to have fracture in the cervical area was 45.81±19.44 years; average age of the cases who were found to have fracture in the thoracic area was 58.69±20.62 years; average age of the cases who were found to have fracture in the lumbar area was 58.23±24.02 years and there were no statistical differences between them (p=0.074).

When the areas where fracture was detected and the genders of the cases were examined, two (16.7%) of the cases with a fracture in the cervical area were female; while 16 (44.4%) of the cases with a fracture in the thoracic area were female and 18 (60.0%) of the cases with a fracture in the lumbar area were female and significant difference was found only in fractures in cervical and lumbar areas in terms gender (p=0.006).

When the fracture detection rates of axial and coronal sagittal reformat imaging techniques were assessed in terms of fracture area, no significant difference was found between axial and coronal sagittal reformat imaging techniques in terms of the differentiation of cervical fractures (p=0.636); however, the fact that the cases who were detected as no fracture were different shows that both methods can be useful in fracture exclusion in these patient groups (Figure 1 and 2). Significant difference was found between axial and coronal sagittal reformat imaging techniques in the distinction of thoracic and lumbar fractions (Table 2).

When the fracture detection rates of axial and coronal sagittal reformat imaging techniques were assessed in terms of anatomic region, while all of the 117 corpus fractures were seen in coronal sagittal reformat, 58 were seen in axial (p<0.001). When spinous process fractures were assessed, while all of the fractures were seen with both methods, in terms of transverse process fractures, 14 of the 15 fractures were seen in axial, while 11 were seen in coronal sagittal reformat and the difference between was not found to be statistically significant (Table 3).

Table 1. Distribution of fractures and cases according to the region and anatomy of the vertebra

		Cervical (12 cases, 24 fractures)	Thoracic (36 cases, 67 fractures)	Lumbar (30 cases, 54 fractures)
Anatomic region	Corpus (n=117)	13 (11.1%)	60 (51.3%)	44 (37.6%)
	Spinous process (n=7)	5 (71.4%)	2 (28.6%)	0
	Transverse process (n=15)	1 (6.7%)	5 (33.3%)	9 (60.0%)
	Lamina (n=6)	5 (83.3%)	0	1 (16.7%)

n: Number

Eurasian J Emerg Med.
2020;19(4): 232-5

Discussion

In post-trauma physical examination, coronal sagittal reformat imaging is more sensitive when compared with axial imaging in patients who have tenderness in thoracic and lumbar region and we believe that it will be of use to the physician by distinguishing especially corpus fractures.

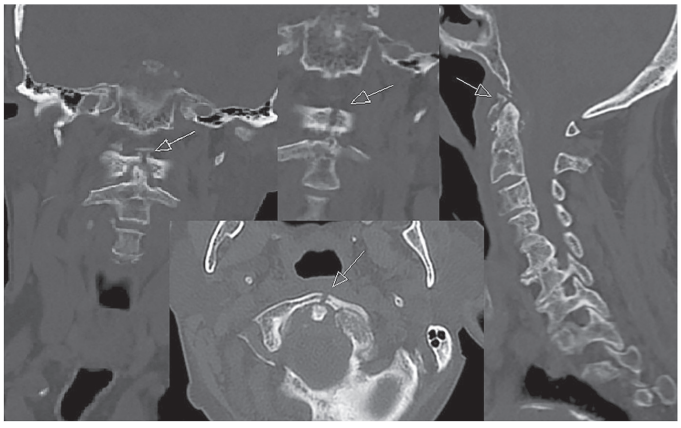

Figure 1. Positive fracture with axial imaging but reformat imaging changes decision

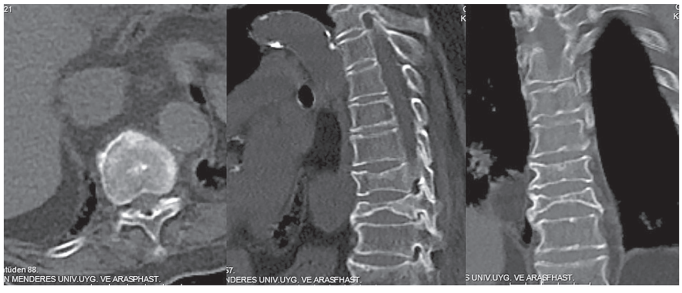

Figure 2. Positive fracture with reformat imaging but axial imaging changes decision

In a study conducted in a centre where MPR and VR 3D images are used routinely in CT examinations in musculoskeletal system trauma, treatment approach was reported to have changed due to findings in MPR or 3D VR images in almost 30% of patients with pelvic fracture on axial CT images. It has been reported that the reason for this is the presentation of a more severe injury than clinically predicted in MPR or 3D VR images or monitored in conventional axial images (1). In their study, Pate et al. (6) researched the advantages of 3D CT in 202 patients with musculoskeletal system pathology, especially in fractures of the skeletal areas with complex anatomy, articular diseases of the hip and spinal stenosis. They reported that 3D CT does not give additional information to what is obtained with standard radiographic techniques; however, it shows the existing standard data with a different method and the images obtained are more easily understood by clinicians and they are very useful in especially preoperative assessment in most of the cases. In our study, no significant differences were found between axial and coronal sagittal reformat imaging techniques in the differentiation of cervical fractures; however, the fact that the cases who were detected as no fracture were different shows that both methods can be useful in fracture exclusion in these patient groups. Wicky et al. (7) assessed the diagnostic efficacy of direct graphy and 3D helical CT in 42 patients with tibial fracture and the accuracy of these two techniques in planning surgical approach. In the assessment, direct graphy (AP, lateral and both oblique) and 3D images were classified and surgical plan was changed according to the results found. As a conclusion, it was reported that helical CT reconstructions demonstrated tibial plateau fractures better and more correctly and provided more correct surgical planning. However, there are also studies which

Table 2. Fracture detection rates of axial and reformat imaging techniques by fracture areas

	Axial		Coronal sagittal reformat		p value
	Positive	Negative	Positive	Negative	
Cervical (n=24)	21 (87.5%)	3 (12.5%)	22 (91.7%)	2 (8.3%)	0.636
Thoracic (n=67)	25 (37.3%)	42 (62.7%)	66 (98.5%)	1 (1.5%)	<0.001
Lumbar (n=54)	39 (72.2%)	15 (27.8%)	51 (94.4%)	3 (5.6%)	0.001
Total (n=145)	85	60	139	6	-

n: Number

Table 3. Fracture detection rates of axial and reformat imaging techniques by anatomic region

		Axial	Coronal sagittal reformat	p value
Anatomic region	Corpus (n=117)	58 (68.2%)	117 (100%)	<0.001
	Spinous process (n=7)	7 (100%)	7 (100%)	0.100
	Transverse process (n=15)	14 (93.3%)	11 (73.3%)	0.127
	Lamina (n=6)	6 (100%)	4 (66.6%)	0.083

n: Number

show that in tibial plateau fractures, routine CT imaging does not have a contribution to direct graph in classification and treatment plan (8). In their study, Uzun et al. (9) reported that in fractures of the knee region, 3D imaging did not have a contribution to axial CT in terms of the presence of the 3D imaging, articular elongation and the presence of bone fragment; however, 3D VR images were required in the assessment of compression amount in cases which had compression fracture. Deplacement degrees of fragments which can be seen with axial section were assessed better with MPR and 3B VR images.

It has been shown that when assessment in which 2D imaging and 2D and 3D assessment are made together in distal humerus fractures, interobserver compliance increases when 3D evaluation is added (10).

Proximal humerus fracture imaging is primarily conducted with direct graphy. Generally direct graphy is enough in classification and treatment plan conducted by using Neer Classification of two-piece proximal humerus fractures. However, additional information is frequently required in three and four pieces fractures in terms of surgical treatment.

Preoperative CT use with 3D reconstruction has been reported to be valuable in complex fractures (11). In addition, 2D and 3D reconstructions and CT scans are recommended for suspicious wrist traumas where direct radiographic findings are normal (12).

Conclusion

In conclusion, in the evaluation of trauma patients, coronal sagittal reformat imaging is more sensitive when compared with axial imaging in patients who have tenderness in thoracic and lumbar region and we believe that it will be of use to the physician by distinguishing corpus fractures significantly, especially those which will change the treatment regimen.

Ethics

Ethics Committee Approval: Permission was taken from local ethical committee (Adnan Menderes University, 53046469-050,04,04) for this study.

Informed Consent: Informed consent was obtained from the patients.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: F.T.T., Concept: F.T.T., S.E.Ç., Design: F.T.T., S.E.Ç., E.E., Data Collection or Processing: F.T.T., S.E.Ç., Ö.T., E.E., Analysis or Interpretation: F.T.T. Ö.T., E.E., Literature Search: F.T.T., S.E.Ç., Ö.T., E.E., Writing: F.T.T. Ö.T., E.E.

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. Pretorius ES, Fishman EK. Volume-rendered three-dimensional spiral CT: musculoskeletal applications. Radiographics. 1999;19:1143-60.
2. Magid D, Fishman EK. Imaging of musculoskeletal trauma in three dimensions. Radiol Clin North Am. 1989;27:945-56.
3. Kuszyk BS, Ney DR, Fishman EK. The current state of the art in three-dimensional oncologic imaging: an overview. Int J Radiat Oncol Biol Phys. 1995;33:1029-39.
4. Pretorius ES, Fishman EK. Helical (spiral) CT of the musculoskeletal system. Radiol Clin North Am. 1995;33:949-79.
5. Pretorius ES, Scott WW Jr, Fishman EK. Acute trauma of shoulder: role of spiral CT imaging. Emerg Radiol. 1995;2:13-7.
6. Pate D, Resnick D, Andre M, Sartoris DJ, Kursunoglu S, Bielecki D, et al. Perspective: Three-dimensional imaging of the musculoskeletal system. Am J Roentgenol AJR. 1986;147:545-51.
7. Wicky S, Blaser PF, Blanc CH, Leyvraz PF, Schnyder P, Meuli RA. Comparison between standard radiography and spiral CT with 3D reconstruction in the evaluation, classification and management of tibial plateau fractures. Eur Radiol. 2000;10:1227-32.
8. te Stroet MAJ, Holla M, Biert J, van Kampen A. The value of a CT scan compared to plain radiographs for the classification and treatment plan in tibial plateau fractures. Emerg Radiol. 2011;18:279-83.
9. Uzun Ç, Atman E, Şahin G. Evaluation of Articular trauma with helical computed tomography: contribution of three-dimensional imaging. J Ankara Univ Fac Med. 2017;70:151-60.
10. Brouwer KM, Lindenhovius AL, Dyer GS, Zurakowski D, Mudgal CS, Ring D. Diagnostic accuracy of 2- and 3-dimensional imaging and modeling of distal humerus fractures. J Shoulder Elbow Surg. 2012;21:772-6.
11. Bahrs C, Rolauffs B, Südkamp NP, Schmal H, Eingartner C, Dietz K, Pereira PL, Weise K, Lingenfelter E, Helwig P. Indications for computed tomography (CT-) diagnostics in proximal humeral fractures: a comparative study of plain radiography and computed tomography. BMC Musculoskelet Disord. 2009;10:33.
12. You JS, Chung SP, Chung HS, Park IC, Lee HS, Kim SH. The usefulness of CT for patients with carpal bone fractures in the emergency department. Emerg Med J. 2007;24:248-50.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
DOI: 10.4274/eajem.galenos.2020.02259
Case Report
Eurasian J Emerg Med. 2020;19(4): 236-8

Thinking Reverse Robin Hood Syndrome in the Emergency Room: Case of a Male with Vertigo

Sadaf Sheikh[1], Umair Javed[2], Muhammad Akbar Baig[2]

[1]Department of Emergency Medicine, Sultan Qaboos University Hospital, Muscat, Oman
[2]Department of Internal Medicine, Aga Khan University Hospital, Karachi, Pakistan

Abstract

Reversed Robin Hood syndrome (RRHS) is described as the steal of arterial blood flow from ischemic to non-ischemic parts of the brain. It is one of the causes of early deterioration in patients with ischemic stroke. The case presented here led us to think about the relationship between RRHS and stroke risk. Flow steal with arterial occlusions is a well-known phenomenon. This phenomenon is named so due to its similarity with the phrase "rob the poor to feed the rich." However, more studies are needed to evaluate the concept of blood flow steal in real-time. A possible mechanism is the vasodilation of non-ischemic areas that steal the blood flow from the ischemic areas.

Keywords: Reversed Robin Hood syndrome, stroke, vertigo

Introduction

Early neurological deterioration (END) with alternatively known as early stroke progression or stroke in evolution is seen in 5-40% of patients with acute ischemic stroke. It is associated with increased risk of morbidity and mortality (1). It is mainly dealt with the hemodynamic impairment in particularly the vulnerable penumbral areas led to poor cerebral perfusion. The role of trans-cranial Doppler (TCD) to see the hemodynamics in real time is needed in limited cases. Alexandrov et al. (2) described the term RRHS related to decrease in middle cerebral artery flow velocities due to fatigued vasomotor reactivity distal to arterial occlusion led to flow steal directed towards non affected areas (1). Perfusion studies are standard of care as per stroke guidelines (2). Due to the rarity of this pathology, it is important for emergency physicians to have an awareness regarding the condition and its management.

Case Report

A previously healthy 47 years old Filipino male, shipyard worker by profession with past history of hypertension presented in emergency department with history of intermittent spells of black outs and vertigo for the past one month. It occurred initially while he was at work and denied presence of any neurological symptoms at rest. Later it occurred occasionally over the period of one month with no association with position and usually it lasted for a few seconds. There were no fever, chest pain, headache, tinnitus, excessive exposure to sunlight and nausea or vomiting. There were no associated auditory disturbances or tinnitus or any recent history of flu. Patient denied any previous or recent history of heart disease. Personal history revealed no history of smoking however the patient admitted occasional consumption of alcohol.

Initial physical examination revealed a middle-aged male patient lying comfortably in bed. Vitals were: blood pressure: 144/100 mmHg, pulse: 74/min, respiratory rate: 20 per minute and O_2 sats 100% on room air. On general physical examination, patient looked flushed with no jaundice, clubbing, koilonychia, palpable cervical, axillary and inguinal lymph node, or edema.

Modified Rankin score was 0. Postural drop was negative. Central nervous system examination revealed Glasgow Coma Scale of 15/15 and pupils were equally reactive to light bilaterally.

Corresponding Author: Sadaf Sheikh, M.D., Department of Accidents and Emergency, Sultan Qaboos University Hospital, Muscat, Oman
E-mail: sheikh.sadaf@gmail.com **ORCID:** orcid.org/0000-0001-7457-0012

Received: 26.12.2019
Accepted: 14.05.2020

Cite this article as: Sheikh S, Javed U, Baig MA. Thinking Reverse Robin Hood Syndrome in the Emergency Room: Case of a Male with Vertigo. Eurasian J Emerg Med. 2020;19(4):236-8.

Visual acuity was normal and no gross visual field abnormality was noticed on examination. Normal power and tone in upper limb and lower limb with bilaterally down-going plantars were noticed. Reflexes were unremarkable. Cerebellar signs were negative with no pronator drift or nystagmus. Initial lab work up showed in Table 1. Urine toxicology screen, lipid panel and HbA1C were unremarkable. Troponin times 2, echocardiogram and ultrasound neck were unremarkable.

Magnetic resonance imaging (MRI) of brain with angiogram revealed complete occlusion of left internal carotid artery (ICA) with loss of flow void in the right internal jugular vein with possibility of thrombus (Figure 1). However, it revealed no acute infarction, intracranial hemorrhage or mass effect. Additionally, it showed hyper-intense foci on T2/FLAIR in periventricular deep white matter suggestive of micro-vascular ischemic changes. Magnetic resonance venography was negative for cerebral venous sinus thrombosis and internal jugular vein thrombosis. He was prescribed enoxaparin 60 mg twice daily.

Table 1. Laboratory parameters	
Hemoglobin	25
Hematocrit	77
Mean corpuscular volume	96.6
White blood cells	7.6
Neutrophils	69.3
Lymphocytes	22.2
Platelets	205
Blood urea nitrogen	15
Creatinine	0.7
Sodium	133
Potassium	3.7
Chloride	105
Bicarbonate	20.5
Calcium	9.4
Magnesium	1.9

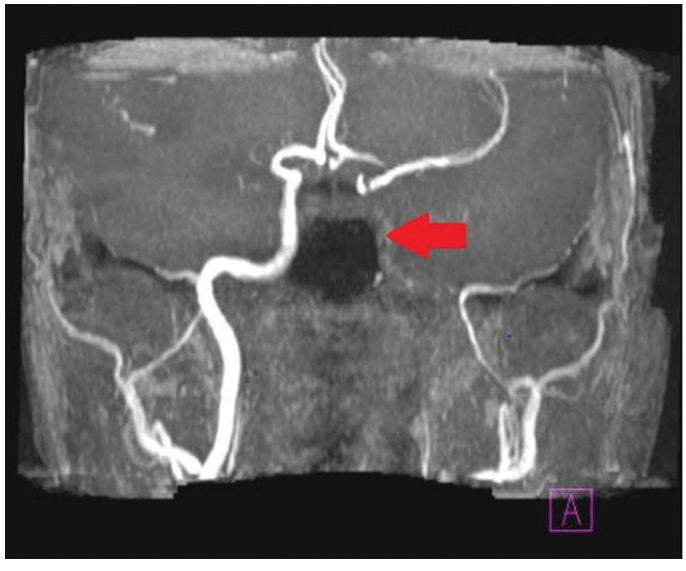

Figure 1. Occluded left carotid artery as seen in magnetic resonance imaging

Due to the personal issues, patient left without medical advice from our facility. He was counselled for symptoms recurrence with vertigo, aphasia, visual disturbances and stroke in particular. He was also advised for TCD and neurological follow up as soon as possible. It was advised to consider options like transluminal angioplasty with stenting of the intracranial ICA or to be kept on dual anti-platelet therapy. Later, he went lost to follow up.

Discussion

RRHS demonstrates exhausted vasodilatory response when blood vessels distal to proximal occlusion failed to further dilate in response to stimuli. There is a flow steal from ischemic to non-ischemic areas (1). RRHS coexist also in the absence of a collateral mechanism hence recurrence of impaired perfusion and stroke. Definite treatment is endovascular stenting with symptoms regression in few week-time. Fewer studies discussed the role of medical treatment versus stenting suggesting trans-luminal stenting effective and safe (1). Medical treatment includes calcium channel blockers, intra-arterial milrinone, anticoagulation and blood pressure management (2-4). Intra-arterial vasodilators are showing promise as a mainstay treatment option. Enhanced external counter pulsation therapy is the newest form of the therapy (4).

TCD and serial NIH stroke scale were used in ICA occlusion for RRHS. It is detected as transient vasodilatory stimuli induced velocity reductions in affected arteries. In case of confirmed steal, RRHS many suggest target population in stroke patients (2).

In conlusion, we describe a case of patient with vertigo and MRI brain showing complete occlusion of ICA and subsequent RRHS which might cause recurrent episodes of focal neurological deterioration in the same territories. Further validation of this relation is needed in association with TCD. However, more studies are needed to evaluate the concept of blood flow steal in real time.

Ethics

Informed Consent: The authors certify that they have obtained verbal patient consent forms. The patient understands that his name and initial will not be published and due efforts will be made to conceal their identity.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.S., U.J., M.A.B., Concept: S.S., U.J., M.A.B., Design: S.S., U.J., M.A.B., Data Collection or Processing: S.S., U.J., M.A.B., Analysis or Interpretation:S.S., U.J., M.A.B., Literature Search: S.S., U.J., M.A.B., Writing: S.S., U.J., M.A.B.,

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. Geng HH, Wang Q, Li B, Cui BB, Jin YP, Fu RL, et al. Early neurological deterioration during the acute phase as a predictor of long-term outcome after first-ever ischemic stroke. Medicine. 2017;96:e9068.
2. Alexandrov AV, Nguyen HT, Rubiera M, Alexandrov AW, Zhao L, Heliopoulos I, et al. Prevalence and risk factors associated with reversed Robin Hood syndrome in acute ischemic stroke. Stroke. 2009;40:2738-42.
3. Alexandrov AV, Sharma VK, Lao AY, Tsivgoulis G, Malkoff MD, Alexandrov AW. Reversed Robin Hood syndrome in acute ischemic stroke patients. Stroke. 2007;38:3045-8.
4. Zhao M, Guan L, Wang Y. The association of autonomic nervous system function with ischemic stroke, and treatment strategies. Front Neurol. 2019;10:1411.

EURASIAN JOURNAL OF EMERGENCY MEDICINE
Letter to the Editor
DOI: 10.4274/eajem.galenos.2020.45077
Eurasian J Emerg Med. 2020;19(4): 239-40

The COVID-19 Crises: Healthcare Resource Management Strategies

Muhammad Akbar Baig[1], Samia Kazmi[2]

[1]Department of Emergency Medicine, Aga Khan University Hospital, Karachi, Pakistan
[2]Department of Internal Medicine, The Indus Hospital, Karachi, Pakistan

Dear Editor,

The recent pandemic of coronavirus disease-19 (COVID-19) poses an immense challenge to the response capacity of healthcare systems worldwide especially of low and low to middle income nations. To ensure that COVID-19 patients can access healthcare facilities without compromising the safety of health care workers, we propose key action steps that may be undertaken in less resourceful settings in order to enable necessary and timely clinical operations.

With available data from China, 40% of COVID-19 patients had mild symptoms not requiring hospital admission, 40% developed moderate symptoms requiring hospital admission, 15% had severe disease requiring oxygen therapy and inpatient intervention and 5% were critical requiring invasive ventilation and intensive care unit admission (1). However, with the recent outbreak in other nations, there was a larger proportion of severe and critically ill COVID-19 patients indicating a dire need to rapidly increase surge capacity for preventing exhaustion of health care resources (2).

Presently, countries already are responding rapidly to the pandemic while ensuring modification to their approaches which are relevant to their local context. They most likely are or will have to deal with cases ranging from massive outbreaks to clusters developing sporadically through local/acquired infection (3).

We believe that in the event of surge, there is a need for multiple COVID-19 treatment areas. Two essential treatment areas will always remain to be hospitals that will serve as dedicated COVID-19 units (C-19U) consisting of triage and inpatient (ward and intensive care unit) service and the primary health centers which will serve as COVID-19 Satellite (C-19S) zones consisting of triage and temporary treatment rooms. Both areas will be connected via a robust referral system along with emergency medical services for transport of moderate to critically ill cases from C-19S to C-19U if required (4).

We suggest the following grid for ease of understanding which will help us divide COVID-19 cases into all possible presentations along with disposition strategies for each.

	COVID-19 positive	COVID-19 suspected
Stable	Stable and confirmed (A)	Stable and suspected (B)
Unstable	Unstable and confirmed (C)	Unstable and suspected (D)

On the basis of above, the cases can be designated as a "cold" COVID-19 patient (not requiring admission) and a "hot" COVID-19 patient (requiring management) as discussed in following detail below;

Cold Covıd-19	Hot Covıd-19
A = No admission needed. Offer symptomatic therapy with and counsel for home quarantine measures	**C** = Admission for COVID-19 testing and management
B = No admission needed. Advise COVID-19 testing, offer symptomatic therapy and counsel for home quarantine measures	**D** = Admission for COVID-19 testing and management

We advise that all relevant stakeholders must continue to ensure basic safety of health care staff by providing personal protective gear and biomedical equipment (oxygen, ventilators etc.) including contingency plans for shortages in supplies.

Corresponding Author: Muhammad Akbar Baig, M.D., Department of Emergency Medicine, Aga Khan University Hospital, Karachi, Pakistan
E-mail: dr_akbar2007@hotmail.com **ORCID:** orcid.org/0000-0002-2830-9099

Received: 23.03.2020
Accepted: 25.06.2020

Cite this article as: Baig MA, Kazmi S. The COVID-19 Crises: Healthcare Resource Management Strategies. Eurasian J Emerg Med. 2020;19(4):239-40

There should be adequate laboratory facilities with defined testing strategies in the event of a surge. Strict policies should be enforced to restrict visitor entry in designated treatment zones and public movement in order to prevent community spread. Debriefing measures should be performed frequently in order to highlight and implement modifications as per perceived experiences (5).

Keywords: COVID-19, SARS CoV-2, Novel corona virus, emergency, crises

Ethics

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: M.A.B., S.K., Design: M.A.B., S.K., Data Collection or Processing: M.A.B., S.K., Analysis or Interpretation: M.A.B., S.K., Literature Search: M.A.B., S.K., Writing: M.A.B., S.K.

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. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. JAMA. 2020;323:1239-42.
2. Hasan Z, Narasimhan M. Preparing for the COVID-19 pandemic: our experience in New York. Chest. 2020;157:1420-2.
3. World Health Organization. Critical preparedness, readiness and response actions for COVID-19 2020 (updated 23 March 2020 cited 2020 16 June). Available from: https://www.who.int/publications-detail/critical-preparedness-readiness-and-response-actions-for-covid-19
4. Norton I, Schreeb Jv, Aitken P, Herard P, Lajolo C. Classification and minimum standards for foreign medical teams in sudden onset disasters: World Health Organization; 2013 (cited 2020 16 June). Available from: https://www.who.int/csr/resources/publications/ebola/foreign-medical-teams/en/
5. World Health Organization. Operational considerations for case management of. COVID-19 in health facility and community 2020 (updated 19 March 2020; cited 2020 16 June). Available from: https://apps.who.int/iris/bitstream/handle/10665/331492/WHO-2019-nCoV-HCF_operations-2020.1-eng.pdf

2020 Referee Index

2020 Author Index

2020 Author Index

2020 Subject Index

2020 Subject Index