

⇒ Research Article



Factors Affecting Length of Stay in Patients Referred to Emergency Department in Bandar Abbas, Iran

Seyed Ashkan Tabibzadeh Dezfuli¹, Hossein Parvizi², Marjan Raji³, Reza Yazdani^{1*}¹Associate Professor of Emergency Medicine, Faculty of Medicine, Hormozgan University of Medical Science, Bandar Abbas, Iran²General Practitioners, Hormozgan University of Medical Science, Bandar Abbas, Iran³Obstetrics & Gynecology Resident PGY3, Hormozgan University of Medical Science, Bandar Abbas, Iran**Abstract**

Background: The increase in demand for emergency services causes overcrowding in emergency departments. Length of stay in emergency departments also influences overcrowding in emergency departments and is a key factor for monitoring the performance in emergency departments. This study investigated the factors affecting length of stay in patients referred to emergency department in Bandar Abbas, Iran.

Methods: This retrospective cross-sectional study was conducted from December 2018 and February 2019 by investigating 234 eligible patients referred to Emergency Department of Shahid Mohammadi. Demographic characteristics were also recorded, which included gender, age, type of disease, triage level, the time for entry to emergency specialist visit, specialist visit to order time, entry to imaging/lab assay, entry to other specialist consultants, and time for entry to final decision.

Results: The results did not indicate any significant difference in both genders and all age groups ($P > 0.05$), but entry time to lab/imaging assays was significantly lower in patients under 40 years old ($P = 0.001$). Moreover, specialist visit to order time ($P = 0.001$), entry to lab/imaging assays ($P = 0.003$), and entry to final decision time ($P = 0.013$) were significantly shorter in the patients with cardiac diseases. Furthermore, entry to specialist visit time ($P = 0.001$), entry to lab/imaging assays time ($P = 0.0212$), and entry to final decision time ($P = 0.004$) were significantly lower in the patients with lower levels of triage.

Conclusions: Triage levels are contributing factors for lengths of stay in emergency department, and these factors can be used for decreasing emergency department lengths of stay.

Keywords: Lengths of stay, Emergency department, Triage, Order time

***Correspondence to**

Reza Yazdani,

Email: ryazdani@hums.ac.ir



Received November 15, 2020, Accepted: January 31, 2021, Published Online: October 10, 2022

Background

The increase in demand for emergency services causes overcrowding in emergency departments in America, Europe, and Asia (1). The overcrowding in emergency departments has been a challenge all over the world (2) and has been investigated by the Institute of Medicine as a public health crisis (3). Overcrowding decreases the efficient capacity for the management and treatment of the patients referred to emergency departments (4). Previous studies reported that overcrowding, prolonged waiting times, and protracted lengths of stay increase the proportion of patients who leave without being examined by a physician (5, 6). Understanding the factors contributing to the emergency department process times and patient care delays is essential for improving the patient care efficiency of emergency departments. Length of stay in emergency departments influences overcrowding in emergency departments and is a key factor for monitoring the performance in emergency departments (7). It was reported that length of stay in emergency departments was related to the rates of

hospital admission, 10-day mortality, and dissatisfaction (8). Patients who spent more than 4 hours in emergency departments exhibited lower satisfaction compared with those who spent less time (9). A study investigated the direct factor affecting emergency department length of stay known as "access block", which refers to the situation in which patients who need an emergency hospital admission remain more than 8 hours in the emergency department due to a lack of access to appropriate hospital inpatient beds (10). Another study found that 7.7% of 11906 patients experienced access block, and the mean length of stay was 4.9 days in those who experienced access block compared with 4.1 days in those who were in no-block group (11). Studies have reported that the increase in testing, consultation, radiology studies, and provision of less substantial treatment contribute to an increase in emergency department length of stay (12-14). Disease and acuity factors such as higher triage level, certain presenting symptoms, or delayed pain alleviation are related to the increase in emergency department length of stay (15). Some demographic characteristics (e.g.,

age and ethnicity) and the presence of junior residents or medical students are related to longer length of stay in emergency department (16-19). Several studies have explored this subject, but no study has been conducted to investigate the parameters in Bandar Abbas, Iran. As such, this study contributes to the factors affecting length of stay in patients referred to emergency department in Bandar Abbas, Iran.

Materials and Methods

A retrospective cross-sectional study was conducted in the Department of Emergency of Shahid Mohammadi in Bandar Abbas from December 2018 and February 2019. A total of 234 eligible patients were randomly selected from patients referred to Department of Emergency of Shahid Mohammadi, Bandar Abbas, Iran. All the patients who referred to the emergency department with complete history and documents were included in the study, while exclusion criteria included the patients with incomplete documents and history and lack of consent for participation in the study as well as the patients who were transferred from hospital. To randomize, 120 patients were systematically selected in December, and other patients were selected in February. Demographic characteristics, including gender, age, reason for coming to the emergency, arrival type, and triage level were recorded. Time sets included entry to medicine specialist visit, specialist visit to order time, entry to lab/imaging assays, entry to other specialist consultants, and entry to final decision time. Entry time was considered as zero time. The data were collected using a checklist and the recorded data for the patients. Other unregistered data were collected from nurses and shift supervisors. The times were recorded based on the medical and nursing reports. Finally, the data were analyzed through independent samples *t* tests, ANOVA, and Mann-Whitney U test using SPSS software (version 23).

Table 2. The Times Based on Age

Age (y)	Entry to Medicine Specialist Visit (min) Mean ± SD	Specialist Visit to Order Time (min) Mean ± SD	Entry to Lab/Imaging Assays Time (h) Mean ± SD	Entry to Other Specialist Consultants (h) Mean ± SD	Entry to Final Decision Time (h) Mean ± SD
<40	14.01 ± 5.78	7.05 ± 3.94	1.75 ± 0.84	2.87 ± 2.23	2.93 ± 1.65
40-60	14.76 ± 6.40	5.80 ± 3.82	2.10 ± 1.09	2.06 ± 1.49	2.37 ± 1.33
>60	15.60 ± 7.95	6.20 ± 4.76	2.01 ± 1.07	2.31 ± 2.07	2.86 ± 1.38
<i>P</i> value	0.635	0.342	0.001	0.321	0.741

Note. SD: Standard deviation.

Table 3. The Times Based on Diseases

Diseases	Entry to Medicine Specialist Visit (min) Mean ± SD	Specialist Visit to Order Time (min) Mean ± SD	Entry to Lab/Imaging Assays Time (h) Mean ± SD	Entry to Other Specialist Consultants (h) Mean ± SD	Entry to Final Decision (h) Mean ± SD
Cardiac	13.75 ± 6.58	4.33 ± 2.79	1.70 ± 0.93	1.22 ± 2.15	1.48 ± 0.92
Surgery	14.66 ± 4.49	5.16 ± 2.82	1.79 ± 0.85	2.12 ± 1.26	2.86 ± 1.24
Internal	15.35 ± 7.34	7.45 ± 4.62	2.13 ± 1.08	2.51 ± 2.12	3.18 ± 1.41
<i>P</i> value	0.612	0.001	0.003	0.356	0.013

Note. SD: Standard deviation.

Results

The results showed that times for entry to medicine specialist visit, specialist visit to order time, entry to lab/imaging assays, entry to other specialist consultants, and entry to final decision time were 14.83 ± 0.445 minutes, 6.29 ± 0.275 minutes, 1.97 ± 0.068 hours, 2.37 ± 0.171 hours, and 2.69 ± 0.096 hours, respectively. The results for times based on gender are presented in Table 1. The results did not reveal any significant differences in both genders for entry to medicine specialist visit ($P=0.978$), specialist visit to order time ($P=0.725$), entry to lab/imaging assays ($P=0.657$), entry to other specialist consultants ($P=0.312$), and entry to final decision time ($P=0.543$).

According to Table 2, there were no significant differences for all age groups ($P>0.05$), but time for entry to lab/imaging assays was significantly lower in patients under 40 years of age ($P=0.001$).

The times based on disease types are illustrated in Table 3. The results indicated that specialist visit to order time ($P=0.001$), entry to lab/imaging assays ($P=0.003$), and entry to final decision time ($P=0.013$) were

Table 1. The Times Based on Gender

Variables	Gender	Mean ± SD	<i>P</i> Value
Entry to medicine specialist visit (min)	Male	14.78 ± 6.42	0.978
	Female	14.90 ± 7.39	
Specialist visit to order time (min)	Male	5.94 ± 3.77	0.725
	Female	6.85 ± 4.77	
Entry to lab/imaging assays time (h)	Male	1.90 ± 0.99	0.657
	Female	2.08 ± 1.08	
Entry to other specialist consultants (h)	Male	1.90 ± 0.99	0.312
	Female	2.08 ± 1.08	
Entry to final decision time (h)	Male	2.71 ± 1.61	0.543
	Female	2.66 ± 0.21	

Note. SD: Standard deviation.

Table 4. The Times Based on Triage Level

Level	Entry to Medicine Specialist Visit (min) Mean ± SD	Specialist Visit to Order Time (min) Mean ± SD	Entry to Lab/Imaging Assays Time (h) Mean ± SD	Entry to Other Specialist Consultants (h) Mean ± SD	Entry to Final Decision (h) Mean ± SD
1	12.25 ± 1.25	4.35 ± 1.35	0.55 ± 0.32	1.33 ± 0.23	1.75 ± 2.48
2	13.00 ± 4.53	5.13 ± 4.95	1.90 ± 0.00	1.95 ± 1.02	2.55 ± 1.45
3	14.44 ± 6.73	5.44 ± 2.04	2.03 ± 1.89	2.22 ± 1.12	2.69 ± 1.46
4	15.07 ± 6.32	6.04 ± 4.13	2.37 ± 1.94	2.26 ± 0.67	2.92 ± 1.00
5	30.75 ± 7.08	7.12 ± 4.35	2.61 ± 2.00	2.75 ± 0.37	5.00 ± 4.69
<i>P</i> value	0.001	0.516	0.0212	0.513	0.004

Note. SD: Standard deviation

significantly shorter in the patients with cardiac diseases.

The times based on triage levels are shown in Table 4. The results showed that entry to specialist visit time ($P=0.001$), entry to lab/imaging assays time ($P=0.0212$) and entry to final decision time ($P=0.004$) were significantly lower in the patients with lower levels of triage.

The results for the times based on to be acute are shown in Table 5. The results did not show significant difference for to be acute and sub-acute ($P>0.05$).

Discussion

The current study was conducted to assess factors affecting length of stay in patients referred to emergency department in Bandar Abbas, Iran. The results indicated no significant difference in both genders, and they were similar to those reported in previous studies (20, 21). Conversely, a study reported significant differences for genders regarding length of stay in emergency department (1). The differences might be attributed to regional differences and cultural factors.

Similarly, the results revealed no significant difference for all age groups, but entry time to lab/imaging assays was significantly lower in patients under 40 years of age. Other studies have also reported significant differences regarding age in emergency departments for length of stay (1, 22-23). Age is a factor related with the increase in emergency department length of stay across different nations (13, 15, 24, 25). Older patients spent more time for lab/imaging assays owing to their communication skills and conditions.

The results also showed that time for specialist visit to order time, entry to lab/imaging assays, and entry to final decision time were significantly shorter in the patients with cardiac diseases. A study reported that the mean for emergency department length of stay was 3.9 days in patients diagnosed with cardiac who experienced access block compared to 5.6 days in cardiac patients who did not experience access block (11). Kılıçslan et al (27) reported that the most common symptoms at the time of present at the emergency department were various cardiac symptoms, fatigue, general poor health, pain, and faulted consciousness (26). The most common specialties are cardiology, neurology, and internal medicine, but internal

Table 5. The Times Based on Acute and Sub-acute

Variables	Status	Mean ± SD	<i>P</i> Value
Entry to medicine specialist visit (min)	Acute	14.93 ± 7.23	0.561
	Sub-acute	14.28 ± 3.76	
Specialist visit to order time (min)	Acute	6.18 ± 4.11	0.723
	Sub-acute	6.91 ± 1.51	
Entry to lab/imaging assays time (h)	Acute	1.99 ± 1.07	0.521
	Sub-acute	1.83 ± 0.68	
Entry to other specialist consultants (h)	Acute	2.31 ± 1.81	0.612
	Sub-acute	2.78 ± 2.64	
Entry to final decision time (h)	Acute	2.65 ± 1.15	0.615
	Sub-acute	2.92 ± 0.21	

Note. SD: Standard deviation.

medicine consultations occurred most frequently (27).

Moreover, the results indicated that entry to specialist visit, entry to lab/imaging, and final decision time were significantly lower in the patients with levels 1-3. It was reported that triage level has a significant effect on emergency department length of stay. Patients in intermediate triage level of 5, spent the longest times for nurse and physician assessment and emergency department lengths of stay (28). Triage level was frequently mentioned in relation to length of stay even in the departments with different triage systems (24, 29).

Conclusion

Overall, age and gender did not have significant effects on lengths of stay in emergency department; however, disease and triage level had significant effects on length of stay. Triage levels are contributing factors for emergency department lengths of stay, and these factors can be used for decreasing lengths of stay in emergency department.

Authors' Contribution

All authors read and approved the final manuscript, and all made the same contribution to the presentation of the idea and writing the manuscript.

Conflict of Interests

All the authors declared no conflict of interests.

Ethical Approval

All the used procedures were approved by the Ethical Committee of Hormozgan University of Medical Sciences (code: IR-HUMS.REC.1399.198).

Funding/Support

This study was supported by Hormozgan University of Medical Science.

Informed Consent

This study was conducted based on the information collected from the emergency department; therefore, it did not need any intervention and consent.

References

- Sarıyer G, Ataman MG, Kızıloğlu İ. Factors affecting length of stay in the emergency department: a research from an operational viewpoint. *Int J Healthc Manag.* 2020;13(sup1):173-82. doi: [10.1080/20479700.2018.1489992](https://doi.org/10.1080/20479700.2018.1489992).
- Kankaanpää M, Raitakari M, Muukkonen L, Gustafsson S, Heitto M, Palomäki A, et al. Use of point-of-care testing and early assessment model reduces length of stay for ambulatory patients in an emergency department. *Scand J Trauma Resusc Emerg Med.* 2016;24(1):125. doi: [10.1186/s13049-016-0319-z](https://doi.org/10.1186/s13049-016-0319-z).
- Institute of Medicine. Committee on the Future of Emergency Care in the United States Health System. *Hospital-Based Emergency Care: At the Breaking Point.* Washington, DC: National Academic Press; 2006.
- Sun BC, Hsia RY, Weiss RE, Zingmond D, Liang LJ, Han W, et al. Effect of emergency department crowding on outcomes of admitted patients. *Ann Emerg Med.* 2013;61(6):605-11. doi: [10.1016/j.annemergmed.2012.10.026](https://doi.org/10.1016/j.annemergmed.2012.10.026).
- Stock LM, Bradley GE, Lewis RJ, Baker DW, Sipsy J, Stevens CD. Patients who leave emergency departments without being seen by a physician: magnitude of the problem in Los Angeles County. *Ann Emerg Med.* 1994;23(2):294-8. doi: [10.1016/s0196-0644\(94\)70043-5](https://doi.org/10.1016/s0196-0644(94)70043-5).
- Fernandes CM, Price A, Christenson JM. Does reduced length of stay decrease the number of emergency department patients who leave without seeing a physician? *J Emerg Med.* 1997;15(3):397-9. doi: [10.1016/s0736-4679\(97\)00030-9](https://doi.org/10.1016/s0736-4679(97)00030-9).
- Richardson DB. Increase in patient mortality at 10 days associated with emergency department overcrowding. *Med J Aust.* 2006;184(5):213-6. doi: [10.5694/j.1326-5377.2006.tb00204.x](https://doi.org/10.5694/j.1326-5377.2006.tb00204.x).
- Dadeh AA, Phunyanantakorn P. Factors affecting length of stay in the emergency department in patients who presented with abdominal pain. *Emerg Med Int.* 2020;2020:5406516. doi: [10.1155/2020/5406516](https://doi.org/10.1155/2020/5406516).
- Walsh M, Knott JC. Satisfaction with the emergency department environment decreases with length of stay. *Emerg Med J.* 2010;27(11):821-8. doi: [10.1136/emj.2009.079764](https://doi.org/10.1136/emj.2009.079764).
- Liew D, Liew D, Kennedy MP. Emergency department length of stay independently predicts excess inpatient length of stay. *Med J Aust.* 2003;179(10):524-6. doi: [10.5694/j.1326-5377.2003.tb05676.x](https://doi.org/10.5694/j.1326-5377.2003.tb05676.x).
- Richardson DB. The access-block effect: relationship between delay to reaching an inpatient bed and inpatient length of stay. *Med J Aust.* 2002;177(9):492-5. doi: [10.5694/j.1326-5377.2002.tb04917.x](https://doi.org/10.5694/j.1326-5377.2002.tb04917.x).
- Casalino E, Wargon M, Peroziello A, Choquet C, Leroy C, Beaune S, et al. Predictive factors for longer length of stay in an emergency department: a prospective multicentre study evaluating the impact of age, patient's clinical acuity and complexity, and care pathways. *Emerg Med J.* 2014;31(5):361-8. doi: [10.1136/emermed-2012-202155](https://doi.org/10.1136/emermed-2012-202155).
- Brick C, Lowes J, Lovstrom L, Kokotilo A, Villa-Roel C, Lee P, et al. The impact of consultation on length of stay in tertiary care emergency departments. *Emerg Med J.* 2014;31(2):134-8. doi: [10.1136/emermed-2012-201908](https://doi.org/10.1136/emermed-2012-201908).
- Kocher KE, Meurer WJ, Desmond JS, Nallamotheu BK. Effect of testing and treatment on emergency department length of stay using a national database. *Acad Emerg Med.* 2012;19(5):525-34. doi: [10.1111/j.1553-2712.2012.01353.x](https://doi.org/10.1111/j.1553-2712.2012.01353.x).
- Capuano F, Lot AS, Sagnes-Raffy C, Ferrua M, Brun-Ney D, Leleu H, et al. Factors associated with the length of stay of patients discharged from emergency department in France. *Eur J Emerg Med.* 2015;22(2):92-8. doi: [10.1097/mej.000000000000109](https://doi.org/10.1097/mej.000000000000109).
- Pines JM, Russell Localio A, Hollander JE. Racial disparities in emergency department length of stay for admitted patients in the United States. *Acad Emerg Med.* 2009;16(5):403-10. doi: [10.1111/j.1553-2712.2009.00381.x](https://doi.org/10.1111/j.1553-2712.2009.00381.x).
- Bekmezian A, Chung PJ, Cabana MD, Maselli JH, Hilton JF, Hersh AL. Factors associated with prolonged emergency department length of stay for admitted children. *Pediatr Emerg Care.* 2011;27(2):110-5. doi: [10.1097/PEC.0b013e31820943e4](https://doi.org/10.1097/PEC.0b013e31820943e4).
- Gerbeaux P, Ledoray V, Liauthaud H, Torro D, Takun K, Thirree R, et al. Medical student effect on emergency department length of stay. *Ann Emerg Med.* 2001;37(3):275-8. doi: [10.1067/mem.2001.111709](https://doi.org/10.1067/mem.2001.111709).
- Lammers RL, Roiger M, Rice L, Overton DT, Cucos D. The effect of a new emergency medicine residency program on patient length of stay in a community hospital emergency department. *Acad Emerg Med.* 2003;10(7):725-30. doi: [10.1111/j.1553-2712.2003.tb00066.x](https://doi.org/10.1111/j.1553-2712.2003.tb00066.x).
- Gardner RL, Sarkar U, Maselli JH, Gonzales R. Factors associated with longer ED lengths of stay. *Am J Emerg Med.* 2007;25(6):643-50. doi: [10.1016/j.ajem.2006.11.037](https://doi.org/10.1016/j.ajem.2006.11.037).
- Arya R, Wei G, McCoy JV, Crane J, Ohman-Strickland P, Eisenstein RM. Decreasing length of stay in the emergency department with a split emergency severity index 3 patient flow model. *Acad Emerg Med.* 2013;20(11):1171-9. doi: [10.1111/acem.12249](https://doi.org/10.1111/acem.12249).
- Han JH, Eden S, Shintani A, Morandi A, Schnelle J, Dittus RS, et al. Delirium in older emergency department patients is an independent predictor of hospital length of stay. *Acad Emerg Med.* 2011;18(5):451-7. doi: [10.1111/j.1553-2712.2011.01065.x](https://doi.org/10.1111/j.1553-2712.2011.01065.x).
- Leslie DL, Marcantonio ER, Zhang Y, Leo-Summers L, Inouye SK. One-year health care costs associated with delirium in the elderly population. *Arch Intern Med.* 2008;168(1):27-32. doi: [10.1001/archinternmed.2007.4](https://doi.org/10.1001/archinternmed.2007.4).
- Goldman RD, Amin P, Macpherson A. Language and length of stay in the pediatric emergency department. *Pediatr Emerg Care.* 2006;22(9):640-3. doi: [10.1097/01.ped.0000227865.38815.ec](https://doi.org/10.1097/01.ped.0000227865.38815.ec).
- Singler K, Bail HJ, Christ M, Weis P, Sieber C, Heppner HJ, et al. [Correlation of patients age on length of stay and admission rate in a German emergency department]. *Dtsch Med Wochenschr.* 2013;138(30):1503-8. doi: [10.1055/s-0033-1343315](https://doi.org/10.1055/s-0033-1343315).
- Kekeç Z, Koç F, Büyük S. Review of geriatric patients hospitalization in emergency department. *Eurasian J Emerg Med.* 2009;8(3):21-4. doi: [10.4170/jaem.2009.58070](https://doi.org/10.4170/jaem.2009.58070).
- Kılıçaslan İ, Bozan H, Oktay C, Göksu E. Demographic properties of patients presenting to the emergency department in Turkey. *Turk J Emerg Med.* 2005;5(1):5-13.
- Bashkin O, Caspi S, Haligo R, Mizrahi S, Stalnikowicz R. Organizational factors affecting length of stay in the emergency department: initial observational study. *Isr J Health Policy Res.* 2015;4:38. doi: [10.1186/s13584-015-0035-6](https://doi.org/10.1186/s13584-015-0035-6).
- Nelson KA, Boslaugh SE, Hodge D 3rd. Risk factors for extremely long length-of-stay among pediatric emergency patients. *Pediatr Emerg Care.* 2009;25(12):835-40. doi: [10.1097/PEC.0b013e3181c330c4](https://doi.org/10.1097/PEC.0b013e3181c330c4).