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EFFECT OF EM PHYSICIAN-LED TRIAGE ON ED LENGTH OF STAY, A CROSS-SECTIONAL STUDY

Original Research

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ABSTRACT

Background: Emergency Department (ED) crowding remains a major global healthcare challenge, linked with increased adverse events, delays in care, and higher rates of patients leaving without being seen (LWBS). Efficient triage plays a crucial role in optimizing patient flow, reducing bottlenecks, and enhancing overall ED performance. In developing emergency care systems, the seniority of the triage physician may influence key operational metrics such as ED length of stay (LoS).

Objective: To determine the effect of emergency medicine (EM) physician seniority during triage on ED LoS and to explore its relationship with triage acuity levels.

Methods: A prospective, cross-sectional, comparative study was conducted over 12 months in the ED of a high-volume tertiary care hospital. A total of 150 patients were screened, and 138 adult patients met inclusion criteria. Data were collected from structured proformas and electronic medical records, including age, gender, triage category, triaging physician seniority (senior post-IMM vs. junior resident), and LoS timestamps from registration to disposition. Descriptive statistics were calculated using IBM SPSS version 26. The association between physician seniority and LoS was analyzed using the Chi-square test, with significance set at $p < 0.05$.

Results: The overall mean ED LoS was 284 ± 112 minutes (median 265). Patients triaged by senior EM residents had a substantially lower mean LoS of 238 ± 98 minutes, compared with 307 ± 115 minutes among those triaged by junior residents, demonstrating a 69-minute reduction. A statistically significant association was found between senior-led triage and a LoS below the median ($\chi^2 = 10.24$, $p = 0.001$). LoS increased progressively across triage categories, from 185 minutes in Category I to 321 minutes in Category IV, confirming consistent prioritization for higher-acuity patients.

Conclusion: Triage performed by senior EM residents is associated with a meaningful reduction in ED LoS, supporting the integration of senior physicians into frontline triage to enhance patient flow and operational efficiency in resource-limited settings.

Keywords: Emergency Service, Hospital; Emergency Treatment; Length of Stay; Physician's Role; Patient Flow; Triage; Workload.

INTRODUCTION

The growing burden of Emergency Department (ED) crowding has emerged as a critical threat to patient safety and healthcare system performance worldwide. The American College of Emergency Physicians defines ED crowding as a state in which the demand for emergency services exceeds the available resources required to provide safe and timely care (1). Similarly, the International Federation of Emergency Medicine recognizes ED crowding as a global public health challenge, underscoring its widespread impact on patient outcomes, operational efficiency, and staff wellbeing across diverse healthcare settings (2,3). In overcrowded EDs, healthcare workers face heightened stress, fatigue, and burnout, which collectively diminish adherence to clinical guidelines and increase the likelihood of diagnostic and therapeutic errors (4). Compounding this, mounting evidence links ED congestion with increased mortality, treatment delays, medication errors, and decreased patient satisfaction, making crowding a multidimensional patient safety concern (5,6). One of the most visible markers of ED dysfunction is the proportion of patients who leave without being seen (LWBS), a key indicator reflecting access barriers and systemic inefficiencies. LWBS rates serve as a quality metric that mirrors a system's ability to deliver timely, patient-centered care (7,8). Patients who depart prior to assessment frequently seek care elsewhere or return to the ED within short intervals, often within 48 hours, reflecting unmet clinical needs and fragmented access to services (9,10). Although some cohorts report lower 30-day mortality among LWBS patients—likely due to lower acuity—the potential for delayed or interrupted care remains a persistent concern (11).

A widely accepted conceptual model for understanding ED crowding is the input-throughput-output framework proposed by a study, highlights the interplay between patient demand, ED internal processes, and hospital capacity (12). Among these components, throughput efficiency—particularly triage accuracy, prioritization, and early decision-making—plays a pivotal role in determining ED length of stay (LoS) and overall patient flow (13). Triage, as the first point of clinical contact, is essential for rapidly identifying patients' acuity levels, ensuring that those with life-threatening conditions are promptly managed while lower-acuity cases are safely redirected (14). In well-established healthcare systems, triage is typically nurse-led and conducted by highly trained personnel with specialized emergency care expertise (15). In Pakistan, however, the emergency care landscape presents unique challenges. Emergency Medicine is a developing specialty, and structured triage training programs and certified triage nurses remain scarce (16,17). Institutional hierarchies, limited public awareness, and cultural expectations often create resistance toward nurse-led triage models, resulting in triage responsibilities being assigned primarily to junior physicians, including house officers, medical officers, and early-stage EM residents, many of whom lack formal triage education or supervision. In such resource-constrained environments, the involvement of senior EM physicians at triage may offer important advantages, including enhanced clinical decision-making, improved triage accuracy, reduced ED LoS, and strengthened patient safety. Their direct visibility in frontline triage may also improve institutional confidence and provide a practical bridge toward future structured nurse-led triage systems. Given these gaps, the present study aims to evaluate the impact of EM physician seniority on ED length of stay in a tertiary care hospital. Specifically, it compares LoS among patients triaged by senior versus junior EM residents, examines the relationship between triage categories and LoS to assess the validity of prioritization, and explores the potential benefits of senior EM physician-led triage in improving patient flow, safety, and training outcomes within low-resource ED settings.

METHODS

The study was designed as a prospective, cross-sectional, comparative analysis conducted in the Emergency Department of Combined Military Hospital (CMH) Rawalpindi, a high-volume tertiary care teaching hospital with an annual ED census exceeding 200,000 visits. Data collection spanned a 12-month period from January 2024 to January 2025 or until the required sample size was reached. All adult patients presenting to the ED during this period were screened for eligibility according to predefined criteria. Individuals aged above 18 years undergoing standard institutional triage upon arrival were eligible for inclusion. Patients were excluded if they presented with out-of-hospital cardiac arrest, were brought directly to the resuscitation room through ambulance activation or visual triage, arrived as inter-hospital transfers, or bypassed triage for clinical or administrative reasons. Records with missing or unclear time stamps or incomplete information were removed from the final analysis. Operational definitions were established before data collection to ensure methodological consistency. A Senior Emergency Resident (Senior REM) was defined as an Emergency Medicine trainee who had

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successfully passed the Intermediate Module in Emergency Medicine (IMM) conducted by the College of Physicians and Surgeons Pakistan and was thus in the advanced phase of the FCPS training program (typically PGY-3 or above). These residents independently performed triage, early stabilization, decision-making, and preliminary disposition planning. A Junior Emergency Resident (Junior REM) was defined as an EM trainee in the first two years of training who had not attempted or passed the IMM and therefore functioned under supervision for most clinical decisions. Emergency Department Length of Stay (ED LoS) was defined as the time interval in minutes from patient registration to final disposition, whether admission, discharge, or transfer. Triage category assignments followed institutional guidelines incorporating elements of the National Early Warning Score and the Modified South African Triage Scale, with localized adaptations to align with resource availability, staffing patterns, and patient volumes. Patients were allocated to clinical areas accordingly, including the resuscitation room, majors area, ambulatory emergency clinic, emergency observation unit, or triage-out pathways.

A total of 138 patients were recruited using a convenience sampling technique. Data were collected through structured proformas using information extracted from manual charts and electronic medical records. Variables included demographic characteristics, the seniority of the triaging physician, arrival and triage times, final disposition times, and assigned triage categories. Data entry and cleaning were performed using Microsoft Excel and IBM SPSS version 26.0. Descriptive statistics such as means, medians, frequencies, and percentages were used to summarize patient characteristics and process measures. Associations between the seniority of the EM physician and ED LoS were examined using the Chi-square test, with a p-value of < 0.05 considered statistically significant. Findings were presented using tables and graphical representations to enhance clarity. Ethical approval was obtained from the Institutional Review Board (IRB) and the study adhered to the principles outlined in the Declaration of Helsinki. All participants or their attendants provided informed consent prior to data collection, and confidentiality was maintained throughout the study.

RESULTS

A total of 150 patients were screened during the study period, of whom 138 met the eligibility criteria and were included in the final analysis. The sample comprised 78 males (56.5%) and 60 females (43.5%). Most patients were between 18–55 years of age (70.3%), with 37.7% aged 18–35 years and 32.6% aged 36–55 years. A smaller proportion fell into the 56–75 years (23.2%) and >75 years (6.5%) age groups. More than half of the participants were triaged as Category III (Urgent, 54.3%), followed by Category IV (Less Urgent, 21.7%), Category II (Emergency, 20.3%), and Category I (Resuscitation, 3.6%). Junior residents in Emergency Medicine conducted 93 triage assessments (67.4%), whereas senior residents performed 45 assessments (32.6%). The overall mean ED length of stay (LoS) was 284 ± 112 minutes, with a median of 265 minutes. Patients triaged by senior residents had a substantially shorter LoS, with a mean of 238 ± 98 minutes and a median of 220 minutes. In contrast, those triaged by junior residents demonstrated a higher mean LoS of 307 ± 115 minutes and a median of 295 minutes. This represented a mean reduction of approximately 69 minutes for patients assessed by senior residents, and the difference was statistically significant ($p = 0.001$), indicating a clear association between physician seniority and ED throughput. Analysis across triage acuity levels revealed a consistent gradient in LoS. Patients triaged as Category I (Resuscitation) had the shortest mean LoS (185 minutes), followed by Category II (Emergency, 255 minutes), Category III (Urgent, 295 minutes), and Category IV (Less Urgent, 321 minutes). Median LoS values followed the same pattern, with 175, 240, 280, and 310 minutes respectively, reflecting shorter stays among high-acuity patients who received expedited management and early disposition. To further validate these patterns, LoS values were dichotomized above and below the cohort median (265 minutes). A statistically significant association was observed between triage physician seniority and LoS distribution ($\chi^2 = 10.24$, $p = 0.001$), demonstrating that patients triaged by post-IMM senior residents were more likely to have a LoS below the median. This supported the observation that senior EM physician-led triage contributed to improved operational flow and reduced overall ED crowding.

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Table 1: Baseline Characteristics of Study Participants (n=138)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	78	56.5
	Female	60	43.5
Age (years)	18-35	52	37.7
	36-55	45	32.6
	56-75	32	23.2
	>75	9	6.5
Triage Category	I (Resuscitation)	5	3.6
	II (Emergency)	28	20.3
	III (Urgent)	75	54.3
	IV (Less Urgent)	30	21.7
Triage Physician	Senior REM	45	32.6
	Junior REM	93	67.4

Key: REM: Resident Emergency Medicine

Table 2: Comparison of Length of Stay (LoS) by Triage Physician Seniority

Triage Physician	N	Mean LoS (minutes)	Median (minutes)	SD (minutes)	p-value
Senior REM	45	238	220	98	
Junior REM	93	307	295	115	0.001*
Overall	138	284	265	112	

Key: REM= Resident Emergency Medicine, LoS: = Emergency Department Length of Stay; SD = Standard Deviation. *Statistical test applied: Mann-Whitney U test. A p-value of < 0.05 was considered statistically significant.

Table 3: Length of Stay (LoS) by Triage Acuity Category

Triage Category	Number of Patients (n)	Mean LoS (minutes)	Median LoS (minutes)
I (Resuscitation)	5	185	175
II (Emergency)	28	255	240
III (Urgent)	75	295	280
IV (Less Urgent)	30	321	310

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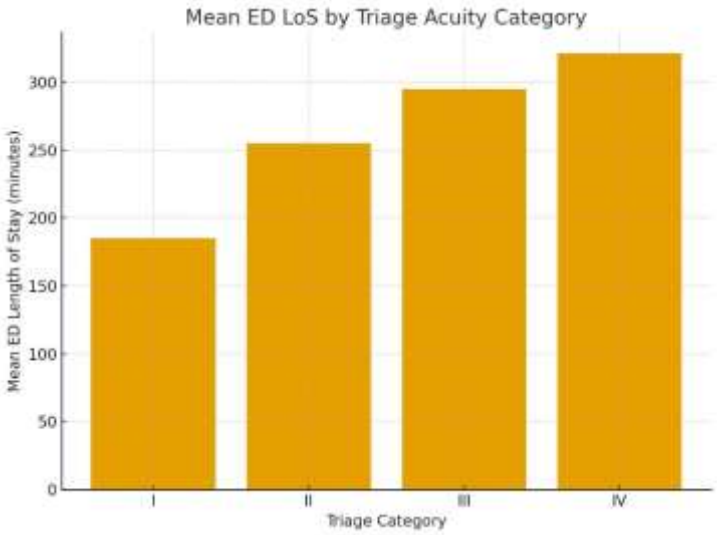

Figure 1 Mean ED Los by triage Acuity Category

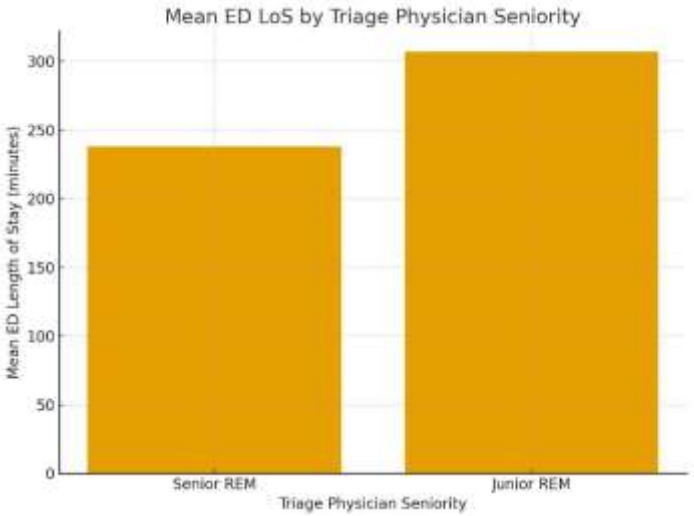

Figure 1 Mean ED Los by Triage Physician Seniority

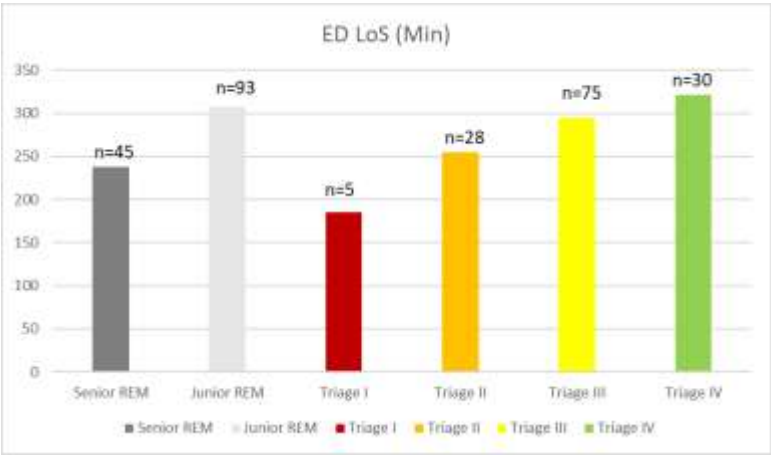

Figure 3 ED Los (Min)

DISCUSSION

The study demonstrated that senior, post-IMM emergency medicine residents significantly reduced Emergency Department length of stay compared to junior residents, underscoring the value of experienced clinical decision-making at the point of entry. The findings highlighted that early involvement of senior physicians enhanced patient flow by expediting diagnostic initiation, accelerating critical interventions, and facilitating timely disposition planning, ultimately improving departmental throughput (18). This reduction in length of stay supported the broader concept that front-loaded clinical expertise at triage can mitigate crowding pressures and strengthen operational efficiency, particularly in emergency care systems undergoing development. The inverse relationship observed between triage acuity and length of stay reinforced the internal consistency of the dataset, demonstrating that the most critically ill patients were prioritized appropriately and managed promptly. This pattern aligned with the study's objective of assessing whether senior-led triage preserved the integrity of clinical prioritization while improving workflow. The consistency of these findings supported the premise that enhanced triage oversight by senior residents strengthens both operational performance and patient safety without compromising acuity-based resource allocation. When compared with available literature, the findings diverged from several studies conducted in more mature

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emergency care systems, where senior physician triage produced either minimal or no significant improvement in overall length of stay (12). Some authors reported only modest reductions confined to non-admitted patients, while others noted shorter waiting times accompanied by paradoxical increases in total department length of stay for most triage categories, suggesting that structural and contextual differences strongly influence outcomes (19). Unlike these observations, the current study demonstrated a consistent and meaningful reduction in length of stay across most patient categories, indicating that the impact of senior-led triage extended beyond rapid initial evaluation and influenced the entire care continuum (18–21). The contrast likely reflected systemic variations; resource-rich healthcare models with established emergency medicine practices, standardized workflows, and high levels of multidisciplinary coordination may derive less incremental benefit from senior triage involvement than evolving systems.

Findings from studies conducted in settings with similar operational challenges provided greater alignment, demonstrating that the introduction of senior-led triage models significantly reduced length of stay and improved patient flow (22). This convergence supported the interpretation that senior-led triage may hold particular value in healthcare environments where emergency medicine is still developing, triage education is limited, and structured patient flow strategies are not fully institutionalized. The current findings therefore contributed important contextual evidence, emphasizing that the effectiveness of senior triage leadership is not universal but dependent on system maturity, staffing models, and local resource constraints. The implications of these results extended beyond operational efficiency. Senior-led triage offered a parallel educational advantage by providing junior residents with real-time supervision, structured decision-making guidance, and opportunities for experiential learning. Incorporating senior residents into triage planning therefore supported both departmental performance and the longitudinal development of clinical competency within residency programs. This dual benefit strengthened the rationale for integrating senior-level expertise at triage, particularly during peak hours or high-volume shifts. Several strengths enhanced the validity of this study. Its prospective and comparative design allowed direct observation of triage performance, improving temporal accuracy for key process indicators such as registration and disposition times. The study also addressed a substantial gap in regional literature by evaluating senior-led triage in a developing emergency care system, providing context-specific evidence that has been largely absent from prior global analyses. Furthermore, the focus on an emerging emergency medicine model added practical relevance for clinical leaders and hospital administrators seeking to optimize patient flow in similar environments.

However, important limitations were present. Conducting the study in a single tertiary centre reduced the generalizability of the findings, especially to lower-volume or non-tertiary EDs. The use of convenience sampling introduced a risk of selection bias and may have influenced subgroup distributions. Potential confounding variables, such as differences in case mix, diagnostic turnaround times, bed availability, and interdepartmental consultation delays, were not controlled for and could have affected length of stay values. The study also did not assess additional performance indicators, including patient satisfaction, appropriateness of triage decisions, leave-without-being-seen rates, or time to physician assessment—metrics that could provide a more comprehensive evaluation of triage effectiveness. The relatively small sample size further limited the precision of comparisons within lower-frequency triage categories. Future research would benefit from multicentre designs, larger sample sizes, adjustment for operational confounders, and incorporation of downstream outcomes to offer a more holistic assessment of senior-led triage models. Qualitative insights from triage physicians and nurses could enrich understanding of workflow barriers and training needs, while time-motion analyses could identify specific process steps most influenced by physician seniority. Collectively, such enhancements would contribute to a more robust evidence base and guide the development of adaptive triage strategies in evolving emergency care systems.

CONCLUSION

The study concludes that senior post-IMM emergency medicine residents bring meaningful improvement to Emergency Department operations by leading triage with greater clinical insight and more efficient decision-making. Their involvement contributed to smoother patient flow and reinforced the reliability of the triage system, particularly through consistent prioritization of higher-acuity cases. These findings emphasize the practical value of integrating senior physicians into frontline triage roles, especially in resource-limited or developing healthcare settings where structured emergency systems are still evolving. Strengthening triage training for junior residents and nursing staff, supported by senior oversight, may further enhance overall departmental performance. The results underscore the importance of adopting senior-led or supervised triage models as part of broader quality improvement strategies aimed at reducing crowding and improving the delivery of timely, safe, and effective emergency care.

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AUTHOR CONTRIBUTION

Author	Contribution
Muhammad Ashfaq*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Tamkeen Pervez	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Amer Iqbal	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Anees Ur Rehman	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Annas Mehboob	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Umair Ali	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

REFERENCES

1. Brink A, Alsma J, van Attekum LA, Bramer WM, Zietse R, Lingsma H, Schuit SC. Predicting inhospital admission at the emergency department: a systematic review. Emergency medicine journal. 2022 Mar 1;39(3):191-8.

2. Javidan AP, Hansen K, Higginson I, Jones P, Lang E. The International Federation for Emergency Medicine report on emergency department crowding and access block: A brief summary. Emergency Medicine Journal. 2021 Mar 1;38(3):245-6.

3. Lindner G, Woitok BK. Emergency department overcrowding: Analysis and strategies to manage an international phenomenon. Wiener Klinische Wochenschrift. 2021 Mar;133(5):229-33.

4. Sartini M, Carbone A, Demartini A, Giribone L, Oliva M, Spagnolo AM, Cremonesi P, Canale F, Cristina ML. Overcrowding in emergency department: causes, consequences, and solutions—a narrative review. InHealthcare 2022 Aug 25 (Vol. 10, No. 9, p. 1625). MDPI.

5. Smalley CM, Meldon SW, Simon EL, Muir MR, Delgado F, Fertel BS. Emergency department patients who leave before treatment is complete. Western Journal of Emergency Medicine. 2021 Feb 26;22(2):148.

6. Kenny JF, Chang BC, Hemmert KC. Factors affecting emergency department crowding. Emergency medicine clinics. 2020 Aug 1;38(3):573-87.

7. Zeleke TA, Nora WT, Denberu MT, Adal O, Demisse LB. Length of stay and associated factors among pediatric patients in the pediatric emergency unit of the Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia. BMC Emergency Medicine. 2024 Sep 19;24(1):170.

8. Adhikari B, Shrestha L, Bajracharya M, Aryal N, Rajbhandari A, Maharjan RK, Das SK, Sapkota J, Tetteh KK, Das D. Triage practices for emergency care delivery: a qualitative study among febrile patients and healthcare workers in a tertiary care hospital in Nepal. BMC Health Services Research. 2024 Feb 8;24(1):180.

9. Bano, H., Sohail, A., Pervez, T., & Kasi, H. (2025). Assessing Awareness and Attitudes of Doctors, Nurses and Healthcare Administrators towards the Role of Advanced Nurse Practitioners in the Emergency Department: A Cross-Sectional Study. Indus Journal of Bioscience Research, 3(2), 731-738.

10. Heslin SM, Schwaner R, Viccellio P, King C, Rowe A, Thode H, Singer AJ. A physician-nurse team adjacent to triage shortens length of stay and left-without-being-seen rates. Clinical and Experimental Emergency Medicine. 2024 Sep 6;12(1):26.

11. Shih HI, Huang YT, Hsieh CC, Sung TC. A rapid clinic-based service for an emergency department of a tertiary teaching hospital during a dengue outbreak. Medicine (Baltimore). 2021;100(14):e25311.

12. Grotta JC, Yamal JM, Parker SA, Rajan SS, Gonzales NR, Jones WJ, et al. Prospective, Multicenter, Controlled Trial of Mobile Stroke Units. N Engl J Med. 2021;385(11):971-81.

13. Youssef E, Benabbas R, Choe B, Doukas D, Taitt HA, Verma R, et al. Interventions to improve emergency department throughput and care delivery indicators: A systematic review and meta-analysis. Acad Emerg Med. 2024;31(8):789-804.

14. Uffen JW, Oosterheert JJ, Schweitzer VA, Thursky K, Kaasjager HAH, Ekkelenkamp MB. Interventions for rapid recognition and treatment of sepsis in the emergency department: a narrative review. Clin Microbiol Infect. 2021;27(2):192-203.

15. Roos J, Helm S, Touet A, Cucchi D, Welle K, Weinhold L, et al. Insights into orthopedic and trauma emergency care and current challenges in Germany. Eur J Trauma Emerg Surg. 2025;51(1):180.

16. Sax DR, Warton EM, Mark DG, Reed ME. Emergency Department Triage Accuracy and Delays in Care for High-Risk Conditions. JAMA Netw Open. 2025;8(5):e258498.

17. Freund Y, Cancella de Abreu M, Lebal S, Rousseau A, Lafon T, Yordanov Y, et al. Effect of the 1-h bundle on mortality in patients with suspected sepsis in the emergency department: a stepped wedge cluster randomized clinical trial. Intensive Care Med. 2024;50(7):1086-95.

18. Leon-Justel A, Jimenez-Barragan M, Navarro-Bustos C, Martin-Perez S, Garrido-Castilla JM, Morales-Barroso IM, et al. Development and validation of an advanced data analytics model to support strategic point-of-care testing utilization decisions in the emergency department. J Med Econ. 2025;28(1):871-84.

19. Tudorache R, Kossorotoff M, Kerleroux B, Denier C, Naggara O, Boulouis G. Determinants of Timely Access to Recanalization Treatments and Outcomes in Pediatric Ischemic Stroke. Stroke. 2024;55(11):2716-9.

20. Jing J, Xie X, Leng X, Wang D, Wang Y. Chinese Stroke Association guidelines on emergency stroke unit. Stroke Vasc Neurol. 2024;9(6):741-5.

21. Ebinger M, Siegerink B, Kunz A, Wendt M, Weber JE, Schwabauer E, et al. Association Between Dispatch of Mobile Stroke Units and Functional Outcomes Among Patients With Acute Ischemic Stroke in Berlin. Jama. 2021;325(5):454-66.

22. Chiang D, Ade JM, Liu XW, Bellolio F, Lohse CM, Sandefur BJ, et al. Assessment of ED triage of anaphylaxis patients based on the Emergency Severity Index. Am J Emerg Med. 2021;46:449-55.