Self-Efficacy and Clinical Competence After an Emergency Medicine Internship

Acil Tıp İntörnlüğü Sonrası Öz Yeterlik ve Klinik Yeterlilik

Araştırma Research

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Abstract

Objectives: Emergency medicine (EM) internships offer high-acuity, real-time learning environments that can significantly influence the academic self-efficacy and clinical confidence of final-year medical students. This study aimed to evaluate the effect of a two-month structured EM internship on students' academic self-efficacy and perceived competence in core EM domains.

Methods: This prospective observational pre-post study was conducted between September 1, 2022, and August 31, 2023, in a university-affiliated tertiary care hospital in Türkiye. Final-year medical students, who are referred to as medical interns within the Turkish medical education system, completed the Medical Achievement Self-Efficacy Scale (MASS) and a 30-item self-assessment aligned with the National Core Medical Curriculum before and after the internship. Statistical analyses included nonparametric tests and Cronbach's alpha for reliability.

Results: Of 126 eligible final-year medical students, 99 completed the pre-internship assessment and 66 completed both pre- and post-internship assessments. MASS scores significantly improved (pre: 68.0 [18–90] vs. post: 77.0 [32–90]; $Z = -4.482$, $p < 0.001$). Self-efficacy increased in all five EM domains, particularly in patient assessment and triage. Limited gains were observed in burnout recognition and complex procedures.

Conclusions: Structured EM internships may enhance self-efficacy and clinical readiness among final-year medical students. Curriculum development should include immersive EM rotations and targeted support for stress resilience and procedural skills.

Keywords: self-efficacy; emergency medicine; internship; medical education; clinical competence; undergraduate students

Özet

Amaç: Acil tıp (AT) stajları, son sınıf tıp öğrencilerinin akademik öz yeterliklerini ve klinik güvenlerini önemli ölçüde etkileyebilecek yüksek yoğunluklu, gerçek zamanlı öğrenme ortamları sunar. Bu çalışmada, iki ay süren yapılandırılmış bir AT stajının öğrencilerin akademik öz yeterlikleri ve temel AT alanlarındaki algılanan yeterlilikleri üzerindeki etkisinin değerlendirilmesi amaçlandı.

Yöntem: Bu prospektif gözlemsel ön test-son test çalışma, 1 Eylül 2022–31 Ağustos 2023 tarihleri arasında Türkiye'de bir üniversite hastanesinde yürütüldü. Türk tıp eğitimi sistemi içinde intörn hekim olarak tanımlanan son sınıf tıp öğrencilerine staj öncesi ve sonrası Tıbbi Başarı Öz Yeterlik Ölçeği (MASS) ve Ulusal Çekirdek Eğitim Programı'na uyumlu 30 maddelik bir öz değerlendirme formu uygulandı. İstatistiksel analizlerde parametrik olmayan testler ve güvenilirlik değerlendirmesi için Cronbach alfa kullanıldı.

Bulgular: Uygun bulunan 126 son sınıf tıp öğrencisinden 99'u staj öncesi değerlendirmeyi, 66'sı ise hem staj öncesi hem de staj sonrası değerlendirmeyi tamamladı. MASS puanları anlamlı olarak arttı (ön test: 68,0 [18–90] ve son test: 77,0 [32–90]; $Z = -4,482$, $p < 0,001$). Öz yeterlik, beş AT alanının tamamında artış gösterdi; en belirgin gelişim hasta değerlendirme ve triyaj alanlarında görüldü. Tükenmişlik farkındalığı ve karmaşık girişimlerde sınırlı gelişim gözlendi.

Sonuç: Yapılandırılmış AT stajları, son sınıf tıp öğrencilerinin öz yeterliklerini ve klinik hazırlıklarını artırabilir. Müfredat geliştirme süreçlerinde uygulamalı AT rotasyonlarına yer verilmeli; stres dayanıklılığı ve girişimsel becerilere yönelik hedeflenmiş destekler sağlanmalıdır.

Anahtar Sözcükler: öz yeterlik; acil tıp; klinik yeterlilik; tıp öğrencileri; intörnlük

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1. Introduction

Medical education is a demanding and multidimensional process that not only requires the acquisition of clinical knowledge but also the development of confidence in applying that knowledge in unpredictable, high-stakes environments. Among the psychological constructs influencing this transition, self-efficacy—the belief in one's ability to perform specific tasks successfully—has emerged as a key determinant of clinical readiness and professional growth (1). Its importance becomes particularly evident during the final stages of undergraduate training, when students begin to assume real-world patient care responsibilities.

Self-efficacy has gained recognition as a measurable educational outcome linked to improved academic performance, enhanced clinical reasoning, and stronger professional identity. In competency-based curricula, its assessment serves as a vital indicator of a student's preparedness to engage in independent clinical decision-making. To that end, various validated instruments have been developed to evaluate medical students' perceived abilities across essential domains of practice, providing a structured and standardized approach to educational impact assessment (2,3).

Emergency Medicine (EM) rotations offer a uniquely fertile setting for the development of self-efficacy. The Emergency Department (ED) is defined by dynamic clinical decision-making, high patient acuity, and time-critical interventions—conditions that create opportunities for mastery experiences, social learning, and emotional arousal, all of which are known to strengthen self-efficacy (4). Unlike other rotations, EM requires students to manage undifferentiated patients, often with limited supervision, reinforcing both autonomy and resilience.

Despite growing interest in measuring self-efficacy, limited research has investigated how EM internships impact this construct within the framework of nationally standardized training programs. This study aimed to address that gap by evaluating changes in academic self-efficacy among final-year medical students following a structured EM internship, using a validated, competency-based self-assessment tool aligned with the national medical curriculum. As part of this evaluation, changes in participants' academic self-efficacy were assessed using the Medical Achievement Self-Efficacy Scale (MASS), a psychometrically validated instrument, alongside a structured self-assessment of core EM competencies. The findings aim to inform curriculum development strategies that enhance clinical readiness and support professional identity formation.

2. Methods

2.1. Study Design and Setting

This prospective, observational pre–post study was conducted between 1 September 2022 and 31 August 2023 at a university-affiliated tertiary care hospital in Muğla, Türkiye. The ED, which includes 50 inpatient beds and functions as a high-acuity training unit, served as the primary clinical setting for the compulsory two-month EM internship undertaken by final-year medical students. The internship is designed to provide hands-on exposure to critical decision-making, procedural interventions, and acute patient care. The study evaluated within-subject changes in academic self-efficacy and perceived EM competencies before and after the compulsory two-month EM internship. This manuscript was prepared in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational research.

2.2. Participants

The source population consisted of all final-year medical students who were scheduled to complete the compulsory two-month EM internship during the 2022–2023 academic year. Within the Turkish medical education system, these students are referred to as medical interns during their final year of undergraduate medical training. A total-population sampling approach was used, and all eligible students during the study period were invited to participate. Eligibility was defined as being a final-year medical student assigned to the EM internship during the study period, completing the full internship period, providing informed consent, and submitting survey responses that could be matched between the pre- and post-internship assessments. Participants who did not complete the rotation, did not provide consent, submitted incomplete forms, or had unmatched pre- and

post-internship responses were excluded from the final matched analysis.

2.3. Sample Size and Power Analysis

Because this study was based on a total-population approach, all eligible final-year medical students during the study period were invited to participate, and no sampling-based recruitment strategy was applied. An a priori power analysis was not performed, as the final matched sample size could not be precisely predicted before data collection because participation was voluntary and depended on completion of both the pre- and post-internship assessments.

Among 126 eligible final-year medical students, 99 completed the pre-internship assessment and 66 completed both pre- and post-internship assessments, yielding a final matched sample of 66 participants. After completion of data collection, a post hoc power analysis was performed using G*Power software, version 3.1.9.7. Based on a two-tailed paired pre-post comparison, an alpha level of 0.05, the final matched sample size of 66, and a medium effect size assumption, the available sample provided more than 80% statistical power to detect within-subject changes. Nevertheless, the reduced matched response rate was acknowledged as a limitation because it may affect representativeness and generalizability.

2.4. Data Sources and Measurement Tools

Data were collected using a structured, self-administered online questionnaire distributed via Google Forms at two time points: on the first and last day of the EM internship. The survey comprised three sections. The first section collected demographic information, including age, sex, and academic performance indicators. The second section included the MASS, an 18-item instrument scored on a five-point Likert scale, designed to assess academic self-efficacy in clinical training contexts. This scale has demonstrated robust psychometric properties in previous studies and showed excellent internal consistency in the present sample (Cronbach's alpha = 0.943 pre-test; 0.968 post-test) (3).

The third section of the survey consisted of a 30-item self-assessment tool developed in alignment with the National Core Medical Curriculum (5). This instrument evaluated perceived competency across five core EM domains: (i) Patient Assessment and Management, (ii) Basic and Advanced Life Support, (iii) ED Triage and Patient Management, (iv) Vascular and Airway Management, and (v) Electrocardiography Interpretation and Cardiovascular Emergencies. Each item was rated on a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree), and the scale demonstrated high internal reliability across all domains.

To minimize potential sources of bias, several methodological safeguards were employed. Survey responses were anonymized to protect participant confidentiality and reduce social desirability bias. Data were collected electronically and independently, without supervision or direct contact with faculty, to mitigate external influence. Pre- and post-internship responses were matched using unique anonymous identifiers, allowing for within-subject analysis while maintaining respondent anonymity.

2.5. Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board of Muğla Sıtkı Koçman University (Protocol No: 220029/25). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. All participants provided informed consent prior to data collection. Participation was entirely voluntary, and participants-were informed of their right to withdraw at any point prior to data locking without any academic or administrative consequences. All responses were anonymized to ensure confidentiality and to protect participant identity throughout data handling and analysis.

2.6. Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Kolmogorov-Smirnov test. Descriptive statistics were reported as mean ± standard deviation (SD) for normally distributed variables and as median (minimum–maximum) for non-normally distributed variables. Because the scale and domain scores were non-normally distributed, comparisons between male and female participants were performed using the Mann–Whitney U test. Paired pre- and post-

Table 1. Pre- and Post-Internship Median Scores for Individual Items of the Medical Achievement Self-Efficacy Scale				
MASS Items	**Pre-Test Median (Range)**	**Post-Test Median (Range)**	**Z Score**	**p-value**
I can apply the skills I have learned so far to a patient.	3.0 (1-5)	5.0 (2-5)	-5.353	<0.001
I have sufficient knowledge about the social factors affecting patients' health problems.	4.0 (1-5)	5.0 (2-5)	-4.607	<0.001
I can electronically research medical literature on a health-related issue.	4.0 (1-5)	5.0 (1-5)	-3.252	0.001
I can effectively apply appropriate diagnostic and treatment steps in a clinical case.	3.0 (1-5)	4.0 (2-5)	-4.678	<0.001
I can respond adequately in a disagreement with a patient in terms of communication.	4.0 (1-5)	4.0 (2-5)	-1.968	0.049
I have a medical perspective informed by humanities subjects (such as philosophy and art) included in the medical school curriculum.	4.0 (1-5)	4,5 (2-5)	-3.005	0.003
I have sufficient knowledge in basic medical sciences.	3.0 (1-5)	4.0 (1-5)	-3.734	<0.001
I can analyze a patient's health problem within a group setting.	4.0 (1-5)	4.0 (2-5)	-4.171	<0.001
I can write a reliable scientific article on a health-related topic.	3.0 (1-5)	4.0 (1-5)	-3.226	0.001
I can select an appropriate scientific research method to address a medical research question.	3.0 (1-5)	4.0 (1-5)	-1.696	0.090
When a patient requests euthanasia, I can support my views ethically and take a clear stance.	4.0 (1-5)	4.0 (1-5)	-2.420	0.016
I can collaborate equitably with colleagues from other healthcare fields.	4.0 (1-5)	5.0 (1-5)	-2.536	0.011
I can manage my feelings of anxiety in specific clinical situations.	4.0 (1-5)	4.0 (1-5)	-2.560	0.010
I can address a public health issue with a preventive approach.	4.0 (1-5)	4.0 (2-5)	-3.468	<0.001
I can structure the information obtained from a patient during a clinical interview.	4.0 (1-5)	5.0 (2-5)	-3.168	0.002
I can make cost-effective choices in the use of medical devices for diagnosis and treatment.	3.0 (1-5)	4.0 (1-5)	-3.065	0.002
I can recognize the signs and symptoms of burnout in my professional life.	4.0 (1-5)	4.0 (1-5)	-1.195	0.232
I can handle critical situations (unexpected and stressful events) while providing healthcare services.	4.0 (1-5)	4.0 (2-5)	-1.407	0.159
Each item of the MASS was rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Data are presented as median values with range (minimum–maximum). Statistical comparisons were performed using the Wilcoxon signed-rank test. $p < 0.05$ was considered statistically significant.				

internship scores were compared using the Wilcoxon signed-rank test. A two-tailed p-value <0.05 was considered statistically significant. Internal consistency of the measurement instruments was evaluated using Cronbach's alpha coefficients.

The primary analyses focused on within-subject pre- and post-internship changes in MASS and EM competency domain scores. Between-group comparisons according to gender and academic performance were considered exploratory secondary analyses and were reported narratively to avoid overemphasizing findings outside the primary study objective.

Results

A total of 126 final-year medical interns were eligible to participate in the study. Of these, 99 interns (54 males and 45 females) provided informed consent and completed the pre-internship assessment, corresponding to a response rate of 78.6%. Upon completion of the two-month EM internship, 66 interns (34 males and 32 females) also completed the post-internship assessment, resulting in a final matched response rate of 52.4%. The mean age of participants was 24.0 ± 1.3 years.

Significant improvements were observed in participants' overall academic self-efficacy, as measured by the MASS. The median pre-test score increased from 68.0 (range: 18–90) to 77.0 (range: 32–90) following the internship ($Z = -4.482$, $p < 0.001$). Detailed item-level MASS results are presented in Table 1. The greatest improvements were noted in domains related to clinical skill application, understanding of social determinants of health, and implementation of diagnostic and therapeutic strategies. However, changes in certain items—such as recognition of professional burnout ($p = 0.232$) and management of unexpected clinical stressors ($p = 0.159$)—did not reach statistical significance.

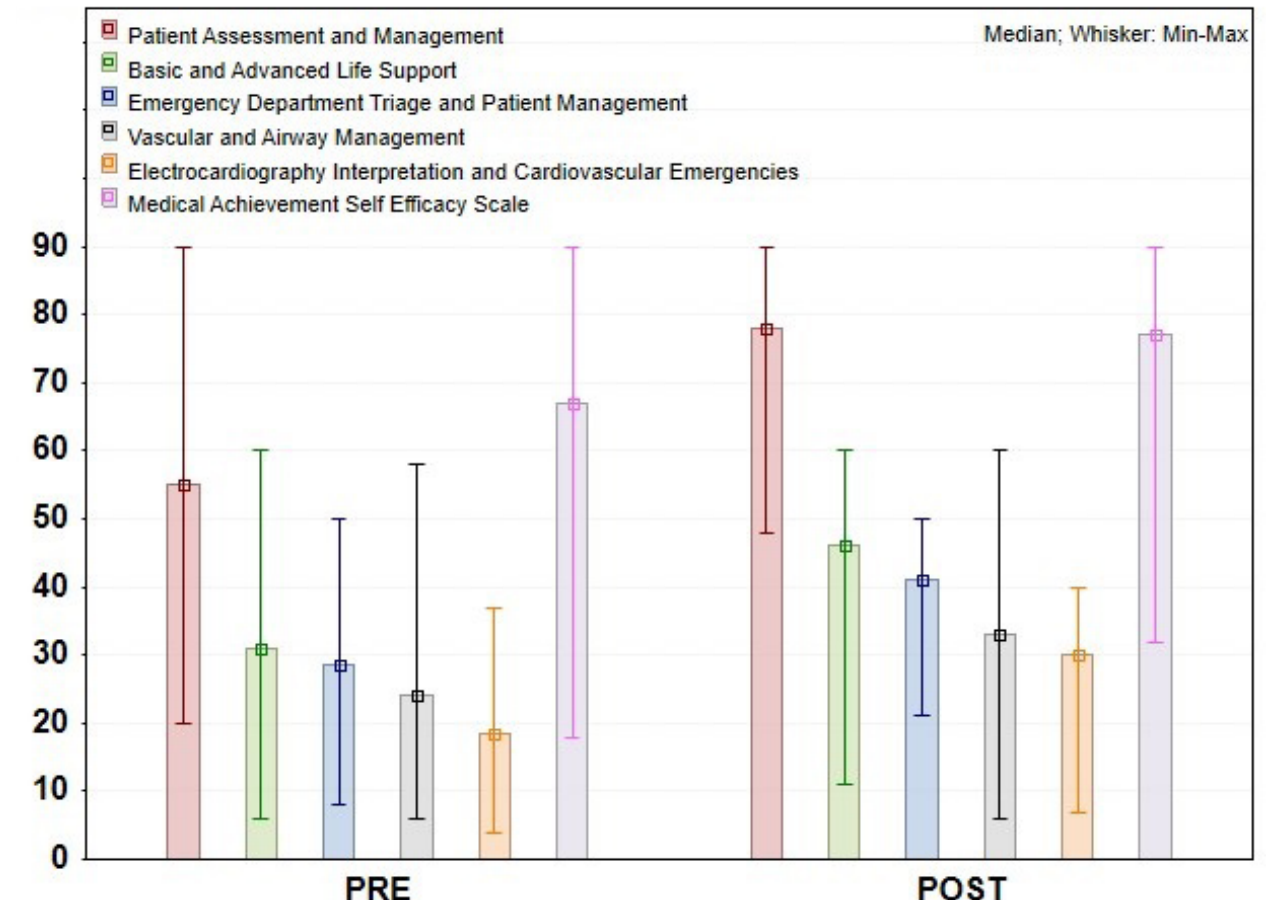

Figure 1. Pre- and Post-Internship Changes in Median Scores Across Academic Self-Efficacy and Core Emergency Medicine Competency Domains

Table 2. Pre and Post-Internship Median Scores for Self-Efficacy Items Related to Patient Assessment and Emergency Department Triage Management

Items	Pre-Test Median (Range)	Post-Test Median (Range)	Z Score	p-value
Patient Assessment and Management	55.0 (25-83)	78.0 (48-90)	-7.222	<0.001
I believe I can perform patient triage in the emergency department.	7.0 (1-10)	10.0 (7-10)	-6.564	<0.001
I believe I can recognize patients' emergency conditions.	7.0 (1-10)	9.0 (5-10)	-6.486	<0.001
I think I have the ability to take the medical history of patients presenting to the emergency department.	8.0 (3-10)	10.0 (6-10)	-6.213	<0.001
I believe I can conduct emergency examinations for patients presenting to the emergency department.	7.0 (2-10)	9.0 (5-10)	-6.573	<0.001
I believe I can provide initial interventions for patients' emergency conditions.	5.0 (1-10)	8.0 (2-10)	-6.560	<0.001
I believe I can establish differential diagnoses for patients presenting to the emergency department and request appropriate laboratory tests accordingly.	6.0 (1-10)	9.0 (5-10)	-6.377	<0.001
I believe I can establish differential diagnoses for patients presenting to the emergency department and request appropriate imaging tests accordingly.	6.0 (1-10)	9.0 (1-10)	-6.450	<0.001
I believe I can plan the treatment of patients presenting to the emergency department and effectively inform patients and their relatives.	5.0 (1-10)	8.0 (2-10)	-6.392	<0.001
I believe I can perform emergency interventions for trauma patients presenting to the emergency department.	5.0 (1-10)	8.0 (1-10)	-6.296	<0.001
Emergency Department Triage and Patient Management	28.5 (8-50)	41.0 (21-50)	-6.666	<0.001
I believe I can assess patients presenting to the green zone in the emergency department.	7.0 (1-10)	10.0 (6-10)	-6.270	<0.001
I believe I can prescribe medication for patients in the green zone of the emergency department.	6.0 (1-10)	10.0 (3-10)	-6.568	<0.001
I believe I can assess patients presenting to the yellow zone in the emergency department.	6.0 (1-10)	9.0 (3-10)	-6.120	<0.001
I believe I can prescribe medication for patients in the yellow zone of the emergency department.	5.0 (1-10)	8.0 (3-10)	-6.401	<0.001
I believe I can assess patients presenting to the red zone in the emergency department.	5.0 (1-10)	6.0 (1-10)	-3.333	<0.001

All items were evaluated on a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree). Scores are presented as median values with range (minimum–maximum). Statistical analysis was conducted using the Wilcoxon signed-rank test to compare pre- and post-internship responses. Composite Z-scores for domain totals are presented above each respective section. A p-value of <0.05 was considered statistically significant.

Table 3. Pre and Post-Internship Median Scores for Self-Efficacy Items Related to Basic and Advanced Life Support, Vascular and Airway Management, and Electrocardiography Interpretation

Items	Pre-Test Median (Range)	Post-Test Median (Range)	Z Score	p-value
Basic and Advanced Life Support	31.0 (8-57)	48.0 (11-60)	-6.360	<0.001
I believe I can perform basic life support (BLS) comprehensively in the emergency department.	6.0 (1-9)	9.0 (1-10)	-6.428	<0.001
I believe I can perform advanced life support (ALS) comprehensively in the emergency department.	6.0 (1-9)	8.0 (1-10)	-4.545	<0.001
I believe I can perform cardiopulmonary resuscitation (CPR) effectively during basic life support in the emergency department.	6.0 (1-10)	9.0 (3-10)	-5.718	<0.001
I believe I can operate a defibrillator effectively during advanced life support in the emergency department.	5.0 (1-10)	8.0 (1-10)	-6.121	<0.001
I believe I can administer medications appropriately during advanced life support in the emergency department.	5.0 (1-10)	7.0 (1-10)	-4.309	<0.001
I believe I can manage ventilator settings effectively following advanced life support in the emergency department.	4.0 (1-9)	6.0 (1-10)	-4.614	<0.001
Vascular and Airway Management	24.5 (6-58)	32.0 (6-60)	-4.183	<0.001
I believe I can establish peripheral intravenous (IV) access for patients in the emergency department.	6.0 (1-10)	8.0 (1-10)	-4.184	<0.001
I believe I can establish central venous access for patients in the emergency department.	3.0 (1-10)	4.0 (1-10)	-2.216	0.027
I believe I can use a laryngeal mask airway (LMA) for airway management in the emergency department.	5.0 (1-10)	7.0 (1-10)	-2.916	0.004
I believe I can use an endotracheal tube for airway management in the emergency department.	4.0 (1-10)	7.0 (1-10)	-4.624	<0.001
I believe I can use a combitube for airway management in the emergency department.	3.0 (1-10)	5.0 (1-10)	-2.378	0.017
I believe I can perform surgical airway techniques for airway management in the emergency department.	2.0 (1-10)	3.0 (1-10)	-1.407	0.159
Electrocardiography Interpretation and Cardiovascular Emergencies	18.5 (4-37)	30.0 (7-40)	-5.767	<0.001
I believe I can identify acute coronary syndrome (ACS) on the electrocardiogram (ECG) of patients presenting to the emergency department.	6.0 (1-10)	8.0 (2-10)	-5.149	<0.001
I believe I can manage acute coronary syndrome (ACS) in patients presenting to the emergency department.	5.0 (1-10)	7.0 (2-10)	-5.953	<0.001
I believe I can recognize arrhythmias on the electrocardiogram (ECG) of patients presenting to the emergency department.	5.0 (1-10)	8.0 (1-10)	-5.330	<0.001
I believe I can manage arrhythmias in patients presenting to the emergency department.	4.0 (1-10)	7.0 (1-10)	-5.376	<0.001

All items were rated on a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree). Values are presented as median scores with ranges (minimum–maximum). Pre- and post-internship comparisons were analyzed using the Wilcoxon signed-rank test. Domain-level Z-scores and significance levels are shown in the header row of each section. A p-value <0.05 was considered statistically significant.

Participants also completed a 30-item structured self-assessment aligned with the National Core Medical Curriculum to evaluate self-efficacy across five core domains of EM. Median scores significantly improved in all domains between the pre- and post-internship assessments ($p < 0.001$ for all comparisons). The most substantial gain was observed in patient assessment and management, with median scores increasing from 55.0 (25–83) to 78.0 (48–90) ($Z = –7.222$, $p < 0.001$). Other domain-specific improvements were also statistically significant. In the domain of basic and advanced life support, the median score increased from 31.0 (range: 8–57) to 48.0 (range: 11–60) ($Z = –6.360$, $p < 0.001$). ED triage and patient management scores rose from 28.5 (8–50) to 41.0 (21–50) ($Z = –6.666$, $p < 0.001$). In vascular and airway management, the median score improved from 24.5 (6–58) to 32.0 (6–60) ($Z = –4.183$, $p < 0.001$). Similarly, electrocardiography interpretation and cardiovascular emergency management scores increased from 18.5 (4–37) to 30.0 (7–40) ($Z = –5.767$, $p < 0.001$). Comprehensive results are detailed in Tables 2 and 3, and changes in domain-specific scores are visualized in Figure 1.

The figure illustrates changes in median self-efficacy scores among final-year medical students before and after the two-month emergency medicine internship. The Medical Achievement Self-Efficacy Scale and five competency domains show significant upward trends. All domains demonstrated statistically significant improvements ($p < 0.001$ for all comparisons), except where noted.

Exploratory secondary analyses were conducted to assess whether self-efficacy scores differed according to gender or academic performance. No statistically significant differences were observed in overall MASS scores or domain-specific EM competency scores according to gender or academic performance ($p > 0.05$ for all). However, three individual MASS items demonstrated gender-based differences favoring female participants. These included higher self-efficacy in resolving communication conflicts with patients ($Z = –2.274$, $p = 0.023$), incorporating humanities-based reasoning into clinical decision-making ($Z = –2.183$, $p = 0.029$), and collaborating equitably with multidisciplinary team members ($Z = –1.976$, $p = 0.048$).

Discussion

This prospective observational pre–post study showed that a structured, two-month EM internship was associated with significant improvements in academic self-efficacy and perceived clinical competence among final-year medical students. Using the validated MASS and a curriculum-aligned competency assessment based on the National Core Medical Curriculum, we observed substantial improvements in participants' self-confidence, clinical reasoning, and readiness for independent medical practice. These findings underscore the critical role of immersive clinical education in bridging the gap between theoretical instruction and real-world clinical performance.

EM provides a demanding, high-acuity learning environment characterized by unpredictable case presentations, rapid decision-making, and interdisciplinary coordination. These features may strengthen self-efficacy through Bandura's proposed mechanisms, including mastery experiences, vicarious learning, verbal encouragement, and physiological engagement (6). In the present study, the observed improvements in patient assessment, cardiovascular emergencies, and life support skills likely reflect the educational value of supervised, hands-on participation in acute care. As a compulsory final-year rotation within Türkiye's medical education system, the structured EM internship may serve as an important bridge between clinical training and autonomous practice, consistent with previous studies reporting improved self-efficacy after experiential EM training (7,8).

Nonetheless, improvements were more limited in domains related to burnout recognition and stress management. This finding may reflect the emotional demands of adapting to shift-based emergency department workflows and the limited involvement of final-year medical students in high-stakes clinical decision-making. Therefore, structured debriefing, peer support, reflective learning, and simulation-based stress-management components may help strengthen resilience and psychological preparedness during EM internships.

Exploratory secondary analyses suggested selected gender-based differences in communication, interprofessional collaboration, and humanistic clinical reasoning, with higher self-efficacy scores among female participants. However, these findings should be interpreted cautiously because they were not part of the primary pre–post objective of the study. Previous literature suggests that interpersonal competencies may vary across gendered experiences within hierarchical clinical training environments (9). More importantly, the observed improvements in National Core Curriculum-aligned competencies, particularly triage-based patient management and diagnostic prioritization, support the value of structured undergraduate EM exposure. Such training may help students acquire transferable acute care skills before graduation and may reduce the need for compensatory postgraduate bridging experiences in settings where undergraduate acute care exposure is limited (10).

Participants also reported significant gains in procedural confidence, particularly in basic and advanced life support tasks such as cardiopulmonary resuscitation, defibrillation, and emergency medication administration (11). However, less progress was seen in advanced interventions such as surgical airway management and central venous access, likely due to their procedural complexity and limited availability to participants. Integrating simulation-based training for these high-risk, low-frequency procedures may improve competence while maintaining patient safety (12).

Electrocardiography (ECG) interpretation and cardiovascular emergency management showed marked improvement. Given that ECG proficiency typically evolves through cumulative clinical exposure (13,14), the rotation's emphasis on repeated real-time interpretation likely contributed to the observed gains. To further enhance ECG literacy, integrating structured modules and expert-led case reviews may accelerate skill acquisition without compromising the authenticity of experiential learning (11,15).

Limitations

Several limitations should be considered when interpreting these findings. First, the study relied on self-reported data, which may be influenced by social desirability and subjectivity, particularly in the post-internship phase. Although anonymity and unsupervised data collection were implemented to mitigate bias, self-assessments inherently lack objective corroboration.

Second, the reduced matched response rate represents an important limitation. Although 126 final-year medical students were eligible and 99 completed the pre-internship assessment, only 66 completed both pre- and post-internship assessments. This attrition may have introduced response bias and may limit the representativeness of the final matched sample, even for the local institutional context. Students who completed both assessments may have differed from non-completers in motivation, engagement with the internship, or perceived self-efficacy.

Third, the single-center design, conducted at a tertiary academic institution with established supervision protocols, may limit external generalizability. Fourth, the study evaluated only short-term changes in self-efficacy and did not include longitudinal follow-up to determine the sustainability of the observed improvements. Finally, the absence of objective performance metrics, such as simulation scores, observed structured clinical examinations, or supervisor evaluations, precludes direct correlation with actual clinical performance.

Conclusion

This study suggests that a structured, hands-on EM internship may improve academic self-efficacy and perceived clinical competence among final-year medical students. These findings support the integration of supervised, immersive EM rotations into undergraduate medical curricula to strengthen clinical reasoning, procedural confidence, and professional readiness. Future multi-center and longitudinal studies incorporating objective performance indicators are warranted to assess the durability of these improvements and their relationship with actual clinical performance.

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