



KNOWLEDGE, ATTITUDES, AND PRACTICES REGARDING FIRST AID AND EMERGENCY RESPONSE AMONG UNDERGRADUATE MEDICAL STUDENTS: AN ANALYTICAL CROSS-SECTIONAL STUDY

Balabaskaran S^{1*}, Solomon Rajkumar P², Surya B³, Navin Jawahar⁴, Porchelvan Swaminathan⁵, Seshalakshmi P⁶

¹Associate Professor, Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Centre, Ariyur, Puducherry, India.

²Assistant Professor, ³Associate Professor, ⁴Senior Resident, ⁵Professor of Biostatistics, Department of Community Medicine, Panimalar Medical College Hospital & Research Institute, Chennai, Tamil Nadu, India.

⁶MBBS Student, Panimalar Medical College Hospital & Research Institute, Chennai, Tamil Nadu, India.

Corresponding Author*: Dr. S. Balabaskaran, Associate Professor, Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Centre, Ariyur, Puducherry, India.

Email ID: balabaskaran93@gmail.com

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ABSTRACT

Background: Injuries and acute medical emergencies account for approximately 4.4 million deaths annually worldwide. Timely first aid during the critical “golden hour” can reduce mortality and disability, yet evidence on first aid preparedness among undergraduate medical students in India remains limited.

Objectives: To assess knowledge, attitudes, and practices (KAP) regarding first aid and emergency response among undergraduate MBBS students, and to examine associations between KAP domains and academic year, gender, and prior first aid training.

Methods: An analytical cross-sectional study was conducted among 406 undergraduate MBBS students (first to fourth year) at a tertiary care teaching institution in Chennai, India, selected by stratified random sampling with 104 students drawn from each academic year. Data were collected using a pre-tested, structured, self-administered multiple-choice questionnaire covering knowledge, attitude, and practice domains. Associations between KAP domains and sociodemographic variables were examined using Chi-square tests and odds ratios with 95% confidence intervals.

Results: The mean age was 21 ± 1.5 years; 49.8% were male and 50.2% female; 67% had received prior first aid training. Good knowledge was demonstrated by 40.4% of participants and poor knowledge by 35.2%. Attitude was predominantly positive (mean score: 20.38 ± 2.95), with 85.2% agreeing that first aid improves patient survival. Practice scores were lowest across domains (mean: 3.46 ± 1.76), with the weakest performance in airway obstruction (62.3% correct) and fracture management (66.5% correct). First-year students showed significantly higher odds of poor knowledge. Prior training was significantly associated with practice and attitude scores, though not in the expected direction. Female students demonstrated significantly better knowledge and practice than male students.

Conclusion: Medical students demonstrated varying levels of knowledge and generally positive attitudes towards first aid, although practical competency remained limited in selected emergency scenarios. Longitudinally integrated, competency-based first aid training with periodic reinforcement should be incorporated across all years of undergraduate medical education.

KEYWORDS: First Aid, Knowledge, Attitudes, Practices, Emergency Response, Undergraduate Medical Students, Medical Education, Cross-sectional Study, Basic Life Support, India.

Introduction

Injuries and acute medical emergencies account for approximately 4.4 million deaths annually worldwide, with a disproportionate burden falling on low- and middle-income countries[1]. A defining characteristic of traumatic emergencies is the narrow therapeutic window — the “golden hour” — during which early intervention substantially influences survival and functional recovery[2]. Evidence indicates that timely bystander care during this period can reduce trauma-related mortality by up to 30%, and the Law Commission of India has estimated that nearly half of all road accident deaths may be preventable through prompt first aid[3].

First aid is defined as the immediate assistance provided to an individual experiencing injury or sudden illness, with the objectives of preserving life, preventing deterioration, and promoting recovery until professional care becomes available[4]. Its application spans cardiac arrest, choking, haemorrhage, burns, fractures, poisoning, and other common emergencies, and effective delivery has been associated with reduced complication rates and improved survival outcomes without requiring specialist equipment or training[5].

A central barrier to timely first aid is the shortage of trained responders at the scene of emergencies. In India, pre-hospital care infrastructure remains limited, emergency medical services response times are variable, and bystander intervention rates are low[6]. Social hesitancy, fear of medico-legal consequences, and inadequate public awareness of basic emergency procedures compound this problem. Studies from India have documented poor awareness of cardiopulmonary resuscitation, haemorrhage control, and airway management even among educated adults, underscoring the need for structured first aid education across all healthcare-related disciplines[7].

Medical students are present across clinical, educational, and community settings and carry foundational biomedical knowledge that should translate into first aid competence. As future physicians, they will be expected to manage emergencies professionally and to support community awareness of emergency preparedness. Ensuring adequate first aid competency during undergraduate training therefore carries direct public health relevance beyond the individual clinical encounter.

Despite formal training exposure, medical students across multiple countries have demonstrated significant gaps in first aid knowledge, practical confidence, and emergency response skills. A cross-sectional study among medical and nursing students at Taibah University, Saudi Arabia, found that theoretical knowledge was reasonable but self-reported confidence in performing emergency

procedures — particularly basic life support scenarios — was considerably lower[8]. Khan et al. identified critical knowledge gaps in fracture management, burn care, and choking among Pakistani undergraduate medical students who had completed relevant clinical modules[9]. Among non-clinical populations such as school educators, deficits are more pronounced, reinforcing that systematic training is the principal driver of competency rather than incidental clinical exposure[10].

A structural feature of most undergraduate medical curricula contributes to this pattern. Emergency training tends to prioritise hospital-based scenarios where equipment and specialist support are accessible, while pre-hospital first aid — which demands rapid decision-making with minimal resources — receives comparatively little structured attention[11]. The result is a gap between theoretical familiarity with emergency concepts and practical readiness to apply them outside a clinical environment.

In the Indian context, the evidence base on first aid KAP among medical students remains limited. Joseph et al. examined first aid awareness among medical and health science students across Indian institutions and reported wide variability in knowledge scores alongside generally positive attitudes[7]. A more recent study by Solaman et al. found that attitude scores consistently exceeded practical competency, with moderate knowledge levels overall[12]. Heterogeneity in sampling methods and assessment tools across these studies limits cross-institutional comparison and reduces their utility for informing targeted curricular reform.

A further gap in the literature concerns the relationship between academic progression and first aid competency. Most existing studies treat medical student populations as a single group, overlooking potentially significant differences across training years. Stratified analysis by academic year is therefore essential for designing year-specific interventions. The role of prior formal first aid training in shaping competency has been similarly underexplored in the Indian setting. The present study was conducted to assess KAP regarding first aid and emergency response across all four undergraduate years at a tertiary care teaching institution in Chennai, India, and to examine associations between KAP domains and academic year, gender, and prior training exposure.

Materials and Methods

Study Design and Setting

This analytical cross-sectional study was conducted at Panimalar Medical College Hospital and Research Institute, a tertiary care teaching institution in Poonamallee, Chennai,

Tamil Nadu, India. The study was carried out over three months following approval by the Institutional Human Ethics Committee (IHEC; CDSCO Registration No. ECR/1399/Inst/TN/2020)

Study Population and Eligibility Criteria

The study population comprised undergraduate MBBS students enrolled from the first to the fourth year. Students willing to participate and who provided written informed consent were included. Those unavailable during the data collection period or who declined consent were excluded. Intern students were not eligible for inclusion.

Sample Size and Sampling Method

Sample size was calculated using nMaster software (Version 2.0) based on the single population proportion formula, assuming a 95% confidence level ($Z = 1.96$) and an absolute precision of 5%. Expected prevalence rates from Thirunavukkarasu et al.¹³ — knowledge 43.3%, attitude 38.9%, and practice 36.4% — yielded minimum sample sizes of 378, 365, and 356 respectively. The highest value (378) was adopted as the minimum requirement, and after accounting for a 10% non-response rate, the final target was 416 participants.

Stratified random sampling was employed to ensure representation across all academic years. The eligible population comprised 600 students, approximately 150 per batch. Each academic year constituted an independent stratum, from which 104 students were randomly selected using the random number function in Microsoft Excel applied to institutional roll number lists.

Data Collection Tool

Data were collected using a pre-tested, structured, self-administered questionnaire administered via Google Forms, distributed to selected participants through institutional email and class WhatsApp groups. Participants were instructed to complete the questionnaire independently in a single sitting without reference to external materials. Responses were recorded automatically in a secure Google Sheet accessible only to the investigators.

The questionnaire comprised four sections: basic sociodemographic information (age, gender, year of study); personal details; first aid knowledge assessed through multiple-choice questions covering CPR, burn management, the Heimlich manoeuvre, triage, hypoglycaemia, and unconsciousness; attitude assessed through items with five-point response options; and practice assessed through scenario-based multiple-choice questions covering severe bleeding, burns, airway obstruction, and fracture management.

Ethical Considerations

Written informed consent was obtained from all participants in English and Tamil prior to data collection. Participation was voluntary, and participants were informed of their right to withdraw at any stage without penalty. No personally identifiable information was included in the analysis. The study involved no invasive procedures and was classified under the minimal risk category as per the ICMR National Ethical Guidelines for Biomedical and Health Research Involving Human Participants (2017).

Statistical Analysis

Data were exported from Google Forms to Microsoft Excel for cleaning and coding, then imported into SPSS version 26 (IBM Corp., Armonk, NY, USA) for analysis. Descriptive statistics summarised sociodemographic characteristics and domain-wise responses; frequencies and percentages were reported for categorical variables and mean with standard deviation for continuous variables. Associations between KAP domains and academic year, gender, and prior training were examined using the Chi-square test. Odds ratios with 95% confidence intervals were calculated to quantify the strength of association, and a p-value below 0.05 was considered statistically significant.

Results

Sociodemographic Characteristics

Of 416 students approached, 406 completed the questionnaire, yielding a response rate of 97.6%. The mean age was 21 ± 1.5 years, with ages ranging from 18 to 25 years. Among respondents, 202 (49.8%) were male and 204 (50.2%) females. Approximately 67% reported having received prior first aid training.

Knowledge Domain

Responses to individual knowledge items are presented in Table 1. The highest correct response rates were observed for recognition of CPR (85.0%) and the importance of rapid intervention in severe bleeding (80.3%). Correct identification of the compression-to-ventilation ratio for adult CPR was achieved by 73.6% of participants, and the correct definition of an open fracture by 71.4%. Knowledge of the golden hour in trauma care was adequate among 73.4%. The lowest correct response rate (54.9%) was observed for the item on resource requirements, where less than half of the remaining participants correctly identified that first aid does not require expensive equipment.

Based on predefined scoring criteria, 164 participants (40.4%) demonstrated good knowledge, 99 (24.4%) moderate knowledge, and 143 (35.2%) poor knowledge. The mean knowledge score was 4.39 ± 1.68 .

Table 1: Knowledge domain responses among participants (n = 406)

Knowledge item	Correct n (%)	Incorrect n (%)
What does CPR stand for	345 (85.0)	61 (15.0)
Correct compression-to-ventilation ratio for adult CPR	299 (73.6)	107 (26.3)
Correct definition of an open fracture	290 (71.4)	116 (28.6)
Importance of rapid intervention in severe bleeding	326 (80.3)	80 (19.7)
First aid does not require expensive equipment	223 (54.9)	183 (45.1)
The golden hour in trauma care	298 (73.4)	108 (26.6)

Attitude Domain

Attitude towards first aid was predominantly positive across the cohort. A large majority (85.2%) agreed that individuals with adequate knowledge should not hesitate to provide first aid, and the same proportion agreed that first aid improves patient survival. Support for inclusion of first aid training in the undergraduate curriculum was expressed by 83.3%, and 79.3% believed that first aid reduces the burden on hospitals. The lowest proportion of positive responses was observed for willingness to teach first aid techniques to fellow students (61.1%). The mean attitude score was 20.38 ± 2.95 .

Table 2: Attitude domain responses among participants (n = 406)

Attitude item	Positive n (%)	Negative n (%)
Individuals with first aid knowledge should not hesitate to use it	346 (85.2)	60 (14.8)
Support for including first aid in medical curriculum	338 (83.3)	68 (16.7)
Willingness to teach first aid to fellow students	248 (61.1)	158 (38.9)
First aid reduces the burden on hospitals	322 (79.3)	84 (20.7)
First aid increases patient survival rates	346 (85.2)	60 (14.8)

Practice Domain

Practice scores were the lowest across all three domains, with a mean of 3.46 ± 1.76 . The highest correct response rate was observed for management of severe leg bleeding (77.8%), followed by burn management involving clothing adhered to skin (73.4%) and simple burn management (65.5%). Correct responses to the fracture management scenario were provided by 66.5% of participants, and airway obstruction management recorded the lowest correct response rate at 62.3%.

Table 3: Practice domain responses among participants (n = 406)

Practice scenario	Correct n (%)	Incorrect n (%)
Management of severe leg bleeding (gunshot wound)	316 (77.8)	90 (22.2)
Management of a hand burn	266 (65.5)	140 (34.5)
Clothing adhered to burnt skin	298 (73.4)	108 (26.6)
Airway obstruction due to food bolus	253 (62.3)	153 (37.7)
Suspected thigh fracture management	270 (66.5)	136 (33.5)

Mean Scores Across Domains

Table 4: Mean and standard deviation of KAP domain scores (n = 406)

Domain	Mean	Standard Deviation
Knowledge	4.39	1.68
Attitude	20.38	2.95
Practice	3.46	1.76

Association Analyses

Associations between knowledge level and prior training, academic year, and gender are presented in Tables 5–8. No significant association was observed between prior first aid training and knowledge level ($p = 0.207$). First-year students

showed markedly higher odds of poor knowledge compared to other years (OR = 6.597; 95% CI: 2.921–14.898; $p < 0.001$), while second-year ($p = 0.015$) and fourth-year students ($p = 0.001$) demonstrated significantly lower odds of poor knowledge. No significant association was observed among third-year students ($p = 0.105$).

Prior first aid training was significantly associated with practice level ($p = 0.003$), with students who had not received prior training demonstrating lower odds of poor practice than those who had. Second-year students showed lower odds of poor practice ($p = 0.005$), while third-year students showed higher odds ($p = 0.005$). No significant association was observed for first-year or fourth-year students.

Prior training was also significantly associated with attitude ($p < 0.001$), with untrained students demonstrating more positive attitude scores. Second-year students showed higher odds of poor attitude (OR = 3.166; 95% CI: 1.861–5.383; $p < 0.001$), while fourth-year students demonstrated lower odds (OR = 0.411; 95% CI: 0.290–0.669; $p < 0.001$). No significant association was observed for first-year or third-year students.

Male students demonstrated higher odds of poor knowledge (OR = 1.905; 95% CI: 1.274–2.849; $p = 0.002$) and poor practice (OR = 2.256; 95% CI: 1.511–3.366; $p < 0.001$) compared to female students. No significant gender difference was observed for attitude ($p = 0.545$).

Table 5: Association between knowledge domain and prior first aid training and academic year

Variable	Poor n (%)	Good n (%)	OR	p-value	95% CI
Prior training: No	74 (55.2)	60 (44.8)	0.763	0.207	0.502–1.161
Prior training: Yes	168 (61.8)	104 (38.2)			
1st year	55 (88.7)	7 (11.3)	6.597	<0.001	2.921–14.898
2nd year	42 (48.3)	45 (51.7)	0.555	0.015	0.344–0.896
3rd year	77 (65.8)	40 (34.2)	1.445	0.105	0.925–2.263
4th year	68 (48.6)	72 (51.4)	0.499	0.001	0.329–0.758

Table 6: Association between practice domain and prior first aid training and academic year

Variable	Poor n (%)	Good n (%)	OR	p-value	95% CI
Prior training: No	61 (45.5)	73 (54.5)	0.534	0.003	0.351–0.811
Prior training: Yes	166 (61.0)	106 (39.0)			
1st year	41 (66.1)	21 (33.9)	1.658	0.078	0.941–2.924
2nd year	37 (42.5)	50 (57.5)	0.502	0.005	0.311–0.812
3rd year	78 (66.7)	39 (33.3)	1.879	0.005	1.200–2.942
4th year	71 (50.7)	69 (49.3)	0.726	0.126	0.481–1.095

Table 7: Association between attitude domain and prior first aid training and academic year

Variable	Poor n (%)	Good n (%)	OR	p-value	95% CI
Prior training: No	53 (39.6)	81 (60.4)	0.418	<0.001	0.274–0.638
Prior training: Yes	166 (61.0)	106 (39.0)			
1st year	27 (43.5)	35 (56.5)	0.611	0.074	0.354–1.054
2nd year	65 (74.7)	22 (25.3)	3.166	<0.001	1.861–5.383
3rd year	70 (59.8)	47 (40.2)	1.399	0.130	0.905–2.164
4th year	57 (40.7)	83 (59.3)	0.411	<0.001	0.290–0.669

Table 8: Association between gender and KAP domains

Domain	Variable	Poor n (%)	Good n (%)	OR	p-value	95% CI
Knowledge	Male	136 (56.2)	106 (43.8)	1.905	0.002	1.274–2.849
	Female	66 (40.2)	98 (59.8)			
Practice	Male	133 (58.6)	94 (41.4)	2.256	<0.001	1.511–3.366
	Female	69 (38.5)	110 (61.5)			
Attitude	Male	112 (51.1)	107 (48.9)	1.128	0.545	0.763–1.667
	Female	90 (48.1)	97 (51.9)			

Discussion

The present study assessed KAP regarding first aid and emergency response among 406 undergraduate medical students across all four years of the MBBS programme at a tertiary care teaching institution in Chennai, India. While a substantial proportion demonstrated satisfactory knowledge and a positive attitude towards first aid, practical competency was comparatively weaker. Academic year was significantly associated with all three domains, and gender differences were observed in knowledge and practice but not in attitude.

Knowledge

Good knowledge was demonstrated by 40.4% of participants, while 35.2% scored in the poor category. Performance was strongest on basic conceptual items — recognition of CPR and the importance of rapid intervention in severe bleeding — whereas only 54.9% correctly identified that first aid does not require expensive equipment. This specific misconception may discourage bystander response in community settings where improvised materials are the only option available, and it represents a practical gap rather than a theoretical one.

These findings are broadly consistent with comparable studies. Joseph et al., in a cross-sectional study among medical and health science students across Indian institutions, similarly reported adequate awareness of basic emergency concepts alongside identifiable gaps in applied understanding[7]. Albadrani et al. among medical and nursing students in Saudi Arabia found that theoretical knowledge was reasonable but procedural knowledge remained inconsistent[8]. The pattern — stronger performance on recognition-based items and weaker performance on applied judgment — reflects a curricular tendency to prioritise didactic instruction over scenario-based learning that has been noted across multiple healthcare training contexts.

Attitude

Attitude towards first aid was highly positive across the cohort, with strong agreement that knowledge should translate into action, that first aid improves patient survival, and that formal training should be incorporated into the undergraduate curriculum. These findings align with prior literature reporting favourable attitudes among medical students towards emergency preparedness[8,10].

The lower proportion of students willing to teach first aid techniques to peers (61.1%), compared to endorsement on all other attitude items, is consistent with findings from Abdelrahman et al., who observed that positive attitudes did not uniformly translate into readiness to act in emergency situations[10]. The gap between endorsing first aid in principle and actively engaging in its dissemination is more coherently explained by the lower practice scores observed in the same cohort than by any attitudinal ambivalence.

Practice

Practice scores were the lowest of the three domains. The highest correct response rate was for severe bleeding management, while airway obstruction recorded the lowest at 62.3%. This distribution is clinically relevant: airway compromise is among the most time-critical pre-hospital emergencies, and a correct response rate below two-thirds among future physicians identifies a specific gap warranting targeted curricular attention.

The discrepancy between knowledge and practice scores recurs in the KAP literature on first aid among healthcare students. Khan et al. reported analogous findings among Pakistani medical undergraduates, where familiarity with emergency procedures did not reliably predict correct scenario responses[9]. Solaman et al. similarly observed that practical competency lagged behind both knowledge and attitude in a recent Indian study[12]. Knowledge acquisition without structured opportunities for applied practice does not reliably produce emergency response competency — a finding with direct implications for how first aid content is delivered within undergraduate curricula. The present study assessed practice through scenario-based multiple-choice questions, which evaluate intended responses rather than observed performance, and this constraint should be considered when interpreting these results.

Academic Year and KAP

First-year students demonstrated markedly higher odds of poor knowledge, which is expected at this stage of training. The significantly lower odds of poor knowledge among second-year and fourth-year students suggest that curriculum progression contributes to knowledge acquisition, likely through increasing clinical exposure and repeated encounter with emergency concepts. A similar pattern was observed for attitude among fourth-year students, consistent with the view that clinical experience reinforces appreciation for the value of prompt emergency intervention.

The pattern for practice was less consistent. Second-year students performed better than first-year students, but third-year students showed higher odds of poor practice, with no significant finding among fourth-year students. This non-linear trajectory suggests that practical skill development does not follow the same course as knowledge acquisition, and may reflect variability in structured practical training opportunities across different stages of the curriculum. Students in transitional clinical years may encounter settings where first aid skills are assumed rather than formally taught, creating gaps that do not self-resolve without deliberate reinforcement.

The higher odds of poor attitude among second-year students alongside more favourable attitudes among fourth-year students may reflect adjustment to the early clinical environment, where students encounter the complexity of real patient care. By the final undergraduate year, increasing

clinical exposure appears associated with more positive attitudes towards emergency response. These observations suggest that first aid training interventions should be distributed across the programme rather than concentrated in a single year, with content and assessment calibrated to each stage of training.

Prior First Aid Training

Approximately 67% of participants had received prior first aid training, yet knowledge and practice gaps persisted. The absence of a significant association between prior training and knowledge level suggests that single-exposure training does not reliably sustain long-term retention — a pattern documented in the resuscitation education literature, where knowledge decay following one-time training has been reported within months of instruction[5].

Students without prior training demonstrated better practice and attitude scores than those with prior training, a finding that should be interpreted with caution. The binary classification of training status does not account for the type, duration, recency, or quality of training received, and the trained group is likely heterogeneous in ways the data cannot resolve. This finding does not argue against first aid training; it suggests that exposure alone is an insufficient marker of training effectiveness. Periodic reinforcement and competency-based assessment are likely more effective in sustaining knowledge and practical skills than single training events, regardless of format.

Gender Differences

Male students demonstrated higher odds of poor knowledge and poor practice than female students, while no significant gender difference was observed in attitude. The absence of an attitudinal difference alongside performance differences in knowledge and practice indicates that motivational orientation towards first aid is comparable between genders, but knowledge acquisition and applied performance differ. The reasons for this cannot be determined from the present data, and further studies with larger and more geographically diverse samples are needed before any conclusions can be drawn.

Implications for Undergraduate Medical Education

The persistence of practice gaps despite prior training in the majority of participants, the non-linear development of practical skills across academic years, and the specific deficit in airway management collectively identify areas where the current undergraduate curriculum warrants review. First aid training that is competency-based, longitudinally distributed, and assessed through practical performance — rather than delivered as a standalone event — is more likely to produce durable emergency response skills. Simulation-based learning and scenario-driven workshops offer evidence-informed approaches to bridging the gap between knowledge and practice, and their integration

at defined points across the undergraduate programme represents a practical, achievable curricular intervention.

Strengths and Limitations

The stratified sampling design ensured proportional representation across all four undergraduate years, and a response rate of 97.6% minimises non-response bias. The inclusion of scenario-based practice items provides a closer approximation to applied competency than recall-only assessments.

The single-institution design limits generalisability to other medical colleges or curricula. The cross-sectional study design precludes causal inference, and the self-administered questionnaire format introduces potential social desirability bias. Practice was evaluated through intended responses to scenarios rather than direct observation of performance, which may not accurately reflect real-world emergency competency. Association analyses were conducted as crude odds ratios without adjustment for confounding variables and should be interpreted descriptively. The binary classification of prior training does not capture heterogeneity in type, recency, or quality of training received, which may have influenced the direction of some associations.

Conclusion

Undergraduate medical students demonstrated varying levels of knowledge and generally positive attitudes towards first aid and emergency response, although practical competency remained limited in several emergency scenarios. Academic year was associated with performance across all three domains, though practical skill development did not follow a uniformly progressive pattern across training years. Prior first aid training did not consistently translate into better knowledge or practice scores, reinforcing that single-exposure training is insufficient to sustain competency. These findings support the integration of competency-based, periodically reinforced first aid training distributed across the undergraduate curriculum rather than concentrated at a single point. Future multicentre studies incorporating objective assessment of practical skills and longitudinal follow-up would strengthen the evidence base for curricular reform in undergraduate emergency preparedness.

Conflicts of interest

The authors declare no conflicts of interest.

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