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Trauma-Informed Care in Emergency Ultrasound (TIES): A prospective matched patient-clinician survey study

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ABSTRACT

Objectives: Point-of-care ultrasound (POCUS) is widely used in emergency departments (EDs) but often requires close patient contact and body exposure, which may increase patient vulnerability. Trauma-informed care (TIC) principles have not been formally studied in the context of POCUS. This study aimed to evaluate and compare patient and clinician perspectives on TIC behaviors during ED POCUS.

Methods: We conducted a cross-sectional study at two urban academic EDs using matched patient-clinician surveys. The Trauma-Informed Emergency Sonography (TIES) survey was developed following a seven-step framework, including literature review, expert content validation, cognitive interviews, and pilot testing. The survey assessed behaviors across the six core TIC domains using 5-point Likert-scale items. Patients completed 26 experience-related items and clinicians completed 29 behavior-related items following each POCUS encounter. Responses were summarized as percent agreement and compared between matched pairs using Wilcoxon signed-rank tests.

Results: Among 143 matched patient-clinician pairs, patients consistently reported higher agreement with TIC practices than clinicians reported performing. The largest differences were in informing patients they could stop the exam (77% patients vs 45% clinicians, $p < 0.001$), asking about companion preferences (78% vs 48%, $p < 0.001$), and allowing time to redress before discussing results (87% vs 56%, $p < 0.001$). Significant differences were observed in four of six TIC domains: empowerment, voice, and choice ($p = 0.001$); peer support ($p < 0.001$); trustworthiness and transparency ($p = 0.024$); and collaboration and mutuality ($p = 0.035$). Clinicians with prior TIC training and advanced practice providers demonstrated stronger alignment with TIC behaviors.

Conclusion: Patients perceived their POCUS experience as more trauma-informed than clinicians recognized in their own practice, with the largest differences in communication, consent, and eliciting patient preferences. The TIES survey may serve as an exploratory tool to assess TIC behaviors during ED POCUS encounters and inform future training efforts.

1. Introduction

1.1. Background

Point-of-care ultrasound (POCUS) is an essential diagnostic tool in emergency medicine (EM), that allows for rapid bedside assessment, early diagnosis, guides procedures with improved efficacy and safety,

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and can reduce reliance on more time-consuming, and invasive tests [1-5]. However, POCUS often requires close patient contact and body exposure and in emergent situations it may be performed rapidly and under pressure, with limited time for extended communication, which may increase patient vulnerability and discomfort [6-10]. Recent work in EM practice suggests that trauma-informed care (TIC) approach can improve patient trust and satisfaction, especially during close contact diagnostic or procedural practices [11-15].

TIC is an approach that recognizes the widespread impact of trauma and responds by integrating this knowledge into policies, procedures, and practices, while actively seeking to resist re-traumatization. This framework emphasizes six domains: (1) safety, (2) trustworthiness and transparency, (3) peer support, (4) collaboration and mutuality, (5) empowerment, voice, and choice, and (6) cultural, historical, and gender sensitivity [16,17]. In doing so, TIC is important for improving the accessibility of healthcare, particularly for patients with histories of trauma. This is critical in the ED because trauma exposure is strongly associated with adverse mental health outcomes, including anxiety, depression, post-traumatic stress disorder, and substance use disorders, as well as physical health consequences such as chronic pain, cardiovascular disease, and increased healthcare utilization [11,16,18]. While TIC has been widely integrated into mental health and substance use treatment settings, its broader implementation in EM practice remains limited [18-22]. In the ED, patients often present during or shortly after an acute stressor, injury, trauma, or interpersonal violence. The ED environment is characterized by urgency, unpredictability, and high emotional intensity which can potentially evoke feelings of vulnerability [7,23].

Despite established training frameworks for ultrasound education, to our knowledge current EM ultrasound curricula have not formally incorporated TIC training [24-26]. While TIC assessment tools exist for general EM and mental health settings, no validated tool has been developed specifically for POCUS exams, which required us to create a novel survey instrument [12,27-31].

To address this gap, we developed the Trauma-Informed Emergency Sonography (TIES) survey, a novel instrument designed to assess TIC integration during POCUS exams. The objective of this study was to evaluate and compare patient and clinicians' perspectives of TIC behaviors during ED POCUS, using matched surveys. By identifying areas of concordance and discordance between patient experiences and clinician self-reported behaviors, we aimed to highlight opportunities for improvement and inform future training and practice initiatives.

2. Methods

2.1. Study design and setting

This was a cross-sectional study conducted at two high volume with >120,000 visits per year, urban, tertiary care academic EDs from two different states, Massachusetts and Colorado. The same matched survey design was used to evaluate perspectives on TIC behaviors during POCUS at both sites. All participants, including patients and clinicians provided verbal informed consent prior to enrollment. For patients, research staff explained the study purpose, voluntary participation, and data confidentiality before obtaining verbal consent and if they agreed they were provided the survey for completion. Clinicians were approached and consented after completing each POCUS exam, not pre-consented as a group.

Institutional review board approval was obtained at both sites: Hospital A IRB #2023P000071 and Hospital B IRB# 23–0927.

2.2. Selection of participants

Patients and clinicians were enrolled using convenience sampling during weekday hours from 8:00 AM to 9:00 PM, when trained research staff were available. Participants were approached following completion of the POCUS exam, and eligible encounters were approached consecutively when feasible. Missed encounters most commonly occurred during surges or concurrent enrollments.

Eligible patients were adults 18 years or older who underwent a diagnostic POCUS exam performed by EM clinicians, APPs, residents, or attendings, as part of routine clinical care. At both sites, APPs work alongside residents and attending physicians across all ED care areas and perform diagnostic POCUS within their institutional scope of practice. To minimize the Hawthorne effect, clinicians were consented after completing each exam, and they were unaware of being targeted to be surveyed during the exam. Clinicians were eligible if they performed the POCUS exam and were present in the ED when surveys were collected. Surveys were completed within 6 h of the exam to minimize recall bias and majority of response were collected withing first 1–2 h after completion of POCUS exams. If two clinicians were involved, the performer of the POCUS was surveyed. To avoid repeat responses and reduce the chance of being aware of study enrollment, clinicians could only be enrolled once per shift. Surveys were collected without clinician identifying information to encourage honest and more accurate responses.

Patients were excluded if they were clinically unstable, pregnant, under custody, had a POCUS completed for teaching or procedural reasons, had an exam done by a non-EM provider, or if the POCUS was performed by a study team member. Clinicians were not informed of specific study hypotheses and were told only that the study evaluated patient and clinician experiences during POCUS encounters. Surveys were administered at the encounter level and were not linked longitudinally to individual clinicians; therefore, repeat participation could not be definitively excluded.

2.3. Intervention

The TIES survey instrument was developed using the seven-step process described by Artino et al. (2014) [32]. Both the patient and clinician surveys were developed in parallel using the seven-step survey development framework. First, a literature review was conducted to review existing survey instruments and theoretical models regarding participant experiences within the domains of TIC. Following literature review, semi-structured interviews were conducted by two investigators (DV and HS) among EM clinicians and patients regarding their experiences during POCUS. Results from the literature review and interviews were synthesized to further elucidate the constructs of interest, specifically patient and provider experiences of POCUS within the six domains of TIC. Preliminary survey items were then developed, and content validity of the survey was established by an interactive process of review by six content experts across three institutions, including EM physicians with expertise in POCUS, allied health professionals with expertise in TIC, and physicians with expertise in survey instrument development. After revision of the survey items based on expert feedback, cognitive interviews were conducted using the verbal probing technique with ED patients meeting the study's inclusion criteria. The clinician survey underwent parallel cognitive interviews with 9 EM clinicians including 2 attending, 3 residents, and 4 APPs by using the same verbal probing technique. Survey items were revised iteratively to address issues in comprehension, retrieval, judgement, and selection that arose during survey administration. Interviews were coded using in vivo and inductive codes within Microsoft Word Version 16.0 (Microsoft Corporation, Redmond, WA). Cognitive interviews were conducted until coding saturation was achieved and evidence of response process validity was obtained.

During pilot testing with 30 ED patients and their matched clinicians, we assessed: (1) variance by checking that responses were spread across all answer choices rather than clustered at one end; (2) reliability by calculating Cronbach's alpha for each TIC domain, with all six domains showing acceptable internal consistency ($\alpha > 0.70$); and (3) validity by reviewing response patterns, completion rates, and confirming

that questions measured what they intended to measure. Based on these results, we removed 3 poorly performing items, revised wording of 5 items for clarity, and reordered 2 demographic questions. No new items were added, resulting in the final 26-item patient survey and 29-item clinician survey (Appendix 1, 2).

2.4. Measurements

The final TIES instrument consisted of two parallel surveys administered to patients and clinicians. All experience-related items were rated on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." A 'not applicable' option was included in two questions where reasonable. The patient survey included seven demographic questions including age, gender, sexual orientation, race, ethnicity, primary language, and education level, and 26 items focused on the POCUS experience. Clinical context variables including ED unit, care area, ESI level, and ultrasound location were collected by study team members or abstracted from the electronic medical record (Appendix 1). The clinician survey included five demographic questions including gender, training level, years in EM practice, POCUS volume per week, and TIC familiarity, and 29 items assessing clinician-reported behaviors during the exam (Appendix 2).

Surveys were administered using REDCap on password-protected iPads [33]. Participants completed surveys independently on iPads after brief orientation from RAs. For non-English speaking participants, bilingual research staff or professional interpreters assisted with consent and clarified questions as needed, but participants entered their own responses. Eligible participants were identified and approached by trained study team members not involved in clinical care. Enrollment took place over 6 months at each site: January–June 2024 at Hospital B and May–October 2024 at Hospital A. The 6-month enrollment period was based on our sample size calculation in which we anticipated 94–134 matched pairs needed, availability of research staff, and expected enrollment rate from pilot data. To reduce bias, clinicians were not informed of study objectives, and patients were approached only after their POCUS exam. For non-English speaking participants, professional medical interpreters assisted with consent and survey completion. Surveys were excluded if either the patient or clinician completed fewer than 20 questions, or if matched responses were missing.

2.5. Outcomes

"Responses of "agree" and "strongly agree" on the TIC Likert-scale were both categorized as percent agreement. We used a 5-point Likert scale during data collection to capture the full range of participant responses and preserve granularity. The decision to combine "agree" and "strongly agree" for the primary analysis was made to facilitate clinical interpretation and comparison between matched pairs, as this dichotomization represents clinically meaningful agreement with TIC behaviors. Survey items were grouped into six TIC domains: (1) safety, (2) trustworthiness and transparency, (3) peer support, (4) collaboration and mutuality, (5) empowerment, voice, and choice, and (6) - cultural, historical, and gender sensitivity. Figure 1 demonstrates a summary of TIES domains. (See Fig. 1.)

2.6. Analysis

Patient demographics and clinician characteristics were summarized using medians with interquartile ranges for continuous variables and frequencies with percentages for categorical variables. Responses to individual survey items were analyzed using descriptive statistics. Median Likert scores were compared between matched patient-clinician pairs using Wilcoxon signed-rank tests.

For each participant, a median score was calculated for each TIC domain. Domain-level comparisons between patient and clinician responses were also performed using matched Wilcoxon signed-rank tests. Subgroup analyses examined whether patient demographics (age, gender, education level) and clinician characteristics (training level, experience) were associated with differences within domains. A two-sided alpha of 0.05 was used to determine statistical significance. All analyses were completed using R Version 4.3.0.35 [34].

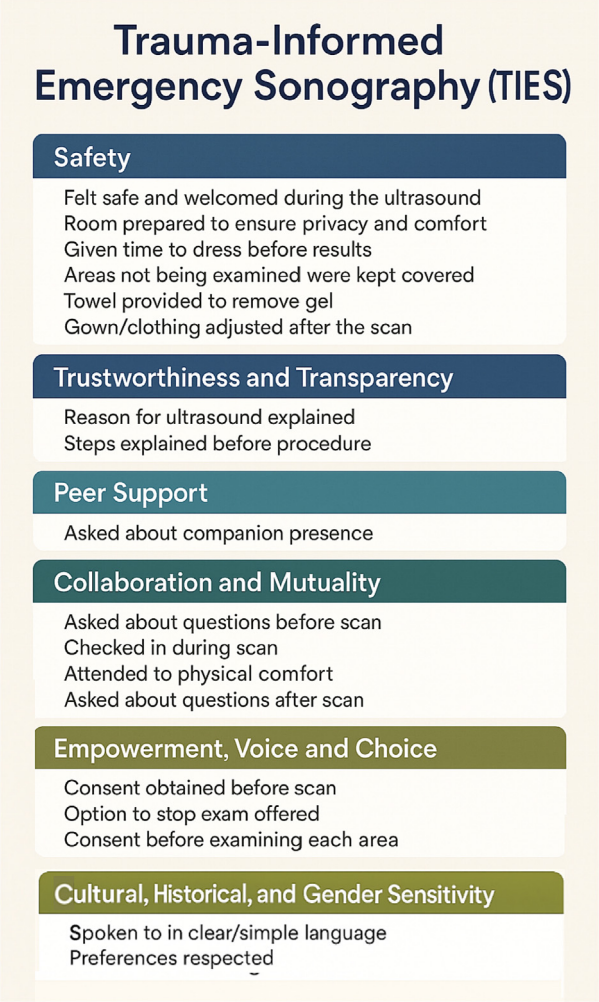

Fig. 1. Trauma-Informed Emergency Sonography (TIES) Core Domains.

2.7. Sample size calculation

Based on a sample size calculation for a Wilcoxon signed-rank test for matched pairs, we identified that we needed between 94 and 134 participants to achieve an effect size between $d = 0.25$ and $d = 0.30$, assuming 80% power and an alpha level of 0.05. Sample size calculations were completed with G*Power 3.1 (University of California, Los Angeles) [35].

3. Results

3.1. Study population

During the study period, approximately 4300 clinical diagnostic POCUS exams were performed at both sites during weekday daytime hours when research staff were available, excluding procedural, weekend, and overnight scans. Of these 176 patient encounters screened, 143 matched patient-clinician pairs were included in the final analysis, 100 from Hospital A, and 43 from Hospital B, after excluding 33 cases

due to incomplete data or lack of matched patient-clinician responses. Missed encounters most commonly occurred during high-volume periods or when several eligible patients were present at the same time. Approximately 65 unique clinicians participated, with enrollment limited to once per shift. Surveys were de-identified without linkage to individual clinicians, so per-clinician scan counts could not be determined. Patient and clinician characteristics are summarized in Tables 1 and 2.

3.2. Patient characteristics

The median patient age was 55 years (IQR 32), and 52% were female. Most patients (68%) were ESI level 3 or 4, and cardiac indications were the most common reason for POCUS (39%). While most scans occurred in private rooms (64%), 34% were performed in hallways or curtained spaces. (Table 1).

3.3. Clinician characteristics

APPs comprised the majority of clinicians (58%), followed by residents (34%) and attendings/fellows (8%). The median clinician age was 31 years (IQR 4), and 53% were female. 67% of clinicians reported familiarity with TIC principles (Table 2). At both sites, APPs routinely perform diagnostic POCUS within departmental credentialing pathways; however, the distribution of clinician types in this sample may not reflect the overall distribution of POCUS operators across all shifts and locations.

3.4. Patient and clinician perspectives on TIC During POCUS

Patient and clinician responses to individual TIC-related items are presented in Table 3. Overall, patients reported positive experiences across most TIC domains, with agreement rates exceeding 75% for most items. However, patients consistently rated their experiences more positively than clinicians rated their own performance.

The most pronounced discrepancies between patient perception and clinician self-report were observed in the following areas:

Table 1
Patient Characteristics ($N = 143$).

Characteristic	n (%)
Age, years (median [IQR])	55 (32)
Gender	
Female	75 (52%)
Male	65 (45%)
Other	3 (2%)
Primary language	
English	117 (82%)
Spanish	26 (18%)
Education	
High school, some college, or associate degree	79 (55%)
Bachelor's degree or higher	47 (33%)
Missing	17 (12%)
Emergency Severity Index (ESI)	
ESI 1 or 2	40 (28%)
ESI 3 or 4	97 (68%)
Missing	6 (4%)
Type of ultrasound	
Cardiac	56 (39%)
Abdominal	36 (25%)
Pelvic	16 (11%)
Other	35 (24%)
Exam location	
Room with a door	91 (64%)
Room with a curtain	18 (13%)
Hallway with curtain	9 (6%)
Hallway	22 (15%)
Missing	3 (2%)

TIES, Trauma-Informed Emergency Sonography; IQR, interquartile range; ESI, emergency severity index.

Table 2
Clinician Characteristics (N = 143).

Characteristic	n (%)
Age, years (median [IQR])	31 (4)
Missing age	52 (36%)
Gender	
Female	76 (53%)
Male	67 (47%)
Level of training	
Attending or Fellow	12 (8%)
Resident	48 (34%)
Advanced Practice Provider	83 (58%)
Years in EM practice	
< 2 years	71 (50%)
2 to 5 years	52 (36%)
5 to 10 years	14 (10%)
>10 years	6 (4%)
Ultrasounds performed per week	
< 5	33 (23%)
5 to 10	74 (52%)
>10	35 (24%)
Missing	1 (1%)
Familiar with trauma informed care	
Yes	96 (67%)
No	45 (31%)
Missing	2 (1%)

TIES, Trauma-Informed Emergency Sonography; IQR, interquartile range; ESI, emergency severity index; EM, emergency medicine.

Informing patients they could stop the exam: 77% of patients vs 45% of clinicians ($p < 0.001$).
Explaining the procedure beforehand: 72% of patients vs 55% of clinicians ($p = 0.002$).
Asking about companion preferences: 78% of patients vs 48% of clinicians ($p < 0.001$).
Allowing time to redress before discussing results: 87% of patients vs 56% of clinicians ($p < 0.001$).
Inviting questions before the exam: 84% of patients vs 50% of clinicians ($p < 0.001$).

3.5. TIC domain-level comparisons

When survey items were aggregated into the six TIC domains (Table 4), statistically significant differences were observed in four domains, with patients consistently reporting higher scores than clinicians. The largest gap was in Peer Support (78% patient vs 48% clinician agreement, $p < 0.001$).

3.6. Subgroup analyses

Patient responses were largely consistent across demographic subgroups (Table 5), with a few exceptions: younger patients,18–64 years, reported higher agreement in the Cultural, Historical, and Gender Sensitivity domain ($p = 0.019$), and patients with lower education levels reported higher agreement in the Empowerment, Voice, and Choice domain ($p = 0.006$). Male patients reported higher agreement in the Peer Support domain compared to female patients (85% vs 72%, $p = 0.043$). Among clinicians (Table 6) female clinicians reported higher agreement in the Empowerment (75% vs 60%, $p = 0.021$) and Peer Support (56% vs 38%, $p = 0.027$) domains compared to male clinicians. APPs demonstrated higher concordance with patient responses compared to residents and attendings in the Empowerment ($p = 0.001$), Peer Support ($p = 0.027$), and Collaboration and Mutuality ($p = 0.013$) domains. Clinicians with lower weekly POCUS volume (≤5 per week) showed higher concordance in the Empowerment domain ($p = 0.021$). Additionally, clinicians familiar with TIC principles were more likely to endorse behaviors aligned with the Safety ($p = 0.029$) and Collaboration and Mutuality ($p = 0.003$) domains.

Table 3
Patient and Clinician Responses to Individual Trauma-Informed Care Survey Items.

Domain	Survey Item	Patient Agreement (%)	Clinician Agreement (%)	*p*-value
Safety	Felt safe and welcomed during the ultrasound	99%	93%	0.15
	Room prepared to ensure privacy and comfort	87%	78%	0.10
	Given time to dress before results	82%	56%	<0.001
	Areas not being examined were kept covered	97%	94%	0.35
	Towel provided to remove gel	92%	84%	0.44
	Gown/clothing adjusted after the scan	85%	80%	0.28
Trustworthiness and Transparency	Reason for ultrasound explained	82%	83%	0.88
	Steps explained before procedure	71%	55%	<0.001
Peer Support	Asked about companion presence	78%	48%	0.01
Collaboration and Mutuality	Asked about questions before scan	76%	50%	<0.001
	Checked in during scan	76%	66%	0.06
	Attended to physical comfort	97%	85%	<0.001
	Attended to emotional needs	89%	83%	0.18
	Asked about questions after scan	69%	64%	0.37
Empowerment, Voice and Choice	Consent obtained before scan	90%	82%	0.18
	Option to stop exam offered	59%	45%	<0.001
	Consent before examining each area	93%	76%	<0.001
Cultural, Historical, and Gender Sensitivity	Spoken to in clear/simple language	80%	80%	0.44
	Preferences respected	98%	90%	0.02

Notes: Agreement reflects combined responses of "agree" or "strongly agree" on a 5-point Likert scale. Wilcoxon signed-rank test was used to compare matched patient-clinician responses.

4. Discussion

To our knowledge, no validated TIC survey exists for POCUS, therefore we developed the TIES instrument. Validity was established through expert review, cognitive interviews with patients and clinicians, and pilot testing demonstrating acceptable internal consistency (Cronbach's $\alpha > 0.70$) across all TIC domains.

The observed differences between patient and clinician responses may reflect several factors. Clinicians may perform TIC behaviors automatically without consciously recognizing them, especially when these practices are part of their routine care. Patients may perceive care as trauma-informed based on the overall interaction, respectful communication, or feeling safe, even if specific TIC behaviors were not explicitly performed. True differences in perception may also exist between what clinicians believe they communicated and what patients experienced. Question wording was carefully matched between patient and clinician surveys during cognitive interviewing to reduce survey design as a source of these differences.

One key finding was variability in behaviors related to patient empowerment during the exam. This variability should be interpreted within the context of ED practice rather than as deficiencies in care. For example, 23% of patients said they were not told they could stop the exam at any time, and 28% reported not receiving an explanation of steps before starting. In high-stress situations where patients may feel exposed or anxious, a reminder that they can pause or stop the exam may enhance perceived safety [36]. For a procedure involving physical contact or potential discomfort, not knowing what to expect can add to fear or confusion [37,38]. These findings align with prior research showing that clear communication and respect for patient preferences can reduce anxiety and build trust in emergency care [6,7,12,21,28,39].

Patients also reported inconsistencies in communication, specifically in being invited to ask questions and having open dialogue during the exam. These are key components of informed consent, patient empowerment, and emotional safety. The largest gap was in the Peer Support domain, where 78% of patients reported being asked about companion preferences but only 48% of clinicians reported asking. These findings may reflect the tension between task-oriented efficiency and patient-centered communication that characterizes emergency care, rather than a lack of clinician attentiveness. Simple actions such as asking, "What questions do you have?" or briefly checking on patient comfort may support engagement even in time-pressured settings. Training programs such as the TIC-based curriculum described by Burns et al. may help reinforce these practices [40]. Asking about companion preferences, even when accommodation is not always feasible, supports patient autonomy and reflects the dynamic nature of consent during diagnostic procedures [16,17].

Subgroup analysis showed that clinicians with prior TIC training and APPs reported stronger alignment with TIC behaviors. APPs had higher concordance with patient responses in the Empowerment, Peer Support, and Collaboration and Mutuality domains compared to residents and attending. Clinicians familiar with TIC principles were more likely to endorse behaviors aligned with the Safety and Collaboration and Mutuality domains. These findings supports the value of incorporating TIC principles into EM and POCUS education across training levels [41–44]. Notably, many TIC behaviors were already reported at high frequencies, for example 98% of patients agreed that clinicians were respectful of their preferences, suggesting trauma-informed sensitivity is already present in routine ED practice.

Overall, our study adds to the growing evidence that TIC is feasible in acute care settings and may improve patient experience and emotional safety [7,11,45]. These findings align with growing professional consensus that TIC should be integrated across emergency care, including diagnostic procedures [45]. Rather than prescribing a fixed set of behaviors, these findings highlight opportunities for reflection, education, and future research focused on identifying high-yield trauma-informed practices for POCUS workflows. With further validation, the TIES survey may serve as a feedback tool for professional development in POCUS education.

Table 4
Domain-Level Comparison of Patient and Clinician Trauma-Informed Care Scores.

Domain	Patient Agreement n(%)	Clinician Agreement n(%)	p-value
Safety	99%	93%	0.06
Trustworthiness and Transparency	79%	73%	0.02
Peer Support	78%	48%	0.01
Collaboration and Mutuality	87%	69%	0.04
Empowerment, Voice, and Choice	92%	73%	0.00
Cultural, Historical, and Gender Sensitivity	97%	94%	0.11

Note: Agreement reflects combined responses of "agree" or "strongly agree" on a 5-point Likert scale.

Table 5
Patient Subgroup Analysis of Trauma-Informed Care Domain Scores.

Subgroup	Group	Safety N (%)	Trust and Transparency N (%)	Peer Support N (%)	Collaboration and Mutuality N (%)	Empowerment, Voice, and Choice N (%)	Cultural, Historical, and Gender Sensitivity N (%)
Age	Younger ($N = 91$)	87 (96)	59 (65)	71 (78)	79 (87)	85 (93)	77 (85)
	Older ($N = 52$)	49 (94)	29 (56)	41 (78)	46 (88)	46 (88)	35 (67)
	p-value	0.745	0.533	0.953	0.830	0.326	**0.019**
Sex	Female ($N = 75$)	72 (96)	50 (67)	58 (77)	70 (93)	71 (95)	59 (79)
	Male ($N = 65$)	61 (94)	37 (57)	51 (78)	54 (83)	57 (88)	51 (78)
	p-value	0.595	0.249	0.884	0.057	0.135	0.993
Education	Lower ($N = 79$)	75 (95)	52 (66)	65 (82)	68 (86)	76 (96)	63 (80)
	Higher ($N = 47$)	45 (96)	27 (57)	31 (65)	41 (87)	38 (81)	40 (85)
	p-value	0.822	0.440	0.158	0.845	**0.006**	0.440
Location	Room ($N = 109$)	102 (94)	66 (61)	82 (75)	92 (84)	99 (91)	89 (82)
	Hallway ($N = 31$)	30 (97)	19 (61)	27 (86)	30 (97)	30 (97)	23 (74)
	p-value	0.604	0.670	0.310	0.071	0.277	0.379

Notes: Younger subgroup was defined as ages 18 through 64 years, older subgroup was defined as ≥ 65 years. Lower education was defined as education up to and including high school, some college and Associate degree. Higher education was defined as education including a Bachelor's degree or higher.

4.1. Limitations

This study has several limitations. First, it was conducted at two large urban academic centers, which may not reflect the environment or patient population in community or non-academic EDs. Institutional culture, training, and available resources could have influenced both patient and clinician responses.

Second, we could not definitively exclude repeat participation by individual clinicians or patients, which could introduce a Hawthorne effect or clustering. Surveys were collected for each encounter and were not linked to individual clinicians. This design was chosen to encourage honest and accurate responses, but it prevents us from assessing the effects of clinicians participating more than once. The clinician sample also included a high proportion of APPs relative to residents and attendings due to staffing structure at our institutions, which may limit generalizability.

Third, all data were collected from self-reported surveys, which can be affected by recall bias or social desirability bias. Clinicians in particular may have overestimated their use or knowledge of TIC practices. Although surveys were administered within 6 h of the POCUS exam to minimize recall bias, response bias remains possible. We did not systematically record the exact time interval between POCUS completion and survey administration. Variation in timing within the 6-h window may have introduced recall bias. However, RAs prioritized approaching participants as soon as clinically appropriate, and most of surveys were completed within 1–2 h of the exam.

Fourth, we measured TIC familiarity as a simple yes or no (familiar vs. not familiar), which does not capture the full range of TIC knowledge and experience. Clinicians with formal training, brief exposure, or self-taught knowledge were all grouped as "familiar," which may have hidden important differences in how TIC was practiced based on level of training.

Fifth, we did not collect information about individual trauma histories. This design choice reflects a key principle of TIC: the use of universal precautions. Rather than relying on trauma screening, which is often not feasible in the ED setting, we approached all patients with the assumption that trauma histories are common and that care should be delivered accordingly. This approach aligns with core TIC practices and supports the implementation of TIC principles in everyday ED workflows without requiring individualized trauma disclosures.

Sixth, critically ill patients were excluded because they could not give consent or complete surveys during acute conditions, and our research process may have delayed care. Our findings may not apply to the scans in highest-acuity cases where TIC may be more challenging to practice but still very important. Future research using other methods

Table 6
Clinician Subgroup Analysis of Trauma-Informed Care Domain Scores.

Subgroup	Group	Safety n (%)	Trust and Transparency n (%)	Peer Support n (%)	Collaboration and Mutuality n (%)	Empowerment, Voice, and Choice n (%)	Cultural, Historical, and Gender Sensitivity n (%)
Age	≤30 years ($N = 38$)	32 (84)	20 (53)	11 (29)	22 (58)	25 (66)	28 (74)
	>30 years ($N = 53$)	44 (83)	24 (45)	13 (25)	30 (57)	30 (57)	43 (81)
	p-value	0.842	0.492	0.909	0.928	0.448	0.473
Sex	Female ($N = 76$)	70 (92)	46 (61)	37 (49)	55 (72)	59 (78)	61 (80)
	Male ($N = 67$)	57 (85)	32 (48)	27 (40)	44 (66)	46 (69)	49 (73)
	p-value	0.197	0.058	0.894	0.688	0.270	0.291
Clinical role	APP ($N = 83$)	76 (92)	49 (59)	46 (55)	64 (77)	70 (84)	64 (77)
	Physician ($N = 60$)	51 (85)	29 (48)	18 (30)	35 (58)	35 (58)	46 (77)
	p-value	0.185	0.083	**0.027**	0.013	**0.001**	0.837
Years of experience in ED	<5 years ($N = 123$)	111 (90)	68 (55)	58 (47)	89 (72)	92 (75)	93 (76)
	≥5 years ($N = 20$)	16 (80)	10 (50)	6 (30)	11 (55)	13 (65)	17 (85)
	p-value	0.211	0.790	0.083	0.243	0.424	0.381
Weekly ultrasound exams	<10 exams ($N = 107$)	96 (90)	58 (54)	52 (49)	76 (71)	85 (79)	79 (74)
	≥10 exams ($N = 35$)	30 (86)	19 (54)	11 (31)	22 (63)	20 (57)	30 (86)
	p-value	0.531	0.505	0.108	0.467	**0.021**	0.179
Familiarity with TIC	Familiar ($N = 96$)	89 (93)	52 (54)	46 (48)	74 (77)	72 (75)	73 (76)
	Not familiar ($N = 45$)	36 (80)	25 (56)	18 (40)	24 (53)	31 (69)	35 (78)
	p-value	**0.029**	0.916	0.411	**0.003**	0.461	0.869

Abbreviations: TIC, trauma informed care; APP, advanced practice provider.

such as post-discharge interviews, proxy reports, or observation could help understand TIC in critical care POCUS.

We also excluded educational POCUS scans to focus on exams done for patient care rather than teaching. In educational scans, patients' perceptions may differ because the exam is not directly tied to their clinical care, and some survey questions specifically address how the POCUS scan connects to their overall treatment. However, TIC principles are equally important during educational scans and should be considered as a good opportunity to improve POCUS training. Lastly, the study used convenience sampling and did not include overnight hours. Experiences from night shifts, when pace, staffing, and routines can differ, may not be fully represented.

5. Conclusion

Patients perceived their care as more aligned with TIC principles than clinicians self-reported assessment, with the largest differences in communication, consent, and eliciting patient preferences. Clinicians with prior TIC training and APPs showed stronger alignment with TIC behaviors, supporting the value of integrating TIC education into EM and POCUS training. The TIES survey offers an exploratory tool to assess TIC integration during POCUS and may inform future training efforts.

Prior presentations

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CRediT authorship contribution statement

Nour Al Jalbout: Writing – review & editing, Supervision, Methodology, Investigation, Formal analysis, Data curation. **Melissa A. Meeker:** Writing – review & editing, Software, Methodology, Formal analysis, Data curation. **Kathleen Joseph:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation. **Dana Vigue:** Writing – review & editing, Investigation, Formal analysis, Data curation, Conceptualization. **Graciela Maldonado:** Writing – review & editing, Investigation, Data curation. **Lillian Fischetti:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Rachel Park:** Writing – review & editing, Investigation, Data curation. **Jack M. Drummond:** Writing – review & editing, Methodology, Investigation. **Matthew Riscinti:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Formal analysis, Data curation. **Hamid Shokoohi:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Declaration of competing interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajem.2026.03.032.

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