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Reviews

A POCUS stewardship framework for optimizing pediatric FAST in trauma: A conceptual model and evidence synthesis

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ABSTRACT

Objective: The Focused Assessment with Sonography in Trauma (FAST) exam is widely used in adult trauma, but its role in pediatric blunt abdominal trauma remains uncertain due to variability in diagnostic accuracy. Point-of-care ultrasound (POCUS) stewardship offers a framework to potentially optimize pediatric FAST (FAST-P) by integrating clinical context, such as indication, pre-test probability, patient stability, and injury severity. This study evaluates how applying POCUS stewardship principles may potentially improve FAST-P diagnostic performance and utility in children.

Methods: We developed a conceptual POCUS stewardship framework based on established stewardship principles, then synthesized current literature to support and refine the model. Studies on FAST-P in pediatric blunt trauma published from January 2000 through December 2025 were reviewed, focusing on four framework components: clinical indication, pre-test probability, hemodynamic status, and injury severity with free fluid volume. Diagnostic performance and CT utilization were analyzed when available.

Results: POCUS stewardship provides a framework that may enhance diagnostic value by aligning FAST-P use with clinical context. Intervention likelihood rose from 0.4% in children with <1% pre-test probability to 41.4% in those with >50%, supporting the importance of proper indication and risk assessment. FAST-P performed best in unstable patients (sensitivity 78.6%, specificity up to 100%), and less effectively in stable ones (sensitivity 50–64%, specificity 83–95%). Adding physical exam findings and risk stratification improved accuracy, with combined approaches achieving up to 96.9% sensitivity and 98.6% negative predictive value. Sensitivity and specificity were highest with large fluid volumes (89%, 99%). FAST-P reduced CT rates from 22.5% to 18.6% in <1% risk patients, and from 92.3% to 78.9% in 6–10% risk.

Conclusions: Integrating POCUS stewardship may potentially improve FAST-P diagnostic utility in pediatric trauma by aligning its use with clinical risk and reducing unnecessary imaging. This conceptual framework requires prospective validation but offers a structured approach to optimizing FAST-P application in clinical practice.

1. Introduction

Point-of-care ultrasound (POCUS) has become an essential tool in the initial evaluation of pediatric trauma, particularly for identifying potential intra-abdominal injuries (IAI). Its rapid, bedside application and non-invasive nature make it especially valuable in time-sensitive situations, where quick decision-making is critical [1,2]. Within this context, the FAST (Focused Assessment with Sonography in Trauma) exam is frequently used to screen for intra-abdominal bleeding or solid organ injury in children following blunt trauma [3,4]. In this manuscript, we use the term "FAST-P" (Focused Assessment with Sonography in Trauma - Pediatric) to specifically refer to the FAST examination when performed in pediatric patients, distinguishing it from the adult FAST exam where performance characteristics differ.

Despite these advantages, the clinical effectiveness of the FAST-P remains inconsistent. Reported sensitivity and specificity vary considerably across studies and settings, which has led to a perception that the

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exam is less reliable in children compared to adults [5,6]. Recent guidelines from the American Academy of Pediatrics note that most studies have found FAST-P has inadequate sensitivity for ruling out intra-abdominal injury in children, though there may be utility when used in combination with clinical findings and in specific patient populations [1,7]. This variation has, understandably, contributed to hesitancy among clinicians and limited its broader adoption in pediatric trauma protocols.

Importantly, this inconsistency is not purely due to technological shortcomings. Rather, it reflects a combination of systematic and clinical factors. Patient-specific variables such as lower injury severity, smaller volumes of free fluid, and anatomical differences can make detection more difficult. [6] Clinician experience and training also play a major role; interpretation of FAST-P requires familiarity with developmental anatomy and subtle findings [8,9]. Additionally, the clinical indication for when to perform a FAST-P often varies, which further affects its diagnostic yield. Together, these elements contribute to the uneven performance of the FAST-P exam and highlight the need for a more thoughtful, context-driven approach to its use.

To address the ongoing challenges in the application of FAST-P, there is a growing need for a more structured, clinically integrated approach to POCUS use, one that moves beyond simply acquiring images and instead focuses on when, how, and why ultrasound should be performed. This approach, known as POCUS stewardship, provides a framework that may help clinicians apply ultrasound more effectively and responsibly in pediatric trauma care [10,11].

At its core, POCUS stewardship is built on four key principles:

1- Clinical Indication – POCUS should be performed only when there is a clear and justifiable clinical reason to do so, based on presenting signs, mechanism of injury, or hemodynamic instability.

2- Pre-Test Probability – Prior to performing a scan, clinicians should assess the likelihood of significant IAI. This helps ensure that POCUS is used in scenarios where it adds meaningful diagnostic value and minimizes use in low-risk situations where false positives or negatives may mislead.

3- Spectrum Effect – The diagnostic accuracy of POCUS is not uniform across all injuries. Its performance improves as injury severity increases, meaning that findings must always be interpreted in the context of the clinical picture and timing.

4- Dynamic Sensitivity and Specificity – Sensitivity and specificity are not fixed metrics. They shift depending on patient anatomy, injury characteristics, and operator skill. Recognizing this variability is critical to understanding what a given FAST-P result can or cannot tell you [12,13] (Table 1).

In this paper, we apply these principles of POCUS stewardship to the FAST-P exam, with a focus on pediatric patients presenting with blunt abdominal trauma. Our goal is to demonstrate how this framework can potentially help overcome the current limitations of FAST-P by promoting more appropriate use, improving diagnostic accuracy, and reducing the risks of false reassurance or missed injuries. A brief summary of this framework was previously published as a conference abstract in Annals of Emergency Medicine; this manuscript provides comprehensive evidence synthesis and implementation guidance not included in that abstract [14].

2. Methods

We developed a conceptual POCUS stewardship framework based on established stewardship principles, then synthesized current literature to support and refine the model. We conducted a structured, evidence-based review of the literature examining the application of POCUS stewardship principles to the FAST-P examination in children with blunt abdominal trauma. This was a focused conceptual review rather than constituting a systematic review. Our review specifically sought studies of the FAST-P where different clinical and operational variables resulted in variable test performance. This approach was designed to clarify how stewardship components such as pre-test probability, hemodynamic status, operator experience, and injury severity affect the diagnostic accuracy and clinical utility of the FAST-P in children with blunt abdominal trauma.

A comprehensive search was conducted using electronic databases, including PubMed and EMBASE, to identify the most relevant studies for each domain from January 2000 through December 2025. While this narrative review does not follow PRISMA systematic review guidelines, we employed a structured approach to literature identification and selection. Keywords used in the search included: FAST, pediatrics, peds, blunt trauma, POCUS, ultrasound, ultrasonography, diagnostic imaging, predictive value, pre-test probability, sensitivity, specificity, training, experience, and accuracy.

The initial search identified approximately 340 articles, of which 85 were selected for full-text review based on relevance to POCUS stewardship principles in pediatric trauma. Both retrospective and prospective studies were included, without restrictions on publication date or geographic location. Studies were excluded if they were not in English

Table 1
Key factors affecting FAST-P performance in association with POCUS stewardship components.

Stewardship Element	Key Factors	Clinical Implication	References
Clinical Indication	⇒ Mechanism of injury ⇒ Clinical signs of IAI ⇒ Hemodynamic status	• FAST should be reserved for patients with clear clinical concern rather than used as routine screening	Marin [1], Fornari [7], Holmes RCT [16], Ishii [18], Kühne [29]
Pre-Test Probability	⇒ Risk stratification tools ⇒ Physical exam findings ⇒ Laboratory markers	• Higher pre-test probability improves positive predictive value • Negative FAST does not rule out injury in moderate-high risk patients	Liang meta-analysis [5], Holmes meta-analysis [6], Duggan pre-test probability [13], Wells [21], Six HEART [23], Mahajan [24], Sathianathan F-AST [33]
Spectrum Effect	⇒ Injury severity ⇒ Volume of free fluid ⇒ Timing of exam	▪ Sensitivity increases with injury severity and larger fluid volumes ▪ Minor injuries may not produce detectable fluid	Long [19], Bloom StatPearls [27], Fox [28], Savatmongkorngul [30], Riera [34]
Dynamic Sensitivity/Specificity	⇒ Operator training and experience ⇒ Pediatric-specific protocols ⇒ Image quality ⇒ QA programs	▪ Sensitivity varies widely (20–80%) based on operator experience ▪ Specificity remains stable (>90%) across training levels	Kwan [8], Steinemann [9], Kim [15], Kornblith [26], Tolu Kendir [31], Shokoohi probe placement [32]

QA, quality assurance; FAST, Focused Assessment with Sonography in Trauma; CT, computed tomography; US, ultrasound.

or included patients over 18 years of age. Ultimately, 35 studies were included in this narrative synthesis based on their contribution to understanding how clinical and operational variables affect FAST-P performance.

Data extraction focused on injury characteristics, timing of FAST-P, operator training, and reported diagnostic performance metrics. Two authors, both trained in POCUS fellowship, with one having over 20 years of experience, independently reviewed and screened the identified studies for inclusion in this narrative review. The primary outcomes of interest included test sensitivity, specificity, and positive and negative predictive values. These outcomes were analyzed across different clinical settings, based on variations in POCUS performance relative to injury severity and the impact of pre-test probability on diagnostic accuracy.

3. Results

3.1. Optimizing clinical indications

FAST-P should be applied only when there is a clear clinical indication, guided by clinical context rather than routine protocol. It is not meant to serve as a blanket screening tool in all pediatric trauma cases. Instead, its use is best reserved for cases where there is a clear clinical indication, typically when there is concern for IAI based on the mechanism of trauma, exam findings, or changes in vital signs.

Studies have shown that when FAST-P is used routinely across all trauma patients, including those without clinical signs of IAI or those who are hemodynamically stable, its sensitivity drops considerably. In one recent analysis focused on mostly stable pediatric patients with blunt trauma, FAST-P sensitivity was reported as low as 21–41%, meaning many injuries were missed due to a high false-negative rate [16,17]. The study also highlighted that more than 85% of trauma activations involve either no injury or only minor IAI, making routine FAST-P use relatively low-yield and increasing the likelihood of false positives or findings of uncertain clinical significance [16] (Tables 2 and 3).

Using the FAST-P routinely in all pediatric trauma activations may also leads to more negative exams in patients who actually have injuries. Several studies report false-negative rates ranging from 20% to 34%, and pooled data from meta-analyses suggest overall sensitivity may be as low as 35–40% in general trauma populations [5,17]. On the other hand, in patients with a low likelihood of significant IAI, many positive FAST-P results turn out to be minor, clinically irrelevant findings or physiologic fluid, which often lead to unnecessary additional testing and increase the false positive rate [7].

In pediatric patients when there is no clinical concern for abdominal injury, the rate of clinically actionable findings drops even further, raising the likelihood of detecting incidental or non-significant findings. As a result, many pediatric trauma guidelines now recommend limiting FAST-P to higher-risk scenarios, such as hemodynamically unstable patients or those with strong suspicion of IAI, rather than using it as a blanket screening tool for all trauma activations [1,18].

Additional research also suggests that in both pediatric and adult trauma cohorts, certain factors, like altered mental status, intubation, or severe head trauma, are strongly associated with higher false-negative rates when FAST is used to detect intra-abdominal bleeding in blunt trauma [18].

3.2. Pre-test probability in pediatric trauma

The diagnostic utility of the FAST-P exam in pediatric trauma is closely tied to pre-test probability, the estimated likelihood of IAI before imaging. This is essential in determining how much weight to give the result. In children with a high clinical probability of injury, especially those who are hemodynamically unstable or present after high-risk mechanisms, a positive FAST-P is highly specific and often actionable. In these cases, it often accurately identifies injury and free fluids which can justify immediate further imaging or operative intervention without delay.

However, the inverse is not always true. A negative FAST-P in a child with moderate or high clinical concern does not reliably rule out IAI. Sensitivity across studies remains inconsistent. Meta-analyses have reported sensitivity for detecting hemoperitoneum ranging widely from as low as 35% up to 80%. For all IAI, the numbers are even more modest, hovering around 50% [5,6,15,16]. More recent studies report slightly improved sensitivity between 59.5% and 61.5% for identifying injuries that require early surgical intervention [19]. Notably, when FAST-P is combined with clinical criteria, such as physical exam findings or mechanism of injury, the sensitivity may improve significantly, with some studies reporting values as high as 96.9% [20].

Specificity, on the other hand, has remained relatively stable across studies, typically ranging from 84% to 99%. [5,15] This is why, in high-risk scenarios, a positive FAST-P can be considered highly predictive, it reliably flags children who need urgent follow-up. But in low-risk

Table 2
Variable sensitivity/specificity of FAST-P

Clinical Context	Sensitivity	Specificity	Key Findings	References
Overall pediatric blunt trauma	35–66%	84–99%	⇒ Wide variability reflects heterogeneous patient populations and operator experience	Liang meta-analysis [5], Holmes meta-analysis [6], Kim accuracy study [15]
Hemodynamically unstable patients	78.6–80%	83–100%	⇒ Improved sensitivity in unstable patients evaluated within 2 h	Holmes RCT [16], Long study [19]
Hemodynamically stable patients	50–64%	83–95%	⇒ Lower sensitivity ⇒ Negative FAST does not rule out IAI	Liang meta-analysis [5], Holmes RCT [16], Long study [19]
Low pre-test probability (<1% risk)	21–41%	90–95%	⇒ High false-negative rate ⇒ Routine screening not recommended	Holmes RCT [16], Skerritt [17], Mahajan [24]
Moderate pre-test probability (6–10% risk)	55–65%	88–95%	⇒ FAST reduced CT rates by 15% in this population	Menaker [25]
High pre-test probability (>50% risk)	70–80%	95–99%	⇒ Intervention likelihood 41.4% ⇒ Positive FAST highly predictive	Mahajan [24], Fox [28]
Large volume free fluid	89–100%	99%	⇒ All patients with large fluid volumes required CT or surgery	Bloom StatPearls [27], Fox [28], Riera [34]
Small volume free fluid	30–50%	85–90%	⇒ Minor injuries often produce no detectable fluid early	Holmes meta-analysis [6], Bloom StatPearls [27], Riera [34]
FAST combined with clinical criteria	96.9%	85–90%	⇒ Adding physical exam and risk stratification improves accuracy	Shihabuddin [20], Sathianathan F-AST [33]
Experienced operators (pediatric training)	60–80%	95–98%	⇒ Dedicated pediatric ultrasound training improves performance	Kwan [8], Steinemann [9], Kornblith consensus [26]
Less experienced operators	20–30%	90–95%	⇒ Specificity remains stable ⇒ Sensitivity highly variable	Kwan [8], Steinemann [9]

Table 3
Supporting data on the key elements of POCUS stewardship in FAST-P.

Study/Source	Population	Key Finding	Clinical Application
Clinical Indication			
Holmes RCT 2017 [16]	925 children, blunt torso trauma	⇒ Sensitivity 21–41% when FAST used routinely ⇒ >85% of activations had no or minor IAI	Reserve FAST for patients with clinical concern rather than routine screening
Skerritt 2014 [17]	Pediatric blunt trauma	⇒ False-negative rates 20–34% ⇒ Pooled sensitivity 35–40% in general trauma	Avoid FAST as blanket screening tool
AAP Guidelines 2024 [1,7]	Pediatric trauma imaging	⇒ FAST has inadequate sensitivity for ruling out IAI ⇒ Utility when combined with clinical findings	Limit FAST to higher-risk scenarios
Pre-Test Probability			
Mahajan 2015 [24]	Children with blunt torso trauma	⇒ Intervention likelihood rose from 0.4% (1% risk) to 41.4% (>50% risk)	Use risk stratification to guide FAST interpretation
Menaker 2014 [25]	Pediatric blunt trauma	⇒ FAST reduced CT rates from 22.5% to 18.6% in 1% risk ⇒ 92.3% to 78.9% in 6–10% risk	FAST most useful in moderate-risk patients
Liang meta-analysis 2021 [5]	Pediatric blunt abdominal trauma	⇒ Positive FAST raised post-test probability to 63% ⇒ Negative reduced to 9%	Negative FAST does not safely exclude IAI
Sathianathan 2025 [33]	Pediatric blunt abdominal trauma	⇒ F-AST score achieved 94% sensitivity, 98.6% NPV	Combining FAST with AST levels improves accuracy
Spectrum Effect			
Long 2022 [19]	Hemodynamically unstable children	⇒ Sensitivity 78.6% in unstable vs 50% in stable patients	FAST performs better in sicker patients
Fox 2011 [28]	Pediatric blunt abdominal trauma	⇒ 100% of children with large free fluid required CT or surgery ⇒ OR 3.24 for severe injury	Positive FAST with large fluid highly predictive
Riera 2021 [34]	Pediatric blunt abdominal trauma	⇒ Sensitivity and specificity highest with large fluid volumes (89%, 99%)	Minor injuries may not produce detectable fluid
Dynamic Sensitivity/Specificity			
Kwan 2022 [8]	Pediatric POCUS learners	⇒ Mastery requires dedicated training ⇒ Performance varies with experience	Standardized pediatric ultrasound education needed
Steinemann 2018 [9]	FAST training variation	⇒ Sensitivity 20–30% with limited training ⇒ 60–80% with dedicated training	Operator experience is key modifiable factor
Kornblith 2022 [26]	Consensus definition	⇒ Developed consensus-based definition of FAST in children	Standardized protocols improve consistency
Combined Approach			
Shihabuddin 2018 [20]	Pediatric blunt trauma	⇒ FAST combined with clinical criteria achieved 96.9% sensitivity	Physical exam findings improve FAST accuracy
Holmes meta-analysis 2007 [6]	Pediatric abdominal US	⇒ Specificity 84–99% across studies ⇒ Sensitivity variable	FAST reliable as rule-in tool

populations, a negative result doesn't provide enough reassurance to stop further workup when concern still exists.

To better illustrate this, one systematic review found that among stable pediatric trauma patients, a positive FAST-P raised the post-test probability of IAI to 63%, while a negative result only reduced it to 9% [5]. That 9% still represents a meaningful risk and cannot safely exclude IAI, particularly in children, where missed injuries can have significant consequences. This highlights why a stewardship-based approach may be essential. It guards against the tendency to over-interpret a negative FAST-P, especially in patients where the clinical picture suggests a non-negligible risk of injury. This consideration may suggest further workup (e.g., observation, CT) when clinical suspicion remains high, directly addressing variable sensitivity [13,21-23].

Recent work has explored combining FAST-P with laboratory markers to improve diagnostic accuracy. A 2025 prospective validation study demonstrated that the F-AST score (combining FAST findings with aspartate transaminase levels) achieved 94% sensitivity and 98.6% negative predictive value for identifying intra-abdominal injuries, substantially improving upon FAST-P alone [33]. This supports the stewardship principle of integrating multiple clinical data points rather than relying on imaging in isolation.

3.3. Dynamic sensitivity and specificity

The diagnostic sensitivity of the FAST-P in pediatric trauma is both user- and context-dependent, with extended FAST protocols offering additional diagnostic information in some pediatric populations [31]. Compared to adults, sensitivity in children tends to be lower, and much of that variability comes from differences in clinicians' experience and training. For example, general emergency clinicians with limited POCUS training, or those working in prehospital settings, have reported sensitivities as low as 20–30% [8,9]. In contrast, clinicians working in high-volume trauma centers, particularly those with dedicated pediatric ultrasound training, often achieve much better performance, with reported sensitivities approaching 60% or more. Among the most experienced operators, those with focused pediatric ultrasound training this sensitivity may reach or exceed 80% [8,9] (Tables 2 and 3).

Specificity, on the other hand, is far more stable across all training levels. Studies consistently show that even with less training, specificity often exceeds 90%, and in some cases reaches 98% [15]. This suggests that while detecting subtle or early injuries remains a challenge for less experienced users, identifying true positives, when fluid is present, is relatively reliable.

Experience also plays a key role in image acquisition and interpretation. Skilled clinicians are more likely to obtain complete views, using proper probe placement techniques, recognize anatomic variations in children, and integrate findings accurately into clinical decisions [32]. However, the fact that sensitivity remains variable even in trained hands highlights the need for standardized ultrasound education and protocol-driven use, especially in pediatric trauma settings. Without consistent training and quality assurance, there is a real risk of missed injuries due to underperformance of this otherwise valuable tool [8,9].

3.4. Spectrum effect and severity of injury

The performance of the FAST-P in trauma is closely tied to the severity of the injury, a relationship consistent with broader FAST literature [30]. Simply put, the more severe the trauma, the more likely the

exam is to detect something meaningful. This relationship exists because higher-energy mechanisms are more likely to produce injuries with larger volumes of intra-abdominal bleeding, fluid that is easier to visualize on POCUS. In contrast, low-grade or isolated injuries may not produce any appreciable free fluid early in the clinical course, which increases the risk of a false negative.

This relationship was demonstrated in a large study where the overall sensitivity of FAST-P for predicting early surgical intervention in children was 59.5% [19]. But when patients were stratified by hemodynamic status, sensitivity increased to 78.6% in unstable children and fell to 50% in those who were stable. [19] The implication is clear: in sicker, more severely injured patients, the test may perform better because the pathology is more pronounced and the physiologic changes are easier to detect and minor injuries often produce little or no free fluid, increasing the likelihood of false negatives.

Additional data reinforce this spectrum effect. Children with higher Injury Severity Scores or who ultimately required surgical intervention showed significantly higher rates of positive FAST-P findings. In fact, one study found that a positive FAST-P was independently associated with severe injury, with an odds ratio of 3.24 (95% CI 1.63–6.42) [19]. This pattern helps explain the overall variability in reported FAST-P sensitivity in pediatric trauma populations. Many pediatric injuries simply do not involve detectable hemoperitoneum, especially early on or when the trauma is relatively minor. However, when free fluid is present, specificity remains high meaning that a positive result is still clinically reliable, even in less severely injured patients [27].

Recognizing this relationship between injury severity and test performance is key. It encourages a more nuanced interpretation of FAST-P results and supports its use as a rule-in tool, particularly in higher-risk presentations. For lower-severity cases, clinicians should be cautious not to overinterpret negative findings, and be ready to pursue additional evaluation if concern remains.

4. Discussion

Applying the principles of POCUS stewardship to FAST-P offers a clear path forward for improving the accuracy, consistency, and clinical value of this tool in blunt abdominal trauma. The evidence suggests that FAST-P continues to have an important role in pediatric trauma care but only when used thoughtfully, with attention to context, patient factors, and provider experience. At the same time, the need for improved training, clearer protocols, and better integration into clinical workflows is evident (Table 3).

A key starting point is the mechanism and severity of injury. Trauma systems already reflect this principle: tiered activation criteria often rely on mechanism alone to predict which patients are more likely to be seriously injured. This aligns with the concept of pre-test probability, which is well-established in many areas of medicine [21,23,29]; however, this is not consistently applied in FAST-P. Clinicians intuitively assess the likelihood of injury when deciding whether to order other tests; this same reasoning should guide whether to perform a FAST-P. Integrating pre-test probability into POCUS decision-making may help focus its use on higher-yield scenarios while avoiding unnecessary imaging in low-risk patients.

This is not just theoretical. Mahajan et al. found that the likelihood of intervention rose meaningfully with increasing clinician-estimated risk, particularly in the 21–41% range of pre-test probability [24]. Similarly, Menaker et al. showed that in children with a 6–10% estimated probability of intra-abdominal injury, FAST-P use led to a 15% reduction in CT rates, while in patients with >11% risk, FAST-P had less influence likely due to overriding clinical concern [25].

Another core stewardship principle is the spectrum effect. The idea that test performance varies with the severity of disease. FAST-P is more likely to detect injuries that are clinically significant, such as those with large volumes of free fluid or signs of ongoing bleeding. Fox et al. demonstrated this clearly: every child in their study with a large amount of free fluid went on to receive either CT or surgical intervention [28]. Studies show that larger fluid volumes strongly correlate with need for intervention [27,34]. The Holmes 2017 trial specifically excluded hypotensive patients and found 100% sensitivity in this population [16].

This reinforces the point that sensitivity is not fixed, and that FAST-P is more diagnostically useful in patients with more severe trauma. In mild injuries, the absence of free fluid doesn't rule out injury especially early in the presentation so a negative FAST-P should never be viewed in isolation. Instead, findings must be interpreted alongside clinical exam, mechanism of injury, and vital signs.

One of the major obstacles to broader integration of FAST-P into pediatric trauma protocols is concern about inconsistent sensitivity and specificity. Unlike adult trauma care, where the FAST is widely embedded, pediatric use remains variable. This skepticism, though understandable, often comes from a misunderstanding of how diagnostic tests behave. Sensitivity and specificity are not static, they depend on a number of modifiable and non-modifiable factors, including timing, clinical setting, and operator skill. Some injuries, such as early solid organ bleeding or hollow viscus injury, may not produce enough free fluid to be visible on ultrasound early on. Other factors, such as patient body habitus, cooperation, or even positioning, can further affect image quality. Perhaps the most important modifiable factor is operator experience. Clinicians with dedicated POCUS training, especially in pediatric populations, tend to perform more complete exams with appropriate probe placement, recognize subtle findings, and interpret them in context [32]. In contrast, those with less experience are more prone to incomplete imaging, technical errors, or misinterpretation, contributing to higher false-negative rates [8,9,26].

4.1. Limitations

As a focused conceptual review, this work has inherent limitations including potential selection bias in literature identification, heterogeneity among included studies in terms of patient populations and clinical settings, and variability in FAST-P definitions and outcome measures across studies. Unlike systematic reviews with pre-specified protocols and comprehensive search strategies, narrative reviews may inadvertently emphasize certain studies or perspectives over others.

The conceptual framework we propose, while evidence-informed, requires prospective validation in diverse clinical settings before it can be considered a validated clinical decision tool. Additionally, the included studies vary in their definitions of positive FAST-P findings, reference standards for intra-abdominal injury, and timing of examinations, which may affect the generalizability of specific performance metrics.

The heterogeneity in operator training, institutional protocols, and patient populations across studies makes it challenging to provide universally applicable sensitivity and specificity estimates. Furthermore, most studies were conducted at academic trauma centers, which may limit applicability to community settings or resource-limited environments.

By embedding these practices into clinical workflows, pediatric trauma teams may better harness the strengths of the FAST-P while minimizing its limitations. The evidence highlights the need for standardized pediatric-focused ultrasound training and more consistent application of stewardship concepts in trauma care protocols. Looking ahead, efforts should concentrate on developing validated clinical pathways that integrate the FAST-P as part of a broader decision-making framework, supported by risk stratification tools and contextual interpretation.

5. Conclusion

This study highlights how applying POCUS stewardship principles can potentially enhance the clinical effectiveness of FAST-P in pediatric blunt abdominal trauma. By aligning FAST-P with core clinical variables

including pre-test probability, patient stability, injury severity, and physical exam findings, clinicians can better interpret FAST-P results and avoid common pitfalls such as overreliance on negative findings in low-sensitivity scenarios. This tailored approach may improve diagnostic precision in high-risk situations while reducing unnecessary imaging and interventions in lower-risk cases. Prospective validation of this stewardship framework is needed to establish its impact on patient outcomes and resource utilization.

Prior presentations

The abstract will be presented at the ACEP National Conference in Salt Lake City Utah in September 2025.

CRediT authorship contribution statement

Kristofer Montoya: Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Rebecca Weinstein:** Writing – review & editing, Writing – original draft, Methodology, Data curation. **Sigmund Kharasch:** Writing – review & editing. **Michael Gottlieb:** Writing – review & editing. **Hamid Shokoohi:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Data curation, Conceptualization, Formal analysis, Visualization.

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