



Click the thumbnail above to access the calculator.

## Focused Assessment With Sonography for Trauma (FAST)

**Introduction:** The FAST examination predicts the presence of pericardial or intra-abdominal injury after penetrating or blunt trauma.

### Points & Pearls

- The focused assessment with sonography for trauma (FAST) examination assesses for fluid in the pericardium (hemopericardium) or abdomen (hemoperitoneum).
- The 4 traditional FAST views are a subxiphoid view of the heart and pericardium, right and left upper quadrant windows, and the pelvis.
- More recently, the extended FAST (eFAST) examination has entered into clinical practice with the addition of bilateral thoracic views to assess for pneumothoraces and hemothoraces.
- **A negative FAST result does not exclude injury.** Ultrasound is user dependent; therefore, clinicians should be cautious in the interpretation of a negative FAST result. Sensitivities of the abdominal and suprapubic views in FAST vary widely, with ranges of 22% to 98% reported in recent literature (Richards 2017, Carter 2015).
- Pericardial view sensitivity approaches 100% in penetrating thoracic trauma (Matsushima 2017, Ball 2009, Rozycki 1999), but cardiac injury can

be missed if there is a concomitant pericardial laceration allowing decompression into the left chest (Ball 2009).

- If clinical suspicion for injury persists despite a negative FAST result, the FAST examination should be repeated, additional investigations should be performed, or intervention should be pursued, depending on the patient's clinical condition.

### Advice

- Most clinicians use the low-frequency phased array ultrasonic probe (cardiac probe) to obtain all windows in the FAST examination.
- **Pericardial:** Place the probe in the subxiphoid area and orient it toward the patient's left shoulder. Apply downward pressure to look under the costal margin and toward the heart. The heart and pericardium will come into view, allowing inspection for hemopericardium and ultrasound findings of cardiac tamponade.
- **Right upper quadrant:** Place the probe in the right anterior to midaxillary line (between the eleventh and twelfth ribs). Visualization of the hepatorenal recess (Morison pouch) allows assessment for hemoperitoneum in the right upper quadrant. Blood is most likely to accumulate here if hemoperitoneum is present.
- **Left upper quadrant:** Apply the transducer firmly onto the skin in the left posterior axillary line (between the ninth and tenth ribs) to visualize the splenorenal and subphrenic spaces.
- In practice, it is important to remember that the right and left upper quadrant views are often more posterior than anticipated. It can

#### CALCULATOR REVIEW AUTHORS

##### Jennie Kim, MD

Department of Surgery  
Maimonides Medical Center, Brooklyn, NY

##### Morgan Schellenberg, MD, MPH

Department of Surgery  
Keck School of Medicine of USC, Los Angeles, CA

##### Kenji Inaba, MD, FRCSC, FACS

Department of Surgery  
Keck School of Medicine of USC, Los Angeles, CA

be helpful to bring the probe all the way down to the stretcher in order to best visualize these windows.

- **Suprapubic:** Place the transducer superior to the pubic symphysis and fan the probe inferiorly to visualize the bladder.

### Critical Actions

It can be useful to repeat the FAST examination while preparing to perform diagnostic peritoneal aspiration, in order to quickly reassess unstable patients with blunt abdominal trauma who have an initial negative FAST result. Intra-abdominal hemorrhage may not be significant enough on initial presentation to give a positive FAST result.

Clinicians should be cautious if the pericardial FAST examination is negative in a patient with penetrating thoracic trauma, especially if the

patient is unstable. Cardiac injuries can decompress through the injured pericardium, most commonly into the left hemithorax, resulting in a negative pericardial FAST result (Ball 2009). Unstable patients with this mechanism of injury and a negative FAST finding should undergo a chest x-ray. If the x-ray reveals a hemothorax, a chest tube must be placed. Ongoing or high-volume chest tube output in this clinical context may be from cardiac injury.

### Evidence Appraisal

The original study conducted by Rozycki et al in 1993 utilized the FAST examination in patients aged  $\geq 16$  years who had blunt or penetrating trauma ( $n = 476$ ). When compared to the gold standards of computed tomography scan, diagnostic peritoneal lavage, and/or operative findings, FAST had a sensitivity of 79% and a specificity of 96%. FAST

### Why to Use

The FAST examination is a rapid, noninvasive, and repeatable imaging modality that can guide a surgeon in the decision to operate. It is performed in the trauma bay and does not require patient transport out of the emergency department, which would be risky for an unstable patient.

### When to Use

- The FAST examination should be used liberally in the evaluation of trauma patients.
- It is especially useful in patients with penetrating thoracic trauma and in unstable patients after blunt abdominal trauma.

### Next Steps

**FAST examination results alone should not determine the decision to operate.** However, a FAST examination can be a helpful adjunct for clinical decision-making, particularly in an unstable blunt trauma patient, in order to rapidly assess the chest and abdomen for potential causes of hypotension.

### Suggested Management

The clinician must consider additional clinical information, including hemodynamic stability and clinical suspicion for injury.

#### Pericardial FAST (penetrating thoracic trauma)

- **Positive:** Emergent surgical intervention is recommended. A median sternotomy is preferred if the patient is stable; otherwise, use a left anterolateral thoracotomy.
- **Equivocal:** Pericardial window or formal TTE is recommended.
- **Negative:** Close clinical monitoring or discharge are recommended, according to the clinical suspicion for injury.

#### Abdominal FAST (blunt abdominal trauma)

- **Positive:** In the unstable patient, emergent exploratory laparotomy is recommended. In the stable patient, cross-sectional imaging (CT scan) is recommended.
- **Equivocal:** In the unstable patient, DPA is recommended. In the stable patient, cross-sectional imaging (CT scan) is recommended.
- **Negative:** In the unstable patient, DPA is recommended if there is clinical suspicion for intra-abdominal bleeding. In the stable patient, CT scan, close clinical monitoring, or discharge are recommended, according to the clinical suspicion for injury.

Abbreviations: CT, computed tomography; DPA, diagnostic peritoneal aspiration; TTE, transthoracic echocardiography.

was further validated in a much larger study (n = 1540) by the same group in 1998. The validation study showed that FAST is most sensitive and specific in patients with penetrating precordial wounds (100% sensitivity, 99% specificity) and in hypotensive patients with blunt abdominal trauma (100% sensitivity, 100% specificity). Rozycki et al (1998) concluded that the accuracy of FAST in these clinical scenarios justified surgical intervention on the basis of the FAST examination findings in these trauma patients. With the application of FAST outside of study protocols by nonexperts and nonradiologists, the contemporary diagnostic yield of FAST ranges more broadly. Recent studies indicate a sensitivity of 22% to 98% for FAST in the detection of hemoperitoneum (Richards 2017, Carter 2015).

More recently, thoracic views have been added to the FAST examination, which is then termed eFAST. These windows assess the chest bilaterally for pneumothoraces and hemothoraces. In some series, the reported sensitivities of eFAST (86%-100%) are superior to the sensitivities of chest x-ray (27%-83%) in the detection of pneumothoraces (Governatori 2015, Nandipati 2011, Wilkerson 2010).

## Use the Calculator Now

[Click here to access the calculator.](#)

## Calculator Creator

Grace Rozycki, MD, MBA

[Click here to read more about Dr. Rozycki.](#)

## References

### Original/Primary Reference

- Rozycki GS, Ochsner MG, Jaffin JH, et al. Prospective evaluation of surgeons' use of ultrasound in the evaluation of trauma patients. *J Trauma*. 1993;34(4):516-526.  
<https://www.ncbi.nlm.nih.gov/pubmed/8487337>

### Validation References

- Rozycki GS, Ballard RB, Feliciano DV, et al. Surgeon-performed ultrasound for the assessment of truncal injuries: lessons learned from 1540 patients. *Ann Surg*. 1998;228(4):557-567.  
<https://www.ncbi.nlm.nih.gov/pubmed/9790345>

- Rozycki GS, Ochsner MG, Schmidt JA, et al. A prospective study of surgeon-performed ultrasound as the primary adjuvant modality for injured patient assessment. *J Trauma*. 1995;39(3):492-498.  
<https://www.ncbi.nlm.nih.gov/pubmed/7473914>

- Rozycki GS, Feliciano DV, Ochsner MG, et al. The role of ultrasound in patients with possible penetrating cardiac wounds: a prospective multicenter study. *J Trauma*. 1999;46(4):543-551.  
<https://www.ncbi.nlm.nih.gov/pubmed/10217216>

## Other References

- Richards JR, McGahan JP. Focused Assessment with Sonography in Trauma (FAST) in 2017: what radiologists can learn. *Radiology*. 2017;283(1):30-48.  
DOI: <https://doi.org/10.1148/radiol.2017160107>
- Ball CG, Williams BH, Wyrzykowski AD, et al. A caveat to the performance of pericardial ultrasound in patients with penetrating cardiac wounds. *J Trauma*. 2009;67(5):1123-1124.  
DOI: <https://doi.org/10.1097/TA.0b013e3181b16f30>
- Nandipati KC, Allamaneni S, Kakarla R, et al. Extended Focused Assessment with Sonography for Trauma (EFAST) in the diagnosis of pneumothorax: experience at a community based level I trauma center. *Injury*. 2011;42(5):511-514.  
DOI: <https://doi.org/10.1016/j.injury.2010.01.105>
- Governatori NJ, Saul T, Siadecki SD, et al. Ultrasound in the evaluation of penetrating thoraco-abdominal trauma: a review of the literature. *Med Ultrason*. 2015;17(4):528-534.  
DOI: <https://doi.org/10.11152/mu.2013.2066.174.evp>
- Wilkerson RG, Stone MB. Sensitivity of bedside ultrasound and supine anteroposterior chest radiographs for the identification of pneumothorax after blunt trauma. *Acad Emerg Med*. 2010;17(1):11-17.  
DOI: <https://doi.org/10.1111/j.1553-2712.2009.00628.x>
- Matsushima K, Khor D, Berona K, et al. Double jeopardy in penetrating trauma: get FAST, get it right. *World J Surg*. 2018;42(2):99-106.  
DOI: <https://doi.org/10.1007/s00268-017-4162-9>
- Carter JW, Falco MH, Chopko MS, et al. Do we really rely on FAST for decision-making in the management of blunt abdominal trauma? *Injury*. 2015;26(5):817-821.  
DOI: <https://doi.org/10.1016/j.injury.2014.11.023>

Copyright © MDCalc • Reprinted with permission.

This edition of *Calculated Decisions*, powered by MDCalc, is published as a supplement to *Emergency Medicine Practice* as an exclusive benefit to subscribers. *Calculated Decisions* is the result of a collaboration between EB Medicine, publisher of *Emergency Medicine Practice*, and MD Aware, developer of MDCalc. Both companies are dedicated to providing evidence-based clinical decision-making support for emergency medicine clinicians.



### Contact EB Medicine:

Phone: 1-800-249-5770

or 678-366-7933

Fax: 770-500-1316

Address:

5550 Triangle Parkway, Suite 150  
Norcross, GA 30092



### Contact MD Aware:

MDCalc

Phone: 646-543-8380

Address:

902 Broadway, 6th Floor  
New York, NY 10010

*Emergency Medicine Practice* (ISSN Print: 1524-1971, ISSN Online: 1559-3908, ACID-FREE) is published monthly (12 times per year) by EB Medicine (5550 Triangle Parkway, Suite 150, Norcross, GA 30092). Opinions expressed are not necessarily those of this publication. Mention of products or services does not constitute endorsement. This publication is intended as a general guide and is intended to supplement, rather than substitute, professional judgment. It covers a highly technical and complex subject and should not be used for making specific medical decisions. The materials contained herein are not intended to establish policy, procedure, or standard of care. Copyright © 2019 EB Medicine. All rights reserved. No part of this publication may be reproduced in any format without written consent of EB Medicine. This publication is intended for the use of the individual subscriber only and may not be copied in whole or part or redistributed in any way without the publisher's prior written permission.