

# Critical Review Form

## Diagnostic Test

Use of Ultrasound to Determine Need for Laparotomy in Trauma Patients, *Annals EM* 1997, 29: 323-330

**Objective:** “To determine whether abdominal ultrasound can be used routinely as the primary screening test to identify the need for laparotomy in trauma patients.” (p 323)

**Methods:** The authors used a retrospective chart review from Lancaster General Hospital (Pennsylvania Level II, non-teaching) to determine if a FAST exam using dedicated ultrasonographers could replace DPL as their primary screen for both blunt and penetrating trauma patients. Technicians & Radiologists were available on site from 7:30AM until midnight daily and responded from home with activation of the trauma team after midnight. All patients underwent US exam unless the trauma surgeon directed otherwise because of clinically apparent need for immediate laparotomy or obviously isolated extraabdominal injury. (p 324) A total of 2013 patients were enrolled during a 2 year period from 1991 to 1993 of which 1631 had US performed as a primary screen. FAST interpretations were characterized as negative, mildly positive (any mention of free fluid with a qualifying statement such as “questionable” or “minimal”), or clearly positive. The endpoint of the study was the need for a therapeutic laparotomy as defined by either intraoperative organ repair or a post-traumatic patient death in which autopsy revealed intraabdominal injury that would have required surgical repair. (p 325) Conversely, laparotomy was not considered to have been required if 1) the patient survived to discharge without laparotomy; 2) the patient underwent non-therapeutic laparotomy; or 3) the patient died and postmortem examination showed no intraabdominal injury requiring repair.

Guide		Comments
I.	Are the results valid?	
A.	Did clinicians face diagnostic uncertainty?	Yes. This was a retrospective evaluation of all trauma patients during a 24 month period to see which patients would require operative management. Based on the discussion, DPL was previously used as the trauma screen. The FAST exam would enable EM physicians to determine presence or absence of hemoperitoneum in blunt and penetrating abdominal trauma in a more timely, less invasive fashion.
B.	Was there a blind comparison with an independent gold standard applied similarly to the treatment group and to the control group?	No. Of the 2013 patients screened, only 1631 had the FAST exam performed and of that number, only a small percentage (< 6%) had other testing for hemoperitoneum like CT scanning. Since not all patients received an exploratory laparotomy, the authors never utilize a uniform gold standard test against which to compare FAST scans.

C.	<b>Did the results of the test being evaluated influence the decision to perform the gold standard?</b>	Several potential biases may introduce systematic error into the author's findings & conclusions. First, the trauma surgeons involved were not blinded to the results of the FAST scan during the resuscitative period ( <i>selection bias, verification bias, ascertainment bias</i> ). Second, not all trauma patients underwent FAST scanning since certain patients were selected out by the trauma surgeon to go straight to laparotomy. Finally, the study fails to assess interobserver variability (Kappa score) among the radiologists who ultimately interpreted the FAST images. It is unclear whether the "negative", "mildly positive", or "positive" designations that the article used were assigned in a uniform fashion.
II.	<b>What are the results?</b>	
A.	<b>What likelihood ratios were associated with the range of possible test results?</b>	<p>For determining need for laparotomy among those with positive FAST exam,</p> <p>Sensitivity = <math>80/86 = 93\%</math>          Specificity = <math>1390/15454 = 90\%</math>          LR+ = <math>sen/1-spec = 9.3</math>          LR - = <math>1-sen/spec = 0.07</math></p> <p><i>Of note there is some discrepancy between the numbers provided by the authors and the numbers used. These are off by several digits.</i></p>
III.	<b>How can I apply the results to patient care?</b>	
A.	<b>Will the reproducibility of the test result and its interpretation be satisfactory in my clinical setting?</b>	No. First, this was a modified FAST exam excluding the subxiphoid cardiac view and including 2 paracolic gutter views which are not used at our institution. Second, this study utilized a dedicated FAST sonographer (not EM physician) trained in sonography. Our institution has residents who are trained in sonography but have varying degrees of skill with the ultrasound machine and the FAST exam. Finally, this study used the FAST exam as a screen done after the primary and secondary survey (much like CT is done today) and in our institution, the FAST is done concurrently the resuscitation and should not cause significant delay.
B.	<b>Are the results applicable to the patients in my practice?</b>	Not for the majority of my patients since EM's were not involved in the FAST scanning and I can not infer the reproducibility of the study where FAST is done by EM physicians rather than by dedicated sonographers.



C.	<b>Will the results change my management strategy?</b>	No. Fifteen years after the study, there is sufficient literature showing the utility of the FAST exam in trauma management (especially blunt trauma). Since the time this study was completed, a paradigm shift in non-operative management has occurred. Better and faster CT's have essentially eliminated the need for DPL and many of the laparotomies that would have been standard of care at the time of the study.
D.	<b>Will patients be better off as a result of the test?</b>	Potentially. If subsequent research demonstrates that FAST can be reproducible by EM personnel, cost effective and decrease length-of-stay (the article showed that the average FAST scan was done in 20 minutes while the CT was done in 70-110 minutes after arrival), then ED patients would benefit, especially in busy and overcrowded trauma centers.

**Limitations:**

1. **Retrospective study design lacking methods:**
  - a. **How were cases identified (by physician recall, ICD-9 codes, or other)?**
  - b. **How was the data abstraction undertaken? Were reviewers blinded to the study hypothesis? How was abstractor reliability assessed?**
  - c. **How was missing or conflicting data managed?**
2. **Clinicians and outcome assessors were not blinded to US results.**
3. **Gold standard (CT and/or laparotomy) were not uniformly applied.**
4. **Indiscriminate enrollment of both blunt and penetrating trauma patients.**
5. **Limited applicability (external validity) to institutions where FAST exam is done by EM physicians and not by dedicated sonographers.**

**Bottom Line**

**An outdated study which sought to identify an alternative to DPL in order to rapidly and less invasively determine which abdominal trauma patients ultimately need operative management. FAST is a good alternative to DPL, but DPL is really no longer used so the question is now irrelevant. In the decade since this study's inception, trauma management has shifted both in trauma assessment with rapid and more sensitive CT's as well as the increasing use of non-operative management of traumatic injuries. Although FAST may have some utility as a screening tool in Level II and III hospitals where surgical staff and CT techs must be called in, Level I trauma centers possess continuous staffing making FAST an adjunctive study at present.**