

Critical Review Form

Diagnostic Test

Surgeon-Performed Ultrasound for Pneumothorax in the Trauma Suite

J Trauma 2004; 56: 527-530

Objective: To evaluate “the reliability of ultrasound to rule out pneumothorax when performed in the trauma suite by appropriately trained surgical residents and trauma staff.”

Methods: A convenience sampling (?) of all trauma patients presenting to Via Christ Regional Medical Center in Wichita, Kansas, a Level-I trauma center between December 2002 and June 2003. As part of the surgeon-performed FAST exam, an ultrasound (US) pneumothorax (PTX) screen was performed by placing a 2.5 – 4 MHz transducer in the second intercostal space mid-clavicular line for five respiratory cycles. An US-defined PTX was the absence of the lung-sliding sign or comet-tail artifact. US were performed *before* the criterion standard CXR (portable?). Experience, level of surgeon ultrasonographers is not defined. Exclusionary criteria included the absence of properly (US) trained residents or faculty, the inability to obtain CXR, patient refusal to undergo evaluation, and hemodynamic instability that precluded US evaluation. (p 527).

Guide		Comments
I.	Are the results valid?	
A.	Did clinicians face diagnostic uncertainty?	Yes, blunt and penetrating trauma patients with PTX, among their possible injuries and CXR not yet obtained.
B.	Was there a blind comparison with an independent gold standard applied similarly to the treatment group and to the control group? (Confirmation Bias)	“The examination was performed before reviewing any radiographic studies”. (p.527)
C.	Did the results of the test being evaluated influence the decision to perform the gold standard? (Ascertainment Bias)	Not clearly stated, but all patients presumably had a CXR.
II.	What are the results?	



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<p>A.</p>	<p>What likelihood ratios were associated with the range of possible test results?</p>	<ul style="list-style-type: none"> 326 pts eligible (age range, 6 months - 94 yrs) with 93.6% blunt trauma and 4.3% had a chest tube placed. <table border="1" data-bbox="917 426 1502 541"> <thead> <tr> <th></th> <th>PTX +</th> <th>PTX -</th> </tr> </thead> <tbody> <tr> <td>US +</td> <td>12</td> <td>1</td> </tr> <tr> <td>US -</td> <td>1</td> <td>312</td> </tr> </tbody> </table> <p>Prevalence 4% Sensitivity 92% Spec 99.7% LR+ 289 (41 – 2058) LR - 0.08 (0.01 – 0.51)</p> <p>Calculate LR's on http://araw.mede.uic.edu/cgi-bin/testcalc.pl</p> <ul style="list-style-type: none"> 28.6% of chest tubes were penetrating trauma. 		PTX +	PTX -	US +	12	1	US -	1	312
	PTX +	PTX -									
US +	12	1									
US -	1	312									
<p>III.</p>	<p>How can I apply the results to patient care?</p>										
<p>A.</p>	<p>Will the reproducibility of the test result and its interpretation be satisfactory in my clinical setting?</p>	<p>Unknown – US experience of surgeons and Kappa values (reproducibility of US findings) are not reported. Furthermore, US criteria for chest tube placement and/or further monitoring are undefined. Whether surgeons performed US differently (or utilize results differently) than EM or other surgeons is unknown.</p>									
<p>B.</p>	<p>Are the results applicable to the patients in my practice?</p>	<p>Although scant patient demographics are presented, blunt and penetrating trauma pts at Wichita Level I trauma center are likely similar to trauma patients everywhere.</p>									
<p>C.</p>	<p>Will the results change my management strategy?</p>	<p>No. Although the current data seem promising to use US in lieu of CXR, the lack of well-defined outcome measures and US-use by surgeons rather than EM-physicians limits external validity. Before I advocate use of this imaging strategy, I'd want to see a uniformly applied true Gold standard (CT chest) and EM-performed US with learning curve and reproducibility described.</p>									



D.	Will patients be better off as a result of the test?	Unknown. Currently CXR and/or CT identify traumatic PTX in Level I trauma centers. The additive advantage of surgeon-performed US is not studied or described in this paper.
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Limitations

- 1) Poorly defined patient demographics. Injury severity score, specific injury mechanism, and mortality rates are all undefined.
- 2) Inadequate Gold standard -- CT chest would have been superior.
- 3) Criteria for chest tube placement is not defined. What difference does identifying PTX make if you aren't going to do anything about it?
- 4) Experience level of the surgeons performing US was not defined. Furthermore, whether surgeons and EM physicians perform equally well at ultrasonography *and* use the results the same is unknown.
- 5) No reproducibility assessment of individual ultrasonographers is reported.
- 6) Discrepant results are reported. On p. 528 one false negative is reported, but in the discussion on p.530 three false negatives are reported! Which is correct? If three false negatives were noted, the sensitivity would be 77%, the LR+ 241, and the LR- 0.23.

Bottom Line

Single center study of trauma surgeon-performed ultrasonography as an adjunct to FAST exam to detect blunt or penetrating PTX before CXR indicating strong diagnostic test characteristics in trauma of US for this indication. Future studies using EM-providers with a wide range of US-experience from various ED settings (academic, rural non-academic, etc.) should be done before this imaging modality is accepted as standard of care.