Evaluation of Intern Accuracy in Detection of Pneumothorax Using eFAST

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Introduction

Cavitary triage is crucial in the initial management of trauma patients, where the presence of free fluid or pneumothorax could warrant emergent procedural intervention. Advanced Trauma Life Support (ATLS) teaches that imaging, such as Xray and ultrasound, are useful adjuncts to quickly identify life-threatening injuries within the trauma bay. The accuracy of the Extended Focused Assessment with Sonography in Trauma (eFAST) has recently come under scrutiny. The current literature suggests that accuracy of eFAST depends on the experience of the provider performing the exam. In our study, we evaluate Post Graduate Year (PGY) 1 level residents that are designated to perform an eFAST exam during the trauma assessment.

Methods

A retrospective chart review was performed from 2017 to 2021 of all trauma patients at a Level 1 American College of Surgeons verified academic trauma center. All patients who were ≥18 years old, had eFAST performed in trauma bay by a first-year resident (general surgery, orthopedic surgery, vascular surgery, emergency medicine, and family medicine) with Computed Tomography (CT)-confirmed pneumothorax (PTX) were included in the study. All enrolled patients received CT, CXR and eFAST during their initial arrival. Data examining demographic characteristics and radiologic outcomes were analyzed. Subgroup analysis among the residents was also performed. Clinically significant pneumothorax were defined as requiring chest tube placement or operative procedure. Mcnemar test was used to determine difference in sensitivity statistical difference determined by p value <0.05.

Table 1: Overall Sensitivity

Sensitivity	All PGY 1	General Surgery	Other Specialties
eFAST			
Overall	0.25	0.26	0.23
Occult Pneumothorax	0	0	0
Significant Pneumothorax	0.31	0.36	0.21
Insignificant Pneumothorax	0.01	0	0.03
Chest X Ray			
Overall	0.35	0.36	0.33
Occult Pneumothorax	0	0	0
Significant Pneumothorax	0.44	0.47	0.38
Insignificant Pneumothorax	0.01	0	0.01

Results

247 patients met inclusion criteria. The mean age was 46 ± 19 years, mean body mass index (BMI) was 27.6 ± 11.4, and 69.4% were male. 232 (96%) patients presented due to blunt mechanism. In patients diagnosed with PTX on CT, CXR had a higher sensitivity than eFAST conducted by PGY1 level residents (35% vs 25%; p<0.05) (Table 2). Despite accounting for strictly clinically significant PTX requiring intervention, CXR demonstrated superior sensitivity as well (44 vs 31%; p<0.05). Subgroup analysis revealed a higher sensitivity on eFAST for clinically significant pneumothorax among general surgery residents relative to their colleagues (36% vs 21%; p<0.05)(Table 1). Multivariate analysis demonstrated penetrating injuries, patients with COPD/Asthma, diminished breath sounds on physical exam, PTX on CXR and clinically significant PTX were independent predictors of a positive eFAST finding when performed by PGY1 residents(Table 3).

Table 2: Sensitivity Subgroup

Overall Pneumothorax Sensitivity			
	eFAST	CXR	p
All PGY1s	0.25	0.35	<0.005
General Surgery Only	0.26	0.36	<0.005
Clinically Significant Pneumothorax Sensitivity			
	General Surgery	*Others*	*P Value*
eFAST +	0.47	0.38	<0.001

Table 3: Multivariate Regression

Multivariate Regression	Odds Ratio (OR)	Confidence Interval	P Value
Blunt Trauma	0.22	0.06-0.89	<0.05
COPD/Asthma	6.75	1.09-41.78	<0.05
Breath Sounds Present	0.07	0.03-0.17	<0.001
CXR w. Ptx	34.85	9.11-133.36	<0.001
Clinically Significant Ptx	13.88	2.96-65.00	<0.001
Clinically Insignificant Ptx	0.07	0.02-.34	<0.001

Discussion

Ultrasonography was initially viewed as an imaging modality with sensitivities that rivaled CXR in the setting of chest trauma. This perspective has come under more recent scrutiny with eFAST underperforming CXR in the detection of chest injury even when performed by professional ultrasonographers. This has called to question the utility of eFAST in the trauma bay as an efficient method of diagnosing chest trauma without the need of radiation exposure. In the setting of patient acuity, however, the value of eFAST remains imperative in rapid diagnosis of significant chest injury. Our data suggests that general surgery residents perform eFAST with similar sensitivity (25%) to professional ultrasonographers (35%) as described by *Santorelli et al* when looking at all PTX. In the setting of clinically significant PTX, general surgery residents were 47% sensitive compared to a reported 65% by Santorelli and colleagues. This can be attributed to PGY 1 having less ultrasound experience.

Conclusion

Our findings indicate general surgery residents are more reliably able to detect clinically relevant pneumothorax compared to off service rotators. While our data suggests that CXR is more accurate than eFAST in overall detection of PTX, educational programs may benefit all PGY1 level residents in improving detection of significant pneumothorax. The majority of PGY1 residents do not receive formal training in ultrasound examination despite being an essential part of resident training. As eFAST is utilized in trauma patients for both intrathoracic and intrabdominal pathology, educational training to improve PGY1 level accuracy is strongly encouraged.

References

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