Section: Emergency Medicine

Original Research Article

DIAGNOSTIC ACCURACY OF POINT-OF-CARE ULTRASOUND IN BLUNT CHEST TRAUMA: A PROSPECTIVE OBSERVATIONAL STUDY

Mathana V[1], Akhil Mohammed A[2], Jerome J[3]

[1]Department of Anaesthesiology, Kanyakumari Government Medical College, Tamil Nadu, India
[2]Department of Emergency Medicine, Tirunelveli Medical College, Tamil Nadu, India
[3]Department of Emergency Medicine, Kanyakumari Government Medical College, Tamil Nadu, India

Received : 30/01/2026
Received in revised form : 16/03/2026
Accepted : 03/04/2026

Keywords:
Blunt chest trauma; point-of-care ultrasound; pneumothorax; haemothorax.

Corresponding Author:
Dr. Mathana V,
Email: mathanajerom@gmail.com

DOI: 10.47009/jamp.2026.8.2.220

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (2); 1207-1214

ABSTRACT

Background: Thoracic injuries are a major contributor to morbidity following blunt trauma. Early identification of pneumothorax and haemothorax is essential for timely management. Although computed tomography (CT) provides definitive diagnosis, bedside thoracic ultrasound has emerged as a rapid, non-invasive modality for initial evaluation in emergency departments. This study aimed to evaluate the diagnostic accuracy of point-of-care ultrasound (POCUS) performed by emergency physicians in detecting pneumothorax and haemothorax in patients with blunt chest trauma, using CT chest as the reference standard. **Materials and Methods:** This is a prospective observational study. Adult patients (>18 years) presenting with blunt chest trauma were enrolled. All patients underwent clinical evaluation, thoracic POCUS, and CT chest. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy of POCUS were calculated. Data were analysed using appropriate statistical software. Diagnostic parameters were calculated with 95% confidence intervals. Associations between clinical variables and imaging findings were assessed using the Chi-square test, with a p-value of <0.05 considered statistically significant. **Result:** Out of 172 patients included, CT chest identified pneumothorax in 69 patients (40.1%) and haemothorax in 31 patients (18.02%). Ultrasound demonstrated 96.88% sensitivity and 100% specificity for haemothorax. For pneumothorax, POCUS showed 82.6% sensitivity and 100% specificity. Clinical signs such as subcutaneous emphysema and tracheal deviation were significantly associated with pneumothorax ($p < 0.001$). **Conclusion:** POCUS is a rapid, reliable, and highly specific bedside imaging modality for detecting pneumothorax and haemothorax in blunt chest trauma, particularly useful for early diagnosis and management in resource-limited emergency settings.

INTRODUCTION

Blunt chest trauma is a common emergency condition resulting from mechanisms such as motor vehicle collisions, falls, and crush injuries.[1] Thoracic trauma contributes significantly to trauma-related morbidity and mortality and accounts for approximately 10–20% of trauma deaths.[2] Life-threatening complications including pneumothorax, haemothorax, lung contusion, and flail chest require rapid identification and management.[3,4] Although computed tomography (CT) is considered the diagnostic gold standard, its use may be limited in unstable patients and resource-constrained settings.[5] Point-of-care ultrasound (POCUS) provides a rapid, bedside, radiation-free tool for evaluating thoracic injuries.[6] However, variations in reported diagnostic accuracy highlight the need for further prospective evaluation to improve trauma triage and management.[7–10]

MATERIALS AND METHODS

Study Design and Setting: This prospective observational study was conducted in the Department of Emergency Medicine of a Tertiary Care Medical College Hospital in Tamilnadu, India from September 2023 to March 2025. The study aimed to evaluate the diagnostic accuracy of thoracic point-of-care ultrasound (POCUS) in adult patients presenting with blunt chest trauma. Prior approval for the study was obtained from the Institutional Ethics Committee.

Adult trauma patients aged more than 18 years presenting with acute blunt chest injury to the Department of Emergency Medicine were screened for eligibility. Patients presenting within 48 hours of injury and fulfilling the inclusion criteria were considered for enrolment.

A consecutive sampling strategy was adopted. All eligible patients presenting during the study period were included until the required sample size of 172 was achieved. The sample size was calculated using the formula for estimating a proportion: n = z2 * p * (1 - p) / e2, using the expected sensitivity of 87%, which was derived from previously published literature evaluating thoracic POCUS for traumatic pneumothorax.[11]

We excluded patients with penetrating chest trauma, extensive subcutaneous emphysema interfering with ultrasound assessment, previous chronic pulmonary conditions such as lung fibrosis, history of prior chest trauma and pregnancy.

Upon arrival, all patients underwent primary assessment and stabilization according to standard trauma protocols (Airway, Breathing, Circulation). Resuscitative measures were instituted when indicated. Thoracic ultrasound examination was performed at the bedside using a Mindray UMT-200 ultrasound system equipped with Linear probe (5–10 MHz) and Curvilinear probe (2.5–5 MHz).

Trauma patients were immobilized in a supine or semi-recumbent position. Therefore, anterior and lateral chest walls were mainly accessible to assessment by US. Initial scanning was performed in the longitudinal plane, perpendicular to the ribs, allowing correct identification of the pleural line between two adjacent ribs with acoustic shadows ('bat-sign').

The transducer was then slightly rotated anti-clockwise (with the transducer marker facing backwards towards the vertebral body) to obtain an oblique scan along one intercostal space which permits visualization of a larger portion of the pleura and lung parenchyma away from rib shadows. Priority was given to scanning specific chest regions where the chance to detect even the smallest pneumothorax is highest. These areas, also known as 'hot zones', are located on both sides of the upper and lower anterior chest wall.

Ultrasound Criteria for diagnosing Pneumothorax include 1. Absence of lung sliding, 2. Absence of B-lines, 3. Presence of Lung Point Sign (The ultrasound point where normal lung sliding alternates with absent sliding, marking the boundary of a pneumothorax) [Figure 3],[12] 4. Presence of "barcode" or "stratosphere" sign on M-mode (An M-mode lung ultrasound pattern showing parallel horizontal lines above and below the pleural line due to absence of lung sliding) [Figure 2].[13] For Haemothorax the criteria are 1. Presence of Anechoic or hypoechoic pleural fluid collection, [Figure 1].[2] Sinusoidal movement of the collapsed lung within pleural fluid (Sinusoid sign).[14]

Hemodynamically stable patients underwent computed tomography (CT) of the chest, which served as the reference standard for confirmation of pneumothorax and haemothorax. Hemodynamically unstable patients or those with severe respiratory distress underwent immediate intercostal drainage (ICD) insertion as clinically indicated. When feasible, CT confirmation was obtained.

The primary outcome was the diagnostic accuracy of thoracic POCUS in detecting Pneumothorax & Haemothorax.

All study data were initially compiled in Microsoft Excel and analysed using appropriate statistical software. Continuous variables such as age were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. The diagnostic performance of thoracic point-of-care ultrasound (POCUS) for detecting pneumothorax and haemothorax was evaluated using computed tomography (CT) chest findings as the reference standard. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy were calculated along with 95% confidence intervals (CI).

A 2 × 2 contingency table was constructed to compare ultrasound findings with CT chest results for both pneumothorax and haemothorax. Associations between clinical examination findings and imaging results were assessed using the Chi-square test. A p-value of <0.05 was considered statistically significant.

RESULTS

During the study period from September 2023 to March 2025, a total of 172 consecutive adult patients presenting to the emergency department with blunt chest trauma and fulfilling the predefined inclusion and exclusion criteria were enrolled in the study. All patients underwent detailed clinical assessment, bedside thoracic ultrasonography, and CT chest evaluation, which served as the reference standard for diagnosis.

The mean age of the study population was 50.05 ± 12.5 years, with ages ranging from 19 to 75 years. Regarding gender distribution, 100 patients (58.1%) were male, while 72 patients (41.8%) were female, yielding a male-to-female ratio of approximately 1.39:1 [Table 1].

On presentation to the emergency department, several patients demonstrated physiological abnormalities suggestive of significant thoracic injury and respiratory compromise. Tachycardia (pulse rate >100 beats/minute) was observed in 95 patients (55.23%). Hypoxemia (SpO_2 <95%) was present in 42 patients (24.42%). Tachypnoea (respiratory rate >20/minute) was documented in 129 patients (75%) [Table 1].

Clinical examination findings provided important initial clues regarding the presence of thoracic injuries. Tracheal deviation was identified in 8 patients (4.65%), suggesting the possibility of significant intrathoracic pathology such as pneumothorax. Bony crepitus, indicative of possible rib fractures or chest wall skeletal injury, was detected in 34 patients (19.77%). Chest wall tenderness, a common finding following blunt thoracic trauma, was observed in 61 patients (35.47%). Subcutaneous emphysema, which may occur due to air leakage from the lung into the subcutaneous tissues, was present in 16 patients (9.3%).

Percussion findings revealed characteristic patterns suggestive of underlying pleural pathology: Hyperresonance on percussion was present in 61 patients (35.47%), which is classically associated with pneumothorax. Dullness on percussion was identified in 23 patients (13.37%), suggesting possible pleural fluid accumulation such as haemothorax. Auscultation findings demonstrated reduced air entry in 78 patients (45.35%), indicating impaired lung expansion or ventilation on the affected side [Table 2].

Bedside point-of-care thoracic ultrasonography (POCUS) was performed immediately after primary resuscitation. Ultrasonography identified features suggestive of haemothorax in 31 patients (18.02%). The most prominent sonographic signs included Anechoic pleural collection, detected in 31 patients (18.02%), consistent with pleural fluid accumulation. Sinusoid Sign, also observed in 31 patients (18.02%), indicating disruption of the normal lung-diaphragm interface.

Ultrasound findings indicative of pneumothorax was observed in 57 patients (33.14%).

These findings included Absence of lung sliding, observed in 57 patients (33.14%), Barcode (stratosphere) sign on M-mode, seen in 57 patients (33.14%), Lung point sign, present in 57 patients (33.14%) & Absence of B-lines, noted in 57 patients (33.14%). These sonographic signs collectively suggested the presence of pneumothorax in the affected patients [Table 3].

All patients subsequently underwent CT chest imaging, which served as the reference standard for confirming thoracic injuries. CT chest revealed Pneumothorax in 69 patients (40.12%), Haemothorax in 32 patients (18.60%) and no significant thoracic pathology in 71 patients (41.28%). Thus, pneumothorax was the most frequently detected intrathoracic injury in the study population, followed by haemothorax [Figure 4].

Comparison of ultrasound findings with CT chest results yielded the distribution shown in [Table 4]. Based on this comparison, the diagnostic performance of thoracic ultrasound for pneumothorax was calculated and arrived at an overall Accuracy of 93.02% (95% CI: 88.13%–96.34%). These findings indicate that thoracic ultrasound demonstrated excellent specificity and high overall diagnostic accuracy for the detection of pneumothorax [Table 4].

The diagnostic performance of thoracic ultrasound for haemothorax was assessed using CT chest as the reference standard and the results were shown in Table 5. Diagnostic parameters were calculated and the results demonstrate that thoracic ultrasound showed perfect sensitivity, specificity, and diagnostic accuracy for detecting haemothorax in this study population [Table 5].

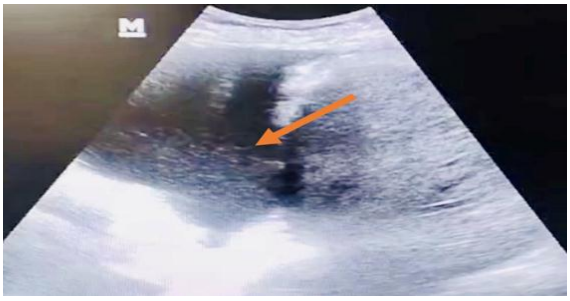

Figure 1. Ultrasound image demonstrating anechoic pleural fluid collection suggestive of hemothorax.

A thoracic ultrasound (intercostal view) shows a well-defined anechoic (dark) area in the pleural space (indicated by the arrow), consistent with fluid accumulation. The absence of internal echoes suggests a simple fluid collection, characteristic of pleural effusion/hemothorax in the appropriate clinical context.

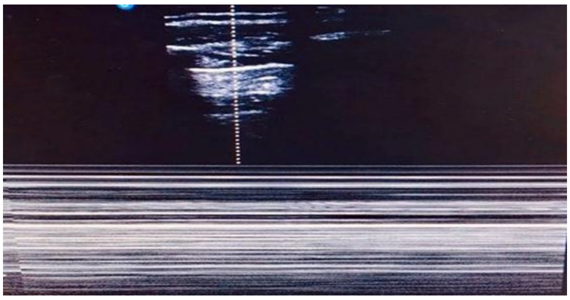

Figure 2. Barcode sign on M-mode lung ultrasound suggestive of pneumothorax.

M-mode ultrasonography demonstrates the characteristic "barcode" or "stratosphere" sign, with parallel horizontal lines present both above and below the pleural line, indicating absence of lung sliding. This pattern is highly suggestive of pneumothorax in the appropriate clinical setting.

Figure 3. Lung point sign on thoracic ultrasound indicating pneumothorax.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

B-mode ultrasound image demonstrates the "lung point" (arrow), representing the interface where normal lung sliding intermittently alternates with absent sliding. This finding corresponds to the boundary between aerated lung and pneumothorax and is considered highly specific for the diagnosis of pneumothorax.

Doughnut chart illustrating the proportion of computed tomography (CT) chest findings among study participants. Normal findings were observed in 41% of cases, pneumothorax in 40%, and hemothorax in 19%, demonstrating the relative frequency of thoracic pathologies identified on CT imaging.

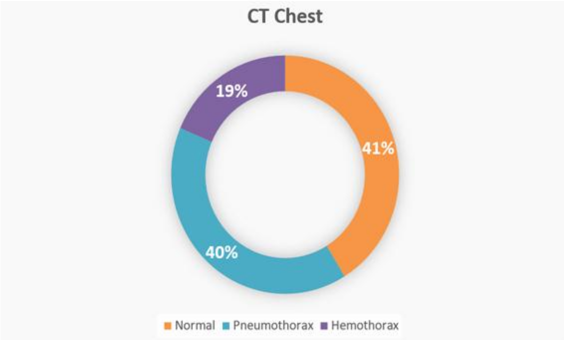

Figure 4. Distribution of CT chest findings in the study population.

Table 1: Demographic characteristics and initial physiologic parameters of the study population (n = 172).

		Mean	Std. Deviation	Minimum	Maximum
Age	n = 172	50.06	12.534	19	75
Systolic Blood Pressure		116.65	10.894	100	140
PR		100.54	9.145	78	132
SpO2		96.19	2.397	90	99
RR		22.72	4.533	14	35
GCS		13.46	2.431	3	15

Values are expressed as mean ± standard deviation, with corresponding minimum and maximum values. Physiologic variables recorded at presentation include systolic blood pressure, pulse rate, oxygen saturation (SpO_2), respiratory rate, and Glasgow Coma Scale (GCS). Units: age (years), systolic blood pressure (mmHg), pulse rate (beats/min), SpO_2 (%), respiratory rate (breaths/min), and GCS (score 3–15).

Table 2: Clinical examination findings among the study population (n = 172).

				Percentage (%)
Tracheal Shift	Deviated	n = 172	8	4.7
	Midline		164	95.3
Chest Rise	Reduced		53	30.8
	Equal		119	69.2
Bony Crepitus	Present		34	19.8
	Absent		138	80.2
Chest Wall Tenderness	Present		61	35.5
	Absent		111	64.5
Subcutaneous Emphysema	Present		16	9.3
	Absent		156	90.7
Hyperresonance on Percussion	Present		61	35.5
	Absent		111	64.5
Dull Note on Percussion	Present		23	13.4
	Absent		149	86.6
Bilateral Air Entry	Reduced		78	45.3
	Normal		94	54.7
Added Sounds	Present		20	11.6
	Absent		152	88.4

Data are presented as frequencies (n) and percentages (%). Clinical parameters assessed on initial examination included tracheal position, chest rise, presence of bony crepitus, chest wall tenderness, subcutaneous emphysema, percussion findings (hyperresonance and dullness), bilateral air entry, and added breath sounds. Findings are categorized as present/absent or by clinical status (e.g., deviated/midline, reduced/equal, normal/reduced) as appropriate.

Table 3: Thoracic ultrasound findings in the study population (n = 172).

				Percentage (%)
Anechoic Sign	Present	n = 172	31	18.02
	Absent		141	81.9
Sinusoid Sign	Present		31	18.02
	Absent		141	81.9
Absent Lung Sliding	Present		57	33.1
	Absent		115	66.9
Bar Code Sign	Present		57	33.1
	Absent		115	66.9
Lung Point Sign	Present		57	33.1

	Absent		115	66.9
Absent B Lines	Present		57	33.1
	Absent		115	66.9

Data are presented as frequency (n) and percentage (%). The distribution of key thoracic ultrasound signs—including anechoic sign, sinusoid sign, absent lung sliding, bar code sign, lung point sign, and absence of B-lines—is shown as present or absent among the study participants. These findings were assessed at initial evaluation using bedside thoracic ultrasonography.

Table 4: Diagnostic accuracy of ultrasound (USG) for detection of pneumothorax using computed tomography (CT) as the reference standard (n = 172).

Pneumothorax	**CT Positive**	**CT Negative**	**Total**
USG Positive	57	0	57
USG Negative	12	103	115
Total	69	103	172
Pearson Chi-Square	127.26	df = 1	P = <.001
Statistic	Value	95% CI	
Sensitivity	82.61%	71.59% to 90.68%	
Specificity	100.00%	96.48% to 100.00%	
Positive Predictive Value	100.00%	93.73% to 100.00%	
Negative Predictive Value	89.57%	83.69% to 93.49%	
Accuracy	93.02%	88.13% to 96.34%	

The contingency table presents the distribution of ultrasound findings against CT results. Diagnostic performance of ultrasound is reported as sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy, each with corresponding 95% confidence intervals (CI). Ultrasound demonstrated high specificity and PPV (100% each), with a sensitivity of 82.61% and NPV of 89.57%. The association between ultrasound and CT findings was statistically significant (Pearson chi-square = 127.26, df = 1, $p < 0.001$)

Table 5: Diagnostic accuracy of ultrasound (USG) for detection of hemothorax compared with computed tomography (CT) as the reference standard (n = 172).

Hemothorax	**CT Positive**	**CT Negative**	**Total**
USG Positive	31	0	31
USG Negative	1	140	141
Total	32	140	172
Pearson Chi-Square	165.44	df = 1	P = < .001
Statistic	Value	95% CI	
Sensitivity	96.88%	84.26% - 99.45%	
Specificity	100.00%	97.33% – 100.00%	
Positive Predictive Value	100.00%	88.97% – 100.00%	
Negative Predictive Value	99.29%	96.09% – 99.87%	
Accuracy	99.42%	96.78% – 99.90%	

Cross-tabulation of USG findings against CT results is presented. Diagnostic performance measures including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy are reported with corresponding 95% confidence intervals. Ultrasound demonstrated high diagnostic accuracy for detecting hemothorax, with excellent sensitivity and specificity. The association between USG and CT findings was statistically significant (Pearson chi-square = 165.44, df = 1, $p < 0.001$).

DISCUSSION

Traditionally, computed tomography (CT) of the chest has been considered the gold standard imaging modality for identifying thoracic injuries due to its high sensitivity and detailed anatomical visualization. However, CT imaging may not always be immediately available, particularly in unstable trauma patients or in resource-limited emergency departments. In such situations, point-of-care ultrasound (POCUS) has emerged as a valuable bedside diagnostic modality that allows rapid assessment without radiation exposure and can be performed repeatedly during resuscitation.[15]

The present study evaluated 172 patients presenting with blunt chest trauma and compared the diagnostic performance of bedside thoracic ultrasonography with CT chest for detecting pneumothorax and haemothorax. In addition, the study examined the association between various clinical examination findings and imaging results.

The mean age of the study population was 50.05 ± 12.5 years, with an age range of 19 to 75 years. The majority of patients belonged to the 50 – 60-year age group (52.33%). Trauma epidemiology studies have consistently reported that middle-aged individuals represent a large proportion of blunt thoracic trauma cases due to occupational exposure, road traffic accidents, and other high-energy mechanisms.[16]

The present study demonstrated a male predominance (58.1%), with females constituting 41.8%, resulting in a male-to-female ratio of 1.39:1. This finding is consistent with global trauma trends, where males experience a higher incidence of traumatic injuries due to greater exposure to occupational hazards and risk-prone activities.[16]

Physiological abnormalities were common among the study population. Tachypnoea (respiratory rate >20/minute) was present in 75% of patients, indicating the high prevalence of respiratory distress following thoracic trauma. Respiratory compromise in blunt chest trauma may occur due to pain, lung contusion, pneumothorax, or haemothorax. Similarly, tachycardia (pulse rate >100 beats/minute) was observed in 55.23% of patients, which may reflect physiological stress, hypovolemia, or pain. Hypoxemia (SpO_2 <95%) was identified in 24.42% of patients, suggesting impaired gas exchange resulting from pleural or parenchymal lung injury.

These findings highlight the importance of prompt physiological assessment in trauma patients, as early identification of respiratory and circulatory compromise is critical for initiating appropriate resuscitative measures.

Clinical examination continues to play a vital role in the initial assessment of trauma patients. In the present study, several classical physical signs demonstrated associations with underlying thoracic injuries.

Tracheal deviation, observed in 4.65% of patients, was strongly associated with pneumothorax. Tracheal deviation typically occurs in tension pneumothorax, where increasing intrathoracic pressure leads to mediastinal shift and compression of mediastinal structures. Although this sign is relatively uncommon, its presence is highly suggestive of a life-threatening pneumothorax requiring immediate decompression.

Bony crepitus, detected in 19.77% of patients, indicated the presence of rib fractures or chest wall injury. Rib fractures are commonly associated with pleural injuries and may lead to secondary pneumothorax or haemothorax.

Subcutaneous emphysema, present in 9.3% of patients, was found exclusively in patients with pneumothorax. Subcutaneous emphysema results from air leakage from the pleural space into subcutaneous tissues and is widely recognized as a clinical indicator of pneumothorax.

Percussion findings were also valuable. Hyperresonance, observed in 35.47% of patients, showed a strong association with pneumothorax, whereas dullness on percussion, seen in 13.37% of patients, correlated with haemothorax. These classical bedside signs continue to provide important diagnostic clues during initial trauma assessment.

However, some clinical findings were less specific. Chest wall tenderness, observed in 35.47% of patients, was present in patients with both pneumothorax and haemothorax, indicating that tenderness alone cannot reliably differentiate the underlying pathology. Similarly, reduced air entry, identified in 45.35% of patients, was observed in patients with both normal and abnormal CT findings. These observations highlight the importance of combining clinical examination with imaging modalities to accurately diagnose thoracic injuries.

Thoracic ultrasound demonstrated excellent diagnostic performance in detecting haemothorax in the present study. The anechoic pleural collection, indicative of pleural fluid accumulation, was detected in 31 patients (18.02%).

When compared with CT chest, ultrasound demonstrated 96.88% sensitivity and 100% specificity for haemothorax detection. These findings are consistent with previous studies demonstrating high diagnostic accuracy of ultrasound for pleural effusion and haemothorax.

Hyacinthe et al. reported that thoracic ultrasound has high sensitivity for haemothorax detection but may occasionally miss very small or posteriorly located collections.[17] Similarly, other trauma studies have demonstrated that ultrasound can detect pleural fluid volumes as small as 20–50 mL, making it highly sensitive in trauma settings.[18]

The Sinusoid Sign, another ultrasound indicator of pleural fluid accumulation, was also observed in 31 patients (18.02%) and corresponded with haemothorax detected on CT imaging. These findings reinforce the reliability of ultrasound in identifying pleural fluid collections in trauma patients.

Several sonographic signs were evaluated for pneumothorax detection, including Absence of lung sliding, Barcode (stratosphere) sign on M-mode, Lung point sign & Absence of B-lines. Each of these signs was observed in 57 patients (33.14%).

When compared with CT chest findings, thoracic ultrasound demonstrated a sensitivity of 82.61% and specificity of 100% for pneumothorax detection. The high specificity observed in this study indicates that a positive ultrasound finding reliably confirms pneumothorax, making ultrasound an excellent rule-in diagnostic tool. The absence of lung sliding occurs when air accumulates in the pleural space and separates the visceral and parietal pleura.[19] The barcode sign on M-mode represents the absence of the normal seashore pattern, indicating lack of pleural movement.[20]

The lung point sign, which represents the transition point between normal lung sliding and absent sliding, is considered highly specific for pneumothorax.[12] Lichtenstein et al. demonstrated that the lung point sign has near-perfect specificity for pneumothorax detection.[12] Similarly, absence of B-lines, which normally arise from the pleural line, suggests the presence of air in the pleural space.[21] Previous studies have demonstrated comparable diagnostic performance. Ianniello et al. reported a 77%

ISSN (O): 2687-5365; ISSN (P): 2753-6556

sensitivity and 99.8% specificity for ultrasound in diagnosing pneumothorax in trauma patients.[22] Kirkpatrick et al. also demonstrated that thoracic ultrasound is highly accurate for detecting traumatic pneumothorax and can identify pneumothoraxes not visible on supine chest radiographs.[23]

The sensitivity of 82.61% observed in the present study suggests that ultrasound may occasionally miss small pneumothoraxes.[24] However, its high specificity and rapid bedside availability make it extremely useful in emergency settings.[25]

The integration of thoracic ultrasound into trauma evaluation protocols such as the Extended Focused Assessment with Sonography for Trauma (eFAST) examination has significantly improved early detection of thoracic injuries.[26]

Bedside ultrasound offers several advantages like Immediate availability during resuscitation, Absence of ionizing radiation, Portability, Repeatability for serial monitoring & Applicability in unstable patients. These characteristics make ultrasound particularly valuable in emergency departments and trauma centres where rapid decision-making is essential.[27,28]

CONCLUSION

This prospective study demonstrates that bedside thoracic point-of-care ultrasound (POCUS) is a rapid and reliable diagnostic tool for evaluating blunt chest trauma in the emergency department. Ultrasound showed excellent diagnostic accuracy for haemothorax with 96.88% sensitivity and high specificity (100%) with good sensitivity (82.6%) for pneumothorax when compared with CT chest. These findings indicate that a positive ultrasound result strongly confirms the presence of pneumothorax or haemothorax. When integrated with focused clinical examination, thoracic POCUS enables early identification of critical thoracic injuries. Its portability, rapid availability, and absence of radiation make it particularly valuable in emergency settings and resource-limited environment.

REFERENCES

1. Anita Kumari Gupta AKS. Epidemiological Pattern of Blunt Trauma Chest in Western India [Internet]. [cited 2026 Feb 12]. Available from: https://journals.sagepub.com/doi/epdf/10.4103/am.am_27_20 doi:10.4103/am.am_27_20
2. Narayanan R, Kumar S, Gupta A, Bansal VK, Sagar S, Singhal M, et al. An Analysis of Presentation, Pattern and Outcome of Chest Trauma Patients at an Urban Level 1 Trauma Center. Indian J Surg. 2018 Feb;80(1):36–41. doi:10.1007/s12262-016-1554-2 PubMed PMID: 29581683; PubMed Central PMCID: PMC5866799.
3. Simon JB, Wickham AJ, Simon JB, Wickham AJ. Blunt chest wall trauma: an overview. Br J Hosp Med. 2019 Dec 10;80(12):711–5. doi:10.12968/hmed.2019.80.12.711
4. Manay P, Satoskar RR, Karthik V, Prajapati RP. Studying Morbidity and Predicting Mortality in Patients with Blunt Chest Trauma using a Novel Clinical Score. J Emerg Trauma Shock. 2017 Sep;10(3):128. doi:10.4103/JETS.JETS_131_16
5. Park IH, Kim CW, Choi YU, Kang TW, Lim J, Byun CS. Occult pneumothorax in patients with blunt chest trauma: key findings on supine chest radiography. J Thorac Dis. 2023 Aug 31;15(8). doi:10.21037/jtd-23-541
6. Jahanshir A, Moghari SM, Ahmadi A, Moghadam PZ, Bahreini M. Value of point-of-care ultrasonography compared with computed tomography scan in detecting potential life-threatening conditions in blunt chest trauma patients. Ultrasound J. 2020 Aug 4;12(1):36. doi:10.1186/s13089-020-00183-6 PubMed PMID: 32747992; PubMed Central PMCID: PMC7399008.
7. Stengel D, Leisterer J, Ferrada P, Ekkernkamp A, Mutze S, Hoenning A. Point-of-care ultrasonography for diagnosing thoracoabdominal injuries in patients with blunt trauma. Cochrane Injuries Group, editor. Cochrane Database Syst Rev. 2018 Dec 12;2018(12). doi:10.1002/14651858.CD012669.pub2
8. Rovida S, Orso D, Naeem S, Vetrugno L, Volpicelli G. Lung ultrasound in blunt chest trauma: A clinical review. Ultrasound J Br Med Ultrasound Soc. 2022 Feb;30(1):72–9. doi:10.1177/1742271X21994604 PubMed PMID: 35173781; PubMed Central PMCID: PMC8841950.
9. Lentz B, Fong T, Rhyne R, Risko N. A systematic review of the cost-effectiveness of ultrasound in emergency care settings. Ultrasound J. 2021 Mar 9;13(1):16. doi:10.1186/s13089-021-00216-8
10. Kapoor K, Yadav VK, Chaudhary R, Sethi R, Kapoor R. Assessment of the Impact of Early Point- of- Care Ultrasound in Diagnosing Acute Abdominal Pain in the Emergency Department. 2024.
11. DeMasi S, Parker MS, Joyce M, Mulligan K, Feeser S, Balderston JR. Thoracic point-of-care ultrasound is an accurate diagnostic modality for clinically significant traumatic pneumothorax. Acad Emerg Med. 2023;30(6):653–61. doi:10.1111/acem.14663
12. Lichtenstein D, Mezière G, Biderman P, Gepner A. The "lung point": an ultrasound sign specific to pneumothorax. Intensive Care Med. 2000 Oct 1;26(10):1434–40. doi:10.1007/s001340000627
13. Chuang TJ, Lai CC. Sonographic barcode sign of pneumothorax. QJM Int J Med. 2017 Aug 1;110(8):525–6. doi:10.1093/qjmed/hcx088
14. Lichtenstein DA, Mezière G, Lascols N, Biderman P, Courret JP, Gepner A, et al. Ultrasound diagnosis of occult pneumothorax. Crit Care Med. 2005 Jun;33(6):1231–8. doi:10.1097/01.ccm.0000164542.86954.b4 PubMed PMID: 15942336.
15. Volpicelli G, Elbarbary M, Blaivas M, Lichtenstein DA, Mathis G, Kirkpatrick AW, et al. International evidence-based recommendations for point-of-care lung ultrasound. Intensive Care Med. 2012 Apr 1;38(4):577–91. doi:10.1007/s00134-012-2513-4
16. Søreide K. Epidemiology of major trauma. Br J Surg. 2009 Jul 1;96(7):697–8. doi:10.1002/bjs.6643
17. Hyacinthe AC, Broux C, Francony G, Genty C, Bouzat P, Jacquot C, et al. Diagnostic Accuracy of Ultrasonography in the Acute Assessment of Common Thoracic Lesions After Trauma. CHEST. 2012 May 1;141(5):1177–83. doi:10.1378/chest.11-0208 PubMed PMID: 22016490.
18. Kocijančič I, Vidmar K, Ivanovi-Herceg Z. Chest sonography versus lateral decubitus radiography in the diagnosis of small pleural effusions. J Clin Ultrasound. 2003;31(2):69–74. doi:10.1002/jcu.10141
19. Lichtenstein DA, Mezière GA. Relevance of Lung Ultrasound in the Diagnosis of Acute Respiratory Failure*: The BLUE Protocol. CHEST. 2008 Jul 1;134(1):117–25. doi:10.1378/chest.07-2800
20. Rovida S, Orso D, Naeem S, Vetrugno L, Volpicelli G. Lung ultrasound in blunt chest trauma: A clinical review. Ultrasound J Br Med Ultrasound Soc. 2022 Feb;30(1):72–9. doi:10.1177/1742271X21994604 PubMed PMID: 35173781; PubMed Central PMCID: PMC8841950.
21. Gargani L, Volpicelli G. How I do it: Lung ultrasound. Cardiovasc Ultrasound. 2014 Jul 4;12(1):25. doi:10.1186/1476-7120-12-25
22. Ianniello S, Di Giacomo V, Sessa B, Miele V. First-line sonographic diagnosis of pneumothorax in major trauma:

accuracy of e-FAST and comparison with multidetector computed tomography. Radiol Med (Torino). 2014 Sep 1;119(9):674–80. doi:10.1007/s11547-014-0384-1
23. Kirkpatrick AW, Sirois M, Laupland KB, Liu D, Rowan K, Ball CG, et al. Hand-Held Thoracic Sonography for Detecting Post-Traumatic Pneumothoraces: The Extended Focused Assessment With Sonography For Trauma (EFAST): J Trauma Inj Infect Crit Care. 2004 Aug;57(2):288–95. doi:10.1097/01.TA.0000133565.88871.E4
24. Brook OR, Beck-Razi N, Abadi S, Filatov J, Ilivitzki A, Litmanovich D, et al. Sonographic Detection of Pneumothorax by Radiology Residents as Part of Extended Focused Assessment With Sonography for Trauma. J Ultrasound Med. 2009;28(6):749–55. doi:10.7863/jum.2009.28.6.749
25. Sharma Y, Obidigbo B, P N. Diagnostic Applications of Point‐of‐Care Ultrasound in Emergency Medicine: A Narrative Review. Cureus. 2026 Jan 14. doi:10.7759/cureus.101501
26. Kithinji SM, Lule H, Acan M, Kyomukama L, Muhumuza J, Kyamanywa P. Efficacy of extended focused assessment with sonography for trauma using a portable handheld device for detecting hemothorax in a low resource setting; a multicenter longitudinal study. BMC Med Imaging. 2022 Dec 1;22:211. doi:10.1186/s12880-022-00942-y PubMed PMID: 36456990; PubMed Central PMCID: PMC9716853.
27. Bloom BA, Gibbons RC. Focused Assessment With Sonography for Trauma. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 [cited 2026 Mar 12]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK470479/ PubMed PMID: 29261902.
28. Seif D, Perera P, Mailhot T, Riley D, Mandavia D. Bedside Ultrasound in Resuscitation and the Rapid Ultrasound in Shock Protocol. Crit Care Res Pract. 2012;2012:503254. doi:10.1155/2012/503254 PubMed PMID: 23133747; PubMed Central PMCID: PMC3485910.