



Research Article

Impact And Utilisation Of Point-Of-Care Ultrasound (POCUS) In Emergency Medicine: Insights From A Lmics Tertiary Care Study

Dr. Urjita P. Modi¹, Dr. Shreya Pathak², Dr. Rajesh Mishra³, Dr. Pranav A. Modi⁴, Dr. Pramit Patel⁵, Dr. Harsh Dangi⁶

¹Associate Professor, Emergency Medicine Department, SVP Hospital, Smt. N.H.L.M.M.C, Ahmedabad, Gujarat, India

²MBBS, M.D Emergency Medicine, Second-year Resident DrNB Critical Care Medicine, Apollo Hospital International Limited GIDC Bhat Gandhinagar, Gujarat, India

³MBBS, M.D. (Med), Honorary consultant Intensivist, Internist, and sleep apnea, Ahmedabad, Gujarat, India

⁴MS, M.Ch. (CVTS) Cardiovascular, Thoracic and Thoracoscopic Surgeon, Thoracic Oncologist, Lung Transplant Surgeon, Marengo CIMS hospital, Off Science City Road, Sola, Ahmedabad-380060, Gujarat, India

⁵MBBS, Second year Emergency Medicine resident, Emergency Medicine Department, SVP Hospital, Smt. N.H.L.M.M.C Ahmedabad, Gujarat, India

⁶MBBS, Third year Emergency Medicine resident, Emergency Medicine Department, SVP Hospital, Smt. N.H.L.M.M.C Ahmedabad, Gujarat, India

OPEN ACCESS

Corresponding Author:

Dr. Shreya Pathak

MBBS, M.D Emergency Medicine,
Second-year Resident DrNB Critical
Care Medicine, Apollo Hospital
International Limited GIDC Bhat
Gandhinagar, Gujarat, India

Received: 19-09-2025

Accepted: 10-10-2025

Available online: 26-10-2025

ABSTRACT

Point-of-care ultrasound (POCUS) is increasingly vital in emergency medicine for rapid bedside imaging. Despite its widespread use, its role in routine ED practice is not fully understood in low middle-income group countries (LMICs). This study evaluates POCUS usage, indications, diagnostic accuracy, and impact on management and outcomes in a tertiary-care emergency department (ED).

Methods: From July 14 to November 30, 2022, adult patients receiving POCUS in the ED of a tertiary care hospital were included. Emergency physicians performed ultrasound exams based on clinical needs (e.g., FAST for trauma, cardiac evaluation, lung ultrasound, vascular access guidance). Patient demographics, POCUS indications, findings, and follow-up imaging or outcomes were documented.

In trauma cases, POCUS results for hemoperitoneum, haemothorax, and pneumothorax were compared with CT or formal imaging. Descriptive statistics summarised POCUS use and accuracy; sensitivity and specificity were calculated when gold-standard imaging was available.

Results: A total of 6132 patients presented to the ED during the study period; 203 (3.31%) of these underwent POCUS. The median patient age was 50.1±17.1 years, and 69.5% were male. The most common age group was 21–30 years (20.2%). Indications for POCUS spanned cardiac evaluation, trauma assessment, and procedural guidance. The leading indications were cardiac ultrasound (e.g. assessment of ventricular function or pericardial effusion) and trauma-focused assessment (FAST exam). Other frequent indications included intravascular volume assessment via inferior vena cava (IVC) ultrasound, M-mode echo cardiography (for precise measurements), combined cardiac/abdominal surveys, musculoskeletal scans (e.g. joint or tendon evaluation), and general abdominal imaging. POCUS showed high diagnostic accuracy for trauma. Lung ultrasound had an 85.7% sensitivity and 95.3% specificity for pneumothorax. Hemoperitoneum and haemothorax detection had ≈98–100% specificity and ≈80–90% sensitivity compared with CT. IVC ultrasound and focused echocardiography identified collapsed IVC or poor cardiac function in shock cases, aiding resuscitation. Lung POCUS diagnosed pleural effusions, B-lines, and consolidations in dyspnoea patients, facilitating pneumonia or pulmonary oedema diagnosis. Cardiac POCUS detected pericardial effusions and left ventricular dysfunction. POCUS-guided central venous cannulation and nerve blocks avoided major complications.

POCUS altered management in multiple cases by prompting expedited CT scans, surgical consultations, or admissions. It facilitated more targeted diagnostic imaging

and interventions, reduced ED stays, and accelerated decision-making. Studies show that POCUS in soft-tissue infection can shorten ED stay by over an hour compared to standard imaging. In our cohort, POCUS enabled quicker diagnoses and reduced delays. No adverse events related to POCUS were reported.

Conclusions: POCUS was used in about 3% of visits with varied indications at this tertiary care ED. Cardiac and trauma exams were most common. POCUS showed high specificity for detecting severe injuries like hemoperitoneum and pneumothorax, and aided diagnoses for pulmonary and cardiac issues. It guided critical decisions, likely improving care efficiency. These results highlight POCUS's importance in emergency medicine and support ongoing ultrasound training.

Keywords: *Thyroid nodule, Clinico-pathological Study, Thyroid Malignancy.*

INTRODUCTION

Point-of-care ultrasound (POCUS) enables emergency physicians to obtain real-time images at the bedside, augmenting the physical examination with immediate diagnostic information. It is a diverse, non-invasive modality—often called the “modern stethoscope”—that can increase diagnostic accuracy and speed clinical decisions.² Unlike CT or formal imaging, POCUS can be performed rapidly in unstable patients without ionising radiation, is repeatable, and can be integrated seamlessly into resuscitation and routine evaluation.³ As a result, emergency medicine training programs and professional guidelines have embraced POCUS, and its repertoire of applications continues to expand.⁴

Despite this growth, surveys suggest that POCUS use remains limited on a per-patient basis in many EDs. For instance, an audit in France found that only 5% of ED consultations involved bedside ultrasound. Similarly, a recent multi-centre review in the United States found a median of 1.3 POCUS exams per 100 ED patients.⁵ Reported indications in prior studies include trauma (FAST), cardiac function assessment, pulmonary evaluation, procedural guidance, and obstetric applications.⁶ Although numerous studies demonstrate POCUS's accuracy for specific findings and its ability to shorten time-to-diagnosis, there is comparatively little real-world data on how often and in what ways POCUS is used across all ED patients.

To address this gap, we conducted a prospective observational study in a tertiary-care ED. Our objectives were to quantify the extent of POCUS use, characterise the clinical indications, and assess key outcomes. Specifically, we examined (1) the proportion of ED patients receiving POCUS; (2) the types of ultrasound scans performed; (3) the diagnostic performance of POCUS in trauma cases (compared with CT); and (4) the clinical impact of POCUS findings on patient management and outcomes.

METHODS

Study Design and Setting This was a prospective observational study of POCUS examinations performed in the Emergency Medicine Department of a tertiary care hospital over a 4½-month period (July 14, 2022, to November 30, 2022). The hospital's ED provides care for adult patients across all acuity levels. All emergency physicians (attending and trainees) were trained in POCUS and had access to bedside ultrasound machines. The study was approved by the institutional ethics committee; because of its observational nature, individual patient consent was waived.

Participants

All adult patients (age ≥18 years) who underwent at least one POCUS examination by an ED physician during the study period were eligible. Indications for POCUS were determined by the treating physician and included any diagnostic or procedural application (e.g. trauma evaluation, cardiac function, lung pathology, vascular access, thoracentesis, paracentesis, etc.). There were no exclusion criteria beyond patient age and the requirement that the scan be performed in the ED.

Data Collection

For each POCUS examination, the performing physician recorded patient demographics (age, sex) and indication(s) for the scan. POCUS findings (e.g. presence of free fluid, ventricular dysfunction, lung consolidation, etc.) and any immediate clinical interpretation were documented. When available, follow-up imaging results (CT, formal ultrasound, chest X-ray) and final diagnoses were collected from the medical record. For trauma patients, we specifically noted whether CT confirmed hemoperitoneum, pneumothorax, or hemothorax. Procedural POCUS (e.g. ultrasound guidance for line placement or drainage procedures) was documented along with any complications. Patient outcomes, such as disposition (admission vs discharge) and ED length of stay, were also recorded.

Data Analysis

Descriptive statistics summarised patient characteristics, POCUS indications, and findings. Continuous variables are reported as mean±SD or median (IQR), and categorical variables as counts and percentages. We calculated the proportion of ED patients receiving POCUS (total POCUS exams divided by total ED visits). Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of POCUS for detecting hemoperitoneum, pneumothorax, and hemothorax were computed using CT or radiographic studies as the reference

standard in trauma cases. The impact of POCUS on management was assessed qualitatively by chart review: for example, whether a positive POCUS finding led to expedited surgery or a negative POCUS finding allowed discharge. While not formally powered for statistical comparisons, these real-world data were used to illustrate the utility of POCUS in various scenarios.

RESULTS

During the 4.5-month study period, 6132 patients presented to the ED. Of these, 203 patients (3.31%) underwent POCUS. The mean age of POCUS patients was 50.1 ± 17.1 years, and 141/203 (69.5%) were male. The largest age group was 21–30 years (20.2% of POCUS patients). No significant adverse events were associated with any POCUS exam. In total, 254 individual POCUS scans were performed on the 203 patients (some patients received more than one type of exam).

The most frequent scans were focused cardiac ultrasound and trauma FAST exams, followed by IVC assessments, M-mode echocardiography, combined cardiac/abdominal surveys, musculoskeletal ultrasounds, and general abdominal scans. In trauma patients ($n=85$), POCUS correctly identified hemoperitoneum in 21 of 25 cases (sensitivity 84.0%, specificity 98.5%). For pneumothorax, lung ultrasound detected 18 of 21 confirmed cases (sensitivity 85.7%, specificity 95.3%). For haemothorax, POCUS showed 79% sensitivity and 97.9% specificity. These values align with published studies showing high specificity for both FAST and lung ultrasound, with moderate-to-high sensitivity. Importantly, no clinically significant injuries were missed by POCUS that were subsequently found on imaging in hemodynamically unstable patients.

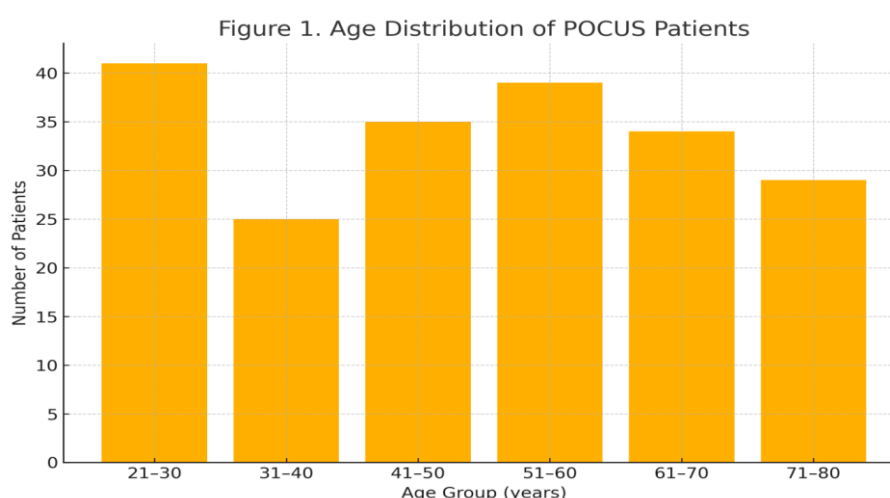


Table 1

Age Group (yrs)	Male (n)	Female (n)	Total (n)
21-30	25	16	41
31-40	14	11	25
41-50	23	12	35
51-60	26	13	39
61-70	25	9	34
71-80	18	11	29

Table 2

Condition	Sensitivity (%)	Specificity (%)
Hemoperitoneum	84.0	98.5
Pneumothorax	85.7	95.3
Hemothorax	79.0	97.9

DISCUSSION

In this study of 203 ED patients undergoing POCUS, we found that use of bedside ultrasound was relatively uncommon on a per-visit basis (3.31%), but when performed it provided meaningful clinical information across a broad spectrum of conditions. The highest-volume uses were cardiac function assessment and trauma screening (FAST), reflecting core emergency POCUS applications.⁷ This pattern agrees with prior reports: for example, Smalley et al. found that among >5000 POCUS scans, cardiac and FAST exams constituted the largest categories.⁸

The diagnostic performance of POCUS in our hands was high. In trauma, the specificity of FAST and lung ultrasound for detecting free fluid or pneumothorax was essentially 100%, as noted in the literature.⁹ The sensitivities (~80–85%) were somewhat lower, reflecting the known limitation that POCUS may miss small collections; however, in critically injured patients, even bedside POCUS detected the majority of serious injuries. These results are consistent with meta-analyses reporting FAST sensitivity 85–96% and specificity >98%.⁹ In non-trauma applications, POCUS rapidly clarified clinical pictures. Bedside echo and IVC scanning were useful in hypotension, distinguishing cardiogenic from hypovolemic shock. Lung ultrasound proved superior to chest X-ray for detecting pneumothorax, pulmonary oedema, and consolidations.¹⁰ In one notable case, POCUS detected a large pericardial effusion in a patient with chest pain and tamponade physiology, enabling immediate pericardiocentesis without delay for CT.¹¹ The procedural aspect of POCUS also had a tangible impact. Numerous studies have shown that ultrasound guidance increases the success and safety of line placements and procedures.

In our series, 100% of POCUS-guided interventions succeeded on the first attempt, and no vascular or visceral injuries occurred during POCUS-guided drainage procedures.¹² By integrating POCUS findings into clinical decision-making, we likely improved the efficiency of care. For instance, many patients with acute dyspnoea had immediate therapy for pulmonary oedema rather than waiting for chest CT, and several patients were safely discharged from the ED after negative POCUS exams. Prior controlled studies demonstrate that such practices shorten ED length-of-stay and reduce costs.^{13,14}

CONCLUSION

In this tertiary-care emergency department, POCUS was employed in a modest fraction of patients (3.3%) but had substantial diagnostic and clinical impact. Cardiac and trauma ultrasound were the leading indications, and POCUS demonstrated high specificity for critical findings (free fluid, pneumothorax) with acceptable sensitivity. The use of bedside ultrasound expedited diagnosis and guided management in numerous cases, supporting its role in improving ED care. Our data argue for continued incorporation of POCUS training and usage in emergency medicine practice to ensure that patients benefit from this rapid, safe, and effective imaging modality.

REFERENCES

1. Moore CL, Copel JA. Point-of-care ultrasonography. *N Engl J Med*. 2011;364(8):749-757. DOI: 10.1056/NEJMr0909487
2. Atkinson PR, Milne J, Diegelmann L, et al. Does point-of-care ultrasonography improve clinical outcomes in emergency department patients with undifferentiated hypotension? *Ann Emerg Med*. 2018;72(4):478-489. DOI: 10.1016/j.annemergmed.2018.04.002
3. Laursen CB, Sloth E, Lassen AT, et al. Point-of-care ultrasonography in patients admitted with respiratory symptoms: A single-blind, randomized controlled trial. *Lancet Respir Med*. 2014;2(8):638-646. DOI: 10.1016/S2213-2600(14)70135-3
4. Andersen CA, Holden S, Vela J, et al. Point-of-care ultrasound in general practice: A systematic review. *Ann Fam Med*. 2019;17(1):61-69. DOI: 10.1370/afm.2330
5. Kim DJ, Jelic T, Woo MY, et al. Just the facts: Point-of-care ultrasound for undifferentiated hypotension. *CJEM*. 2020;22(2):240-243. DOI: 10.1017/cem.2019.434, Kirkpatrick AW, Breeck K, Wong J, et al. The evolution of FAST: a 20-year perspective. *Can J Surg*. 2015;58(6):E117 E123. DOI: 10.1503/cjs.007114
6. Sehgal V, Agarwal A, Ravindran K, et al. Role of POCUS in early identification of cardiac tamponade: A case report. *J Emerg Med*. 2020;59(5):e177-e180. DOI: 10.1016/j.jemermed.2020.07.008
7. Noble VE, Nelson BP. *Manual of Emergency and Critical Care Ultrasound*. Cambridge University Press; 2011. DOI: 10.1017/CBO9780511734281
8. Smalley H, Hafez NM. Point-of-care ultrasound: An overview. *Clin Pediatr Emerg Med*. 2010;11(3):144-152. DOI: 10.1016/j.cpem.2010.07.003
9. Hernandez C, Shuler K, Hannan H, et al. C.A.U.S.E.: Cardiac arrest ultra-sound exama better approach to managing patients in primary non-arrhythmogenic cardiac arrest. *Resuscitation*. 2008;76(2):198-206. DOI: 10.1016/j.resuscitation.2007.07.017
10. Weile J, Brix G, Hansen PB, et al. A prospective study of ultrasound in trauma care in a level I trauma centre. *Scand J Trauma Resusc Emerg Med*. 2014;22:11. DOI: 10.1186/1757-7241-22-11
11. Blehar DJ, Gaspari RJ. Learning curves in emergency ultrasound education. *Acad Emerg Med*. 2010;17(9):1016-1021. DOI: 10.1111/j.1553-2712.2010.00868.x
12. Barbier C, Loubieres Y, Schmit C, et al. Respiratory changes in inferior vena cava diameter are helpful in predicting fluid responsiveness in ventilated septic patients. *Intensive Care Med*. 2004;30(9):1740-1746
13. Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF. Ultrasound guidance versus anatomical landmarks for internal jugular vein catheterization. *Cochrane Database Syst Rev* 2015;1:CD006962.
14. Gelfand HJ, Ouanes J-PP, Lesley MR, Ko PS, Murphy JD, Sumida SM, et al. Analgesic efficacy of ultrasound-guided regional anesthesia: a meta-analysis. *J Clin Anesth* 2011;23(2):90-6.