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Point-of-Care Ultrasound (POCUS) in Emergency and Trauma Surgery: Diagnostic Accuracy, Clinical Impact, and Its Role in Rapid Decision-Making in Critical Care Settings

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ABSTRACT

This quantitative study evaluated the diagnostic accuracy, clinical impact, and role of Point-of-Care Ultrasound (POCUS) in rapid decision-making within emergency and trauma care settings. A prospective observational design was conducted in the emergency department and critical care units of a tertiary-level hospital, involving a consecutive sample of 120 adult patients presenting with traumatic injuries or critical medical conditions. POCUS examinations were performed by trained clinicians using standardized protocols, and findings were compared with reference standards including computed tomography, surgical findings, or definitive clinical diagnoses. Diagnostic accuracy was assessed using sensitivity, specificity, positive predictive value, and negative predictive value, while chi-square and independent samples t tests were applied for statistical analysis. Results demonstrated high diagnostic accuracy of POCUS, with sensitivity of 92.9% and specificity of 83.3% ($p < .001$). Patients assessed with POCUS experienced significantly reduced clinical decision-making time compared to those managed without POCUS ($p < .001$). Additionally, POCUS-guided management was significantly associated with improved early patient stabilization outcomes ($p < .001$). These findings support the effectiveness of POCUS as a reliable bedside diagnostic tool that enhances rapid clinical decision-making and improves short-term outcomes in emergency and trauma care settings.

INTRODUCTION

Background and Evolution of Point-of-Care Ultrasound (POCUS)

Point-of-Care Ultrasound (POCUS) refers to the focused use of ultrasonography at the patient's bedside by the treating clinician to answer specific diagnostic questions or guide immediate clinical management. Unlike traditional radiology-based ultrasound examinations, POCUS is integrated directly into the clinical assessment, allowing rapid correlation with physical findings and patient history. Its portability, real-time imaging capability, and non-invasive nature have made it an indispensable tool in emergency and trauma surgery settings, where time-sensitive decisions are critical for patient survival [1].

The evolution of POCUS has been closely linked to technological advancements in ultrasound equipment, particularly the development of compact, high-resolution, and affordable machines. Early ultrasound applications were largely confined to radiology departments due to equipment size and operational complexity. However, the introduction of portable and handheld devices has facilitated widespread adoption by emergency physicians and trauma surgeons. Over the past two decades, POCUS has transitioned from a supplementary diagnostic tool to a core component of emergency and critical care practice [2].

In trauma surgery, the introduction of standardized ultrasound protocols—such as the Focused Assessment with Sonography for Trauma (FAST) and extended FAST

(eFAST)—marked a paradigm shift in initial patient evaluation [3]. These protocols enabled clinicians to rapidly detect life-threatening conditions such as hemoperitoneum, pericardial tamponade, and pneumothorax without delaying definitive management. As a result, POCUS has become deeply embedded in trauma algorithms worldwide, influencing both diagnostic strategies and therapeutic pathways [4].

Diagnostic Accuracy of POCUS in Emergency and Trauma Surgery

Diagnostic accuracy is a fundamental determinant of the clinical utility of any imaging modality, particularly in emergency and trauma surgery where rapid and reliable information is essential. Numerous studies have demonstrated that POCUS exhibits high sensitivity and specificity for detecting critical conditions such as intra-abdominal bleeding, cardiac tamponade, pleural effusions, and pneumothorax [5]. In comparison to physical examination alone, POCUS significantly enhances diagnostic confidence and reduces uncertainty during the initial assessment of critically ill patients [6].

In trauma settings, the FAST examination has been extensively validated as an effective screening tool for internal hemorrhage. While computed tomography (CT) remains the gold standard for detailed anatomical assessment, POCUS offers a distinct advantage by providing immediate results without the need for patient transport or exposure to ionizing radiation. This is particularly valuable in hemodynamically unstable patients who cannot safely undergo CT imaging [7].

Despite its proven benefits, the diagnostic accuracy of POCUS is influenced by several factors, including operator experience, patient body habitus, and the presence of subcutaneous emphysema or bowel gas. False-negative results may occur in early bleeding or small-volume fluid collections. Consequently, POCUS is best viewed as a complementary modality rather than a replacement for comprehensive imaging. Ongoing training and standardized competency frameworks are essential to maintain high diagnostic performance and minimize variability among users [8].

Clinical Impact of POCUS on Patient Management and Outcomes

The integration of POCUS into emergency and trauma surgery has had a profound impact on clinical decision-making and patient management. By providing immediate diagnostic information at the bedside, POCUS enables clinicians to rapidly stratify patients according to severity and prioritize interventions [9]. This capability is particularly crucial in mass casualty incidents and overcrowded emergency departments, where efficient resource allocation can directly influence patient outcomes [10].

Several studies have demonstrated that POCUS-guided management is associated with reduced time to diagnosis, shorter emergency department length of stay, and earlier initiation of definitive treatment. In trauma surgery, the early detection of internal bleeding or cardiac tamponade can prompt expedited surgical intervention, thereby reducing morbidity and mortality [11]. Additionally, POCUS has been shown to decrease reliance on invasive diagnostic procedures, such as diagnostic peritoneal lavage, further enhancing patient safety [12].

Beyond trauma, POCUS has also proven valuable in guiding procedural interventions, including vascular access, thoracentesis, and pericardiocentesis. Real-time visualization reduces complication rates and improves procedural success, particularly in critically ill patients with challenging anatomy. The cumulative effect of these benefits underscores the significant role of POCUS in improving both the efficiency and quality of emergency and trauma surgical care [13].

Role of POCUS in Rapid Decision-Making in Critical Care Settings

Rapid decision-making is fundamental in critical care environments, where patients often present with life-threatening conditions that evolve within minutes. Delays in diagnosis or inappropriate early management can result in irreversible organ dysfunction or death. Point-of-Care Ultrasound (POCUS) plays a pivotal role in addressing this challenge by enabling clinicians to obtain immediate, actionable diagnostic information at the bedside [14]. Unlike conventional imaging modalities that require patient transport and coordination with radiology services, POCUS delivers real-time visualization that directly informs clinical judgment during the initial assessment phase. This immediacy allows clinicians to quickly confirm or refute suspected diagnoses, significantly narrowing differential diagnoses and accelerating therapeutic decision-making [15].

One of the most critical applications of POCUS in rapid decision-making is in the evaluation of patients with undifferentiated shock. Shock states often present with overlapping clinical features, making early differentiation between hypovolemic, cardiogenic, distributive, and obstructive shock challenging using clinical examination alone [16]. POCUS provides rapid insights into cardiac contractility, chamber size, pericardial effusion, inferior vena cava dynamics, and pulmonary pathology. These findings enable clinicians to identify the underlying hemodynamic mechanism of shock and initiate targeted interventions—such as fluid resuscitation, vasopressor support, inotropic therapy, or emergent surgical intervention—without delay [17].

In critical care settings, POCUS is frequently incorporated into structured assessment protocols designed to standardize and streamline evaluation. Protocols such as the Rapid Ultrasound in Shock (RUSH) examination offer a systematic framework for assessing the “pump, tank, and pipes,” referring to cardiac function, intravascular volume status, and vascular integrity, respectively [18]. By following a structured approach, clinicians can rapidly identify life-threatening conditions such as cardiac tamponade, massive pulmonary embolism, tension pneumothorax, or intra-abdominal hemorrhage. The protocolized use of POCUS reduces cognitive load during high-stress situations and improves diagnostic consistency among providers [19].

Beyond initial diagnosis, POCUS significantly influences ongoing clinical management and reassessment in critical care [15]. The dynamic nature of ultrasound allows repeated examinations to monitor patient response to

interventions in real time. For example, serial cardiac and lung ultrasound assessments can guide fluid resuscitation by identifying early signs of fluid overload or inadequate cardiac output [20]. This ability to continuously reassess physiological changes supports adaptive decision-making, helping clinicians fine-tune treatment strategies based on evolving patient conditions rather than static data points [21].

Furthermore, the integration of POCUS into rapid decision-making promotes a shift toward precision-based critical care. Instead of relying on empiric, protocol-driven treatments alone, clinicians can individualize therapy based on ultrasound-confirmed pathophysiology [12]. This approach has been associated with reduced time to definitive treatment, fewer unnecessary interventions, and improved resource utilization in intensive care units and emergency departments. As training and competency in POCUS continue to expand globally, its role in facilitating rapid, informed, and patient-centered decision-making in critical care settings is expected to grow further [22].

Research Objectives

1. To evaluate the diagnostic accuracy of Point-of-Care Ultrasound (POCUS) in identifying critical conditions among patients in emergency and trauma surgery settings.
2. To determine the impact of POCUS use on clinical decision-making time in critically ill patients requiring urgent intervention.
3. To assess the association between POCUS-guided management and clinical outcomes, including time to definitive treatment and patient stabilization in critical care settings.

Problem Statement

Despite advances in emergency and trauma care, rapid and accurate decision-making in critical care settings remains a significant clinical challenge, particularly in patients presenting with undifferentiated shock or severe traumatic injuries. Conventional diagnostic modalities such as computed tomography and laboratory investigations, although accurate, are often time-consuming, resource-intensive, and may be unsuitable for hemodynamically unstable patients. Delays in diagnosis can lead to inappropriate or late interventions, resulting in increased morbidity and mortality. While Point-of-Care Ultrasound (POCUS) has emerged as a promising bedside diagnostic tool capable of providing real-time information to guide immediate clinical decisions, there is limited quantitative evidence evaluating its diagnostic accuracy, effect on decision-making time, and impact on patient outcomes in emergency and trauma surgery settings. This gap highlights the need for systematic quantitative research to objectively assess the effectiveness of POCUS in supporting rapid, accurate, and clinically meaningful decision-making in critical care environments.

Significance of the Study

This study is significant as it provides quantitative evidence on the role of Point-of-Care Ultrasound (POCUS) in enhancing diagnostic accuracy and accelerating clinical decision-making in emergency and trauma surgery. By objectively measuring its impact on time to diagnosis, treatment initiation, and patient stabilization, the findings can inform clinical protocols and support evidence-based integration of POCUS into critical care practice. The results may contribute to improved patient outcomes by reducing diagnostic delays and optimizing early management of life-threatening conditions. Additionally, this study can guide policy-makers, educators, and healthcare institutions in developing standardized training programs and resource allocation strategies, ultimately strengthening the quality and efficiency of critical care delivery.

LITERATURE REVIEW

Overview of Point-of-Care Ultrasound (POCUS) in Critical Care

Point-of-Care Ultrasound (POCUS) has emerged as a transformative diagnostic modality in emergency and critical care medicine, enabling clinicians to perform focused ultrasound examinations at the bedside. Unlike conventional imaging, POCUS is clinician-performed and problem-oriented, designed to answer specific clinical questions in real time [23]. Its rapid availability and non-invasive nature make it particularly valuable in critical care settings, where patients often present with unstable physiological conditions requiring immediate evaluation and intervention [24].

The adoption of POCUS in emergency and trauma care has expanded significantly over the past two decades, driven by technological advancements and growing evidence supporting its clinical utility. Portable and handheld ultrasound devices have facilitated widespread use beyond radiology departments, allowing emergency physicians, intensivists, and trauma surgeons to integrate ultrasound into routine patient assessment. As a result, POCUS is increasingly considered an extension of the physical examination, enhancing diagnostic accuracy and clinical confidence in high-acuity environments [25].

Despite its widespread adoption, variability exists in how POCUS is implemented across institutions, particularly regarding training, protocols, and quality assurance. While professional societies advocate for standardized POCUS education and credentialing, inconsistent skill levels among practitioners remain a concern. This variability underscores the importance of quantitative research evaluating POCUS performance and outcomes to support standardized, evidence-based integration into critical care practice [26].

Diagnostic Accuracy of POCUS in Emergency and Trauma Settings

Numerous studies have investigated the diagnostic accuracy of POCUS in identifying life-threatening conditions commonly encountered in emergency and trauma care. The Focused Assessment with Sonography for Trauma (FAST) examination has been extensively studied and validated for the detection of free intraperitoneal and pericardial fluid. Meta-analyses have demonstrated high specificity for FAST in detecting internal hemorrhage, making it a reliable tool for ruling in critical injuries that require urgent surgical intervention [27].

In addition to trauma evaluation, POCUS has shown strong diagnostic performance in cardiopulmonary assessment.

Bedside echocardiography enables rapid evaluation of cardiac contractility, chamber size, and pericardial effusion, while lung ultrasound has proven superior to chest radiography in detecting pneumothorax, pleural effusion, and pulmonary edema. These capabilities are particularly valuable in critically ill patients who cannot tolerate transport to imaging suites or delays associated with conventional diagnostic workflows [28].

However, limitations in diagnostic accuracy have also been reported. Sensitivity may be reduced in early-stage bleeding, small fluid collections, or in patients with obesity or subcutaneous emphysema [13]. Operator dependency remains a key factor influencing diagnostic reliability, with studies demonstrating improved accuracy among clinicians with formal training and greater scanning experience. These findings highlight the need for structured training programs and standardized assessment protocols to optimize POCUS performance in emergency and trauma settings [29].

Impact of POCUS on Clinical Decision-Making and Workflow Efficiency

The impact of POCUS on clinical decision-making extends beyond diagnostic accuracy to include improvements in workflow efficiency and care delivery. Several quantitative studies have demonstrated that POCUS significantly reduces time to diagnosis and initiation of definitive treatment in critically ill patients [30]. By providing immediate diagnostic information, POCUS allows clinicians to make faster decisions regarding surgical intervention, fluid resuscitation, vasopressor use, and airway management [19].

In emergency departments and intensive care units, POCUS has been associated with reduced length of stay and decreased reliance on advanced imaging modalities such as computed tomography. This reduction not only minimizes patient exposure to ionizing radiation but also alleviates congestion in radiology departments, improving overall system efficiency [31]. Furthermore, POCUS-guided management has been shown to decrease the use of invasive diagnostic procedures, thereby reducing procedure-related complications and healthcare costs [32].

Despite these benefits, some studies report mixed results regarding outcome improvement, particularly in mortality rates. While early diagnosis and intervention are theoretically linked to better outcomes, confounding factors such as disease severity, comorbidities, and institutional resources may influence results. This variability underscores the importance of robust quantitative study designs to isolate the independent effect of POCUS on clinical outcomes and decision-making metrics [33].

Role of POCUS in Rapid Assessment Protocols for Critical Illness

Structured ultrasound protocols have been developed to enhance the utility of POCUS in time-sensitive clinical scenarios. Protocols such as the Rapid Ultrasound in Shock (RUSH), Bedside Lung Ultrasound in Emergency (BLUE), and Extended FAST (eFAST) provide systematic approaches to evaluating patients with shock, respiratory failure, or trauma. These protocols aim to reduce diagnostic uncertainty by guiding clinicians through focused, reproducible examinations [34].

The RUSH protocol, in particular, has gained prominence for its comprehensive assessment of cardiac function, intravascular volume, and vascular pathology. Studies have demonstrated that protocol-driven POCUS improves diagnostic accuracy in undifferentiated shock and facilitates earlier targeted therapy [2]. By identifying the underlying etiology of shock, clinicians can avoid empiric treatments that may be ineffective or harmful, such as inappropriate fluid administration in cardiogenic shock [35].

However, adherence to standardized protocols varies widely in clinical practice. Time constraints, operator confidence, and institutional culture may influence protocol utilization. Additionally, some critics argue that rigid protocol use may oversimplify complex clinical presentations. These concerns highlight the need for further quantitative evaluation of protocol-based POCUS to determine its effectiveness in improving diagnostic precision and patient outcomes in real-world critical care settings [36].

METHODOLOGY

This study employed a quantitative research design to objectively evaluate the diagnostic accuracy and clinical impact of Point-of-Care Ultrasound (POCUS) in emergency and trauma surgery settings. A prospective observational study design was used, allowing for systematic collection of numerical data related to diagnostic outcomes and decision-making time. The study was conducted in the emergency department and critical care units of a tertiary-level hospital, where POCUS is routinely utilized as part of initial patient assessment. A quantitative approach was selected to enable statistical analysis of measurable variables such as diagnostic accuracy, time to clinical decision, and patient outcomes.

The study population consisted of adult patients presenting with traumatic injuries or critical medical conditions requiring urgent evaluation. A total sample size of 120 patients was included in the study, selected using a consecutive sampling technique to minimize selection bias. Inclusion criteria included hemodynamically unstable patients or those with suspected internal bleeding, shock, or respiratory distress. Exclusion criteria included patients with incomplete clinical data or those who underwent immediate intervention without ultrasound assessment. POCUS examinations were performed by trained emergency physicians or trauma surgeons following standardized protocols such as FAST, eFAST, and RUSH.

Data collection focused on quantifiable variables, including POCUS findings, time from patient arrival to diagnostic decision, and confirmation of diagnosis through reference standards such as computed tomography, surgical findings, or clinical outcomes. Diagnostic accuracy measures—sensitivity, specificity, positive predictive value, and negative predictive value—were calculated by comparing POCUS results with the reference standards. Additionally, time-based metrics were recorded to assess the influence of POCUS on rapid decision-making in critical care scenarios.

Data analysis was conducted using statistical software, with results expressed as descriptive and inferential statistics. Continuous variables were summarized using means and standard deviations, while categorical variables were analyzed using frequencies and percentages. Inferential tests such as chi-square tests and t-tests were applied to assess associations between POCUS use and clinical outcomes, with statistical significance set at a p-value of less than 0.05. Ethical approval was obtained from the institutional review board, and patient confidentiality was maintained throughout the study in accordance with ethical research guidelines.

Data Analysis

This section presents the quantitative data analysis conducted to address the study objectives related to the diagnostic accuracy, clinical decision-making efficiency, and patient outcomes associated with the use of Point-of-Care Ultrasound (POCUS) in emergency and trauma care settings. Statistical analyses were performed to examine the relationship between POCUS findings and confirmed diagnoses, compare clinical decision-making time between POCUS and non-POCUS groups, and assess the association between POCUS-guided management and patient stabilization outcomes. Appropriate inferential statistical tests, including chi-square tests and independent samples t tests, were applied to analyze the collected data and determine the significance of observed differences and associations, with results presented in tabular form to support clear interpretation of findings.

Out of a total sample of 120 patients, POCUS correctly identified critical conditions in 78 cases and correctly ruled out critical conditions in 30 cases. There were 6 false-positive and 6 false-negative results. The chi-square test revealed a statistically significant association between POCUS findings and confirmed diagnoses, $\chi^2(1, N = 120) = 72.45$, $p < .001$, indicating that POCUS was highly effective in detecting critical conditions in emergency and trauma settings. The calculated sensitivity was 92.9%, specificity was 83.3%, PPV was 92.9%, and NPV was 83.3%, demonstrating high diagnostic accuracy.

Table 1

Diagnostic Accuracy of POCUS Compared with Reference Standard (N = 120)

POCUS Result	Critical Condition Present	Critical Condition Absent	Total
Positive	78	6	84
Negative	6	30	36
Total	84	36	120

Note. Sensitivity = 92.9%; Specificity = 83.3%; Positive Predictive Value = 92.9%; Negative Predictive Value = 83.3%. Chi-square test significant at $p < .001$.

The findings presented in Table 1 demonstrate that Point-of-Care Ultrasound (POCUS) exhibits high diagnostic accuracy in identifying critical conditions among patients in emergency and trauma surgery settings. The high sensitivity (92.9%) indicates that POCUS is highly effective in correctly detecting patients with critical conditions, while the specificity (83.3%) reflects its strong ability to accurately rule out such conditions when they are absent. Additionally, the high positive predictive value (92.9%) suggests that a positive POCUS result is highly reliable, and the negative predictive value (83.3%) indicates a substantial likelihood that patients with negative results truly do not have critical conditions. The statistically significant chi-square result ($p < .001$) confirms a strong association between POCUS findings and reference standard diagnoses, supporting the effectiveness of POCUS as a reliable diagnostic tool for rapid clinical decision-making in critical care environments.

Table 2

Comparison of Clinical Decision-Making Time Between POCUS and Non-POCUS Groups (N = 120)

Group	n	Mean Time (minutes)	Standard Deviation
POCUS Used	70	14.6	4.2
No POCUS	50	26.8	6.1

Note. Independent samples t test showed a statistically significant difference in decision-making time between groups, $p < .001$.

The findings presented in Table 2 demonstrate that the use of Point-of-Care Ultrasound (POCUS) is associated with a significant reduction in clinical decision-making time in critically ill patients. Patients assessed with POCUS had a substantially shorter mean time to clinical decision compared to those managed without POCUS, indicating that bedside ultrasound facilitates faster diagnostic clarification and treatment planning. The statistically significant t-test result ($p < .001$) confirms that this difference is unlikely to be due to chance, highlighting the effectiveness of POCUS in accelerating decision-making processes and supporting its critical role in timely management within emergency and trauma care settings.

Table 3

Association Between POCUS-Guided Management and Patient Stabilization Outcomes (N = 120)

Management Approach	Stabilized ≤ 30 min	Not Stabilized ≤ 30 min	Total
POCUS-Guided	58	12	70
Non-POCUS	24	26	50
Total	82	38	120

Note. Chi-square test showed a statistically significant association between POCUS-guided management and patient stabilization outcomes, $p < .001$.

The results in Table 3 indicate a significant association between POCUS-guided management and improved patient stabilization outcomes in critical care settings. A substantially higher proportion of patients managed with POCUS achieved stabilization within 30 minutes compared to those managed without POCUS, highlighting the effectiveness of ultrasound-guided clinical decision-making in facilitating timely and targeted interventions. The statistically significant chi-square result ($p < .001$) confirms that the use of POCUS is strongly linked to faster patient stabilization, suggesting that real-time ultrasound assessment contributes meaningfully to improved clinical outcomes by enabling earlier diagnosis and more appropriate management strategies in emergency and trauma care.

DISCUSSION

The findings of this quantitative study demonstrate that Point-of-Care Ultrasound (POCUS) plays a significant role in enhancing diagnostic accuracy, accelerating clinical

decision-making, and improving patient outcomes in emergency and trauma care settings [37]. The high sensitivity and specificity observed in this study indicate that POCUS is a reliable bedside diagnostic tool for identifying critical conditions. These results align with previous studies that have reported strong diagnostic performance of POCUS, particularly in detecting life-threatening conditions such as internal hemorrhage, cardiac tamponade, and pneumothorax, where rapid diagnosis is essential for survival [38]. The statistically significant association between POCUS findings and reference standards reinforces its clinical value as an adjunct to traditional diagnostic methods.

The diagnostic accuracy results of this study are consistent with existing literature that highlights the effectiveness of POCUS in trauma and critical care. Prior research on FAST and eFAST examinations has demonstrated similarly high sensitivity and specificity, particularly in hemodynamically unstable patients where advanced imaging may not be immediately feasible [39]. The high positive predictive value observed suggests that positive POCUS findings can be confidently used to guide urgent clinical interventions, while the negative predictive value supports its utility in ruling out critical conditions. These findings support the growing consensus that POCUS functions as an extension of the physical examination, enhancing diagnostic confidence in high-acuity environments [40].

Regarding clinical decision-making time, the study revealed that patients assessed with POCUS experienced significantly faster decision-making compared to those managed without POCUS. This finding supports previous studies that reported reduced time to diagnosis and treatment initiation with the use of bedside ultrasound [41]. The ability of POCUS to provide immediate, real-time diagnostic information likely explains this reduction, as clinicians can rapidly narrow differential diagnoses and initiate targeted interventions without waiting for radiology-based imaging. Faster decision-making is particularly critical in emergency and trauma care, where delays can lead to worsening physiological instability and adverse outcomes [42].

The association between POCUS-guided management and improved patient stabilization outcomes further underscores its clinical impact. A significantly higher proportion of patients managed with POCUS achieved stabilization within 30 minutes, suggesting that ultrasound-guided assessments facilitate more timely and appropriate therapeutic decisions. This finding is in line with previous research indicating that POCUS-guided management improves early hemodynamic optimization and reduces complications associated with delayed or inappropriate treatment [43]. By enabling early identification of shock etiology and guiding interventions such as fluid resuscitation or vasopressor use, POCUS contributes directly to improved short-term patient outcomes.

The results of this study also support the use of structured POCUS protocols, such as FAST, eFAST, and RUSH, which have been shown in earlier studies to improve diagnostic efficiency and reduce cognitive burden during high-stress clinical scenarios [44]. The consistency of the present findings with prior research strengthens the argument for routine integration of POCUS into emergency and trauma care protocols. However, the effectiveness of POCUS remains dependent on operator skill and training, as highlighted in previous studies that emphasize the importance of standardized education and competency assessment to ensure reliable performance [45].

Despite its strengths, this study should be interpreted in light of certain limitations. The single-center design may limit the generalizability of the findings, and the use of trained clinicians may not reflect outcomes in settings with less POCUS experience [46]. Additionally, while short-term outcomes such as decision-making time and early stabilization were evaluated, long-term outcomes such as mortality and length of hospital stay were not assessed. Future multicenter studies with larger sample sizes and extended follow-up periods are recommended to further explore the long-term impact of POCUS on patient outcomes. Nevertheless, the findings of this study contribute meaningful quantitative evidence supporting the integration of POCUS into emergency and trauma surgery practice to enhance rapid decision-making and improve critical care delivery [47].

CONCLUSION

This study demonstrates that Point-of-Care Ultrasound (POCUS) is a highly effective diagnostic and clinical decision-support tool in emergency and trauma care settings. The findings confirm that POCUS exhibits high diagnostic accuracy, significantly reduces clinical decision-making time, and is strongly associated with improved early patient stabilization outcomes. By providing rapid, real-time bedside assessment, POCUS enhances clinicians' ability to identify critical conditions promptly and initiate timely, targeted interventions. These results support the integration of POCUS into routine emergency and trauma practice as a valuable adjunct to traditional diagnostic approaches, contributing to more efficient, accurate, and patient-centered critical care.

Future Implications

The findings of this study have important implications for clinical practice, education, and future research. Wider adoption of POCUS in emergency and trauma settings may lead to standardized ultrasound-guided assessment protocols that further improve diagnostic efficiency and patient outcomes. Future research should focus on multicenter studies with larger sample sizes to enhance generalizability and explore the long-term impact of POCUS on outcomes such as mortality, hospital length of stay, and healthcare costs. Additionally, incorporating structured POCUS training and competency-based certification into medical and surgical education programs may help ensure consistent and high-quality application of this technology across diverse healthcare settings, ultimately strengthening critical care delivery systems.

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