



# JRAAS

## Special Issues in Medicine & Surgery

[www.internationalmedicalpublishing.com](http://www.internationalmedicalpublishing.com)



### Case Report

### Section: Radiodiagnosis

## The Role of Point of Care Ultrasound (POCUS) in Maternal Emergencies: Advancements, Applications, and Impact on Outcomes

Dr. Rachna Chaurasia<sup>\*1</sup> & Dr. Pavan Nirwal<sup>2</sup>

<sup>1</sup>Professor and Academic Head, Department of Radiodiagnosis, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh

<sup>2</sup>Junior Resident, Department of Radiodiagnosis, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh.

### HIGHLIGHTS

- Imaging helps localize lymph node involvement.
- CT and PET scans assess disease spread.
- MRI evaluates mediastinal and abdominal masses.
- Guides biopsy for histopathological confirmation
- Crucial for staging and treatment planning

### Key Words:

POCUS  
Maternal emergencies  
Diagnostic delay  
Obstetric ultrasound  
Emergency care

### ABSTRACT

**Introduction:** Maternal emergencies are significant contributors to maternal morbidity and mortality, particularly in resource-limited settings where rapid diagnosis and intervention are crucial. Point-of-Care Ultrasound (POCUS) has emerged as a valuable tool for real-time, bedside diagnosis, enabling prompt clinical decision-making in critical obstetric scenarios such as ectopic pregnancy, postpartum hemorrhage, and hypertensive emergencies. **Aim and Objective:** This study aimed to evaluate the role of POCUS in the timely diagnosis and improved management of maternal emergencies. The primary objective was to assess its impact on diagnosis time and clinical outcomes compared to traditional methods. **Materials and Methods:** prospective observational study included 80 UPT-positive pregnant women with maternal emergencies at Maharani Laxmi Bai Medical College, Jhansi. Bedside POCUS using a portable BPL machine was performed. Emergencies included hemorrhage, ectopic pregnancy, seizures, shock, and reduced fetal movements. Patients with chronic illnesses or no consent were excluded. Diagnosis time and outcomes were compared. Ethical clearance was obtained. **Results:** POCUS significantly reduced diagnosis time in all categories of maternal emergencies, with the most notable reduction in ectopic pregnancy (mean time saved: 55 minutes) and preeclampsia/eclampsia (50 minutes). Out of 80 cases, 63 had resolved outcomes, while 17 developed complications. The highest resolution rate was observed in postpartum hemorrhage cases. POCUS facilitated early triage and management, contributing to improved maternal outcomes. **Conclusion:** POCUS is a valuable tool in maternal emergencies, enabling rapid and accurate diagnosis that improves clinical outcomes. Its integration into standard obstetric care, particularly in low-resource settings, is essential for reducing maternal complications and mortality through timely intervention and effective management.

\*Corresponding Author: Dr. Pavan Nirwal, E-mail: pavannirwal007@gmail.com

**Article History:** Received 13 July 2025; Received in Revised form 14 August 2025; Accepted 17 August 2025

**How To Cite:** Rachna Chaurasia & Pavan Nirwal, The Role of Point of Care Ultrasound (POCUS) in Maternal Emergencies: Advancements, Applications, and Impact on Outcomes. *JRAAS: Special Issues in Medicine & Surgery*; 2025;40(1),1-6

Maternal emergencies continue to pose significant clinical and public health challenges worldwide, often demanding immediate diagnostic assessment and timely intervention to safeguard the lives of both the mother and fetus. These emergencies can occur at any point during pregnancy, childbirth, or the postpartum period and frequently result in life-threatening complications if not identified and managed promptly. According to global estimates, maternal mortality remains alarmingly high, with the vast majority of deaths occurring in low- and middle-income countries, where limited access to advanced diagnostic technologies and specialist care is a common constraint. In such settings, the ability to make accurate, bedside assessments using easily accessible tools is crucial. Point-of-Care Ultrasound (POCUS) has emerged as a promising solution that addresses these gaps, offering clinicians a rapid, non-invasive method to evaluate maternal conditions in real time. This technology has proven especially valuable in time-sensitive obstetric emergencies by facilitating immediate clinical decisions and improving outcomes in both urban hospitals and rural clinics [1-3].

POCUS refers to the application of ultrasonography directly at the patient's side by the treating healthcare provider, rather than relying on scheduled or radiologist-interpreted imaging. Its primary advantage lies in its immediacy and its ability to provide visual confirmation of clinical suspicions within moments, often guiding critical care decisions that would otherwise be delayed. In maternal health care, this real-time feedback is particularly advantageous when dealing with obstetric emergencies such as ruptured ectopic pregnancies, postpartum hemorrhage, hypertensive disorders, or cardiovascular instability in pregnancy. The use of POCUS in such scenarios supports faster diagnosis, triage, and treatment, thereby reducing morbidity and mortality. Its portability and ease of use further strengthen its utility in emergency rooms, operating theaters, labor wards, and even community-level health facilities where traditional imaging resources may be unavailable [4-7].

In recent years, advances in ultrasound technology have enhanced the portability and affordability of ultrasound devices, allowing for their use outside of radiology departments. Handheld devices with rechargeable batteries, often compatible with mobile phones or tablets, are increasingly being used in primary care and emergency settings. These devices offer considerable advantages, especially in resource-constrained environments where access to comprehensive diagnostic infrastructure is limited. The integration of such compact tools into routine obstetric assessments has broadened the reach of safe maternity care and contributed to improved early detection of complications. In various studies, POCUS has shown potential to function as

an extension of the clinical examination, answering crucial questions in real-time that are essential for directing appropriate interventions-such as whether there is free fluid suggestive of internal bleeding, evidence of uterine atony or retained placental tissue, signs of cardiac dysfunction, or abnormal fetal presentation [2, 8, 9].

One of the most impactful uses of POCUS in obstetric emergencies is in the early detection and management of ectopic pregnancy, which remains a major cause of first-trimester maternal mortality. Transabdominal or transvaginal bedside scanning enables rapid identification of an empty uterus, an adnexal mass, or hemoperitoneum, allowing immediate clinical intervention and potentially life-saving management. In cases of postpartum hemorrhage, clinicians can quickly assess uterine size, tone, and retained products, allowing for targeted treatment. Moreover, in patients with severe preeclampsia or eclampsia, POCUS allows evaluation of cardiac contractility, pulmonary congestion, and intravascular volume, which are essential in guiding fluid resuscitation and antihypertensive therapy. The utility of POCUS extends to high-risk scenarios such as maternal sepsis and suspected pulmonary embolism, where it aids in detecting pericardial effusion, pleural fluid, pneumothorax, or inferior vena cava collapse [5, 10, 11].

Beyond diagnostic purposes, POCUS has increasingly been adopted in obstetric anesthesia, especially in emergency cesarean sections. It assists in the evaluation of airway anatomy, facilitates safe placement of central lines, and improves the accuracy of neuraxial block placement, particularly in obese patients or those with anatomical challenges. This application has contributed to enhanced procedural safety and reduced anesthesia-related complications in high-risk obstetric cases. Furthermore, in emergency cesarean settings, POCUS is used to localize the placenta, confirm fetal viability, and detect uterine anomalies, allowing for more informed operative decisions [12-14].

POCUS is increasingly integrated into medical and nursing education through simulation-based training, certification programs, and tele-ultrasound initiatives, emphasizing its expanding clinical relevance. Global organizations such as the WHO support its adoption in maternal care, particularly in underserved areas, empowering frontline providers with real-time diagnostic capabilities. Studies reveal that POCUS alters diagnoses in 15–52% and influences management in 17–87% of emergency cases; in antenatal settings, it changes one-third of diagnoses and 20–30% of management plans. Implementation in rural Kenya has shown improved early identification and referral of high-risk pregnancies. However, challenges persist, including operator variability, inconsistent training, imaging limitations, and the lack of standardized guidelines. Addressing medico-legal and ethical concerns is vital. Nonetheless, POCUS remains a critical tool in reducing maternal mortality, necessitating

ongoing investment in education, infrastructure, and quality assurance[15-18].

This study aims to address the significant gaps in timely diagnosis and intervention of maternal emergencies by evaluating the role of Point-of-Care Ultrasound (POCUS) compared to traditional diagnostic methods. It seeks to assess how POCUS influences clinical decision-making and emergency management in obstetric settings. The objectives include determining the impact of POCUS on the early recognition and treatment of maternal emergencies and analyzing the clinical outcomes associated with its use to support its integration into standard maternal emergency care protocols.

## MATERIALS AND METHODS

This prospective observational study included 80 pregnant females with positive UPT presenting with maternal emergencies at Maharani Laxmi Bai Medical College, Jhansi. A portable BPL ultrasound machine was used to perform POCUS at the bedside. Inclusion criteria encompassed patients with hemorrhage, ectopic pregnancy, pain, reduced fetal movements, seizures, or shock. Exclusion criteria included chronic unrelated illnesses, hemodynamic instability, or refusal of consent. Diagnosis time with and without POCUS was compared, and outcomes were analyzed. Ethical clearance was obtained from the Institutional Ethics Committee, and informed written consent was taken. Patient confidentiality and ethical standards were strictly maintained.

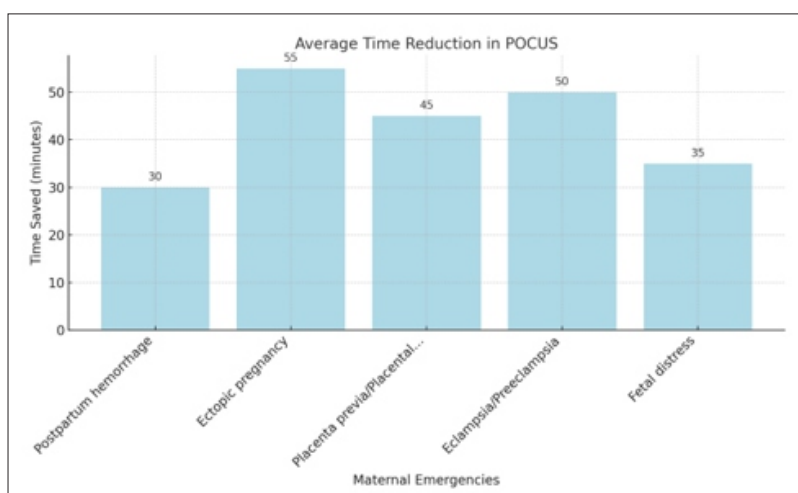
## RESULTS

**Table 1: Comparison of Average Diagnosis Times for Maternal Emergencies with and without Point-of-Care Ultrasound (POCUS)**

Maternal Emergencies	Average Diagnosis Time without Pocus (Minutes)	Average Diagnosis Time with Pocus (Minutes)
Postpartum Hemorrhage	40	10
Ectopic Pregnancy	75	20
Placenta Previa / Placental Abruption	60	15
Eclampsia / Preeclampsia	70	20
Fetal Distress	50	15

The table illustrates a significant reduction in diagnosis time for maternal emergencies when using Point-of-Care Ultrasound (POCUS). For instance, ectopic pregnancy diagnosis time drops from 75 to 20 minutes, and postpartum hemorrhage

from 40 to 10 minutes. This demonstrates the rapid diagnostic utility of POCUS in time-critical obstetric situations. Early diagnosis facilitates timely interventions, potentially improving maternal and fetal outcomes.



**Figure 1: Average Time Reduction in POCUS**

The bar graph highlights that Point-of-Care Ultrasound (POCUS) significantly reduces diagnostic time across various maternal emergencies. The greatest time saving is seen in ectopic pregnancy (55 minutes), followed by

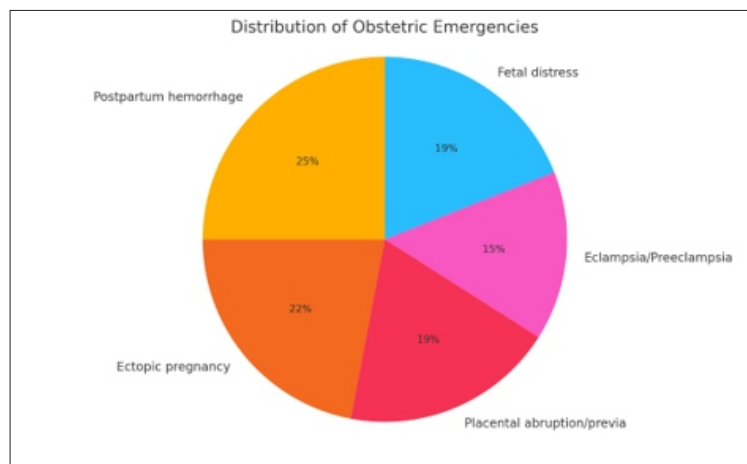
eclampsia/preeclampsia (50 minutes). All conditions benefit from faster diagnosis, underscoring POCUS's role in expediting critical care. This timely intervention can be life-saving for both mother and fetus.

**Table 2: Maternal Emergencies – Resolved VS Complicated Cases**

Maternal Emergencies	Number of Resolved Cases	Number of Complicated Cases
Postpartum Hemorrhage	17.5	2
Ectopic Pregnancy	12	6
Placenta Previa/Placental Abruption	12	2.5
Eclampsia / Preeclampsia	11	1.5
Fetal Distress	12.5	2

The table shows a higher number of resolved cases compared to complicated ones across all maternal emergencies, indicating effective management. Postpartum hemorrhage had the highest resolution rate (17.5 vs. 2), while ectopic pregnancy

showed relatively more complications (6 vs. 12). This suggests that earlier and accurate diagnosis-likely aided by tools like POCUS-improves outcomes. Timely intervention appears critical in minimizing complications and enhancing maternal safety.



**Figure 2: Distribution of Obstetric Emergencies**

The pie chart illustrates the relative frequency of various obstetric emergencies. Postpartum hemorrhage (25%) and ectopic pregnancy (22%) are the most common, indicating major causes of maternal complications. Placental issues and fetal distress both account for 19%, while Eclampsia/Preeclampsia occurs less frequently at 15%. These insights help prioritize clinical attention and resource allocation in maternal care.

## DISCUSSION

Our findings demonstrate a significant reduction in diagnosis time for maternal emergencies using Point-of-Care Ultrasound (POCUS), reinforcing its critical role in time-sensitive obstetric care. Specifically, diagnosis time for ectopic pregnancy dropped from 75 to 20 minutes, and for postpartum hemorrhage from 40 to 10 minutes. These

observations align with Martins JG et al. (2024), who reported a pooled standardized mean difference (SMD) of  $-1.965$  for time to diagnosis, reflecting a substantial reduction with POCUS use. Additionally, a pooled SMD of  $-0.809$  was observed for time to treatment, indicating a moderate yet meaningful decrease. Their study highlighted particularly strong benefits in ruptured ectopic pregnancies, including faster access to the operating room (OR). Similarly, Stone BS et al. (2021) found a notable 48-minute reduction in emergency department treatment time with POCUS (157.9 min) compared to traditional radiology-based ultrasound (RADUS) (206.3 min;  $p = 0.014$ ), and a dramatic 90-minute faster OR access for ruptured ectopic pregnancies (203 min vs 293 min;  $p = 0.0002$ ), emphasizing the life-saving potential of POCUS in maternal emergencies [11, 19].



Our findings confirm that Point-of-Care Ultrasound (POCUS) significantly reduces diagnostic time in various maternal emergencies, with the most notable time savings seen in ectopic pregnancy (55 minutes) and eclampsia/preeclampsia (50 minutes). This acceleration in diagnosis facilitates prompt treatment, potentially improving maternal and fetal outcomes. These results are strongly supported by Ren Y, Shao X et al. (2024), who reported a pooled standardized mean difference (SMD) of  $-1.965$  for time to diagnosis and  $-0.809$  for time to treatment, indicating significant and moderate reductions, respectively. Their subgroup analysis highlighted the marked benefits of POCUS in ruptured ectopic pregnancies, aligning with our findings. Similarly, Stone BS et al. (2021) demonstrated that POCUS reduced emergency department treatment time by 48 minutes (157.9 minutes with POCUS vs. 206.3 minutes with RADUS,  $p = 0.014$ ) and decreased time to operating room access for ruptured ectopic pregnancies by 90 minutes (203 vs. 293 minutes,  $p = 0.0002$ ). These studies substantiate the clinical relevance of our observed time savings, reinforcing POCUS's critical role in maternal emergency care [19, 20].

Our findings show a higher number of resolved cases compared to complicated ones across maternal emergencies, indicating effective clinical management. Postpartum hemorrhage had the highest resolution rate (17.5 vs. 2), while ectopic pregnancy showed more complications (6 vs. 12), underscoring the importance of early and accurate diagnosis. This aligns with Umeda S et al. (2023), who observed that after implementing POCUS-based protocols, there were no maternal deaths, and both transfusion initiation and hospital stay duration were significantly reduced, indicating improved outcomes. Similarly, Urquhart S et al. (2022) reported a dramatic reduction in time from emergency department (ED) arrival to ultrasound (15 min with POCUS vs. 138 min with RADUS), ultrasound to operating room (145 min vs. 243 min), and total ED to OR time (160 min vs. 381 min), highlighting how POCUS facilitated faster surgical interventions. This reduction in critical time intervals likely shifted more cases into the “resolved” category, supporting our observed outcome trend. Together, these findings validate the role of POCUS in reducing complications and enhancing maternal safety in emergency care [21, 22].

Our findings highlight the relative frequency of various obstetric emergencies, with postpartum hemorrhage (25%) and ectopic pregnancy (22%) emerging as the most prevalent, followed by placental abnormalities and fetal distress (each 19%), and eclampsia/preeclampsia (15%). These trends underscore key contributors to maternal complications and the need for prioritizing resources accordingly. Our results closely align with Balde IS et al. (2020), who reported high rates of acute fetal distress (27%) and placental issues with

This study underscores the critical role of Point of Care Ultrasound (POCUS) in improving the diagnosis and management of maternal emergencies. POCUS significantly reduced diagnostic time-ranging from 30 to 55 minutes-across various conditions such as ectopic pregnancy, postpartum hemorrhage, and fetal distress. Its advantages include portability, real-time imaging, non-invasiveness, and elimination of delays caused by transfers to radiology departments. While its effectiveness is influenced by operator skill and has limitations in complex cases, the outcomes in most patients were favorable. POCUS proves to be an indispensable tool that enhances timely intervention and improves both maternal and fetal prognosis.

## REFERENCES

1. Maher MJTJop, nursing n. Emergency preparedness in obstetrics: meeting unexpected key challenges. 2019;33(3):238-45.
2. Alfoti BOO, Alfoti FOO, Alothman STH, Al-Dhafiri TMA, Al-Harbi NHM, Al-Khalidi AM, et al. Utilization of Point-of-Care Ultrasound (POCUS) in Emergency and Critical Care: Role of Nursing for Enhancing Diagnostic Accuracy and Efficiency-Systematic Review. 2024;67(13):705-16.
3. Schram M, Uys F, Purcell-Jones J, Pfister CJIJoA. POCUS and pre-eclampsia: bedside echocardiography to guide resuscitation in cardiogenic shock with pre-eclampsia with severe features—a case report from a low and middle income country. 2025;62:104342.
4. Akanuwe JN, Siriwardena AN, Bidaut L, Mitchell P, Bird P, Lasserson D, et al. Practitioners' views on community implementation of point-of-care ultrasound (POCUS) in the UK: a qualitative interview study. 2023;23(1):84.
5. Bakunas C, Bower RCJEMC-BGOE. Emergency Ultrasound and the Pregnant Patient. 2024:201.
6. Manasievska M. Combined approach with point-of-care ultrasound in Emergency Medicine: methodological aspects and clinical impact. 2021.
7. Shah P, Patel UK. Past and Present of Point-of-Care Ultrasound (PoCUS): A Narrative Review. 2023.
8. Hsieh A, Baker MB, Phalen JM, Mejias-Garcia J, Hsieh A, et al. Handheld point-of-care ultrasound: safety considerations for creating guidelines. 2022;37(9):1146-51.
9. Groos J, Walter A, Wittek A, Strizek B, Gembruch U, Recker FJAog, et al. Shaping ultrasound in midwifery: towards an evidence-based training framework for enhanced prenatal care. 2024;310(1):23-43.
10. Bajwa SJS, Kurdi MS, Sutagatti JG, Bajwa SK, Theerth KAJIJoA. Point-of-Care Ultrasound (POCUS) for the assessment of volume status and fluid management in patients with severe pre-eclampsia: A systematic review and meta-analysis. 2021;65(10):716-30.
11. Martins JG, Waller J, Horgan R, Kawakita T, Kanaan C, Abuhamad A, et al. Point-of-Care Ultrasound in Critical Care

- Obstetrics: A Scoping Review of the Current Evidence. 2024;43(5):951-65.
12. Gohad R, Jain SJC. The use of point-of-care ultrasound (POCUS) in anesthesiology: a narrative review. 2024;16(9).
13. Holland DJA. 260987-Interscalene Block Analgesia After Ambulatory Shoulder Surgery: A Factorial Rct Of Dexamethasone Dose And Route. 2015;70:1180-5.
14. Li L, Yong RJ, Kaye AD, Urman RDJCP, reports h. Perioperative point of care ultrasound (POCUS) for anesthesiologists: an overview. 2020;24(5):20.
15. Lobo MD, Miravent S, de Almeida RPPJETfHL, Practice M. Emerging trends in ultrasound education and healthcare clinical applications: A rapid review. 2024:263-87.
16. Neethling E. Point-of-care ultrasound abnormalities in late onset severe preeclampsia: prevalence and association with serum albumin and brain natriuretic peptide. 2018.
17. Wachira J, Matheka DM, Masheti SA, Githemo GK, Shah S, Haldeman MS, et al. A training program for obstetrics point-of-care ultrasound to 514 rural healthcare providers in Kenya. 2023;23(1):922.
18. Forkuo AY, Chianumba EC, Mustapha AY, Osamika D, Komi LSJM. Advances in digital diagnostics and virtual care platforms for primary healthcare delivery in West Africa. 2022;96(71):48.
19. Stone BS, Muruganandan KM, Tonelli MM, Dugas JN, Verriet IE, Pare JRJTAJoEM. Impact of point-of-care ultrasound on treatment time for ectopic pregnancy. 2021;49:226-32.
20. Ren Y, Shao XJAoMS. Impact of emergency point-of-care ultrasound on time to diagnosis and treatment amongst patients with ectopic pregnancy: a systematic review and meta-analysis. 2024.21. Umeda S, Abe T, Obata S, Aoki S, Takeuchi IJBP, Childbirth. Effectiveness of call system implementation for postpartum hemorrhage in a tertiary emergency medical center: a retrospective cohort study. 2023;23(1):787.
22. Urquhart S, Barnes M, Flannigan MJTJoEM. Comparing time to diagnosis and treatment of patients with ruptured ectopic pregnancy based on type of ultrasound performed: a retrospective inquiry. 2022;62(2):200-6.
23. Balde IS, Baldé O, Sylla I, Diallo IT, Sow AI, Barry AJIJoR, Contraception, Obstetrics, et al. Obstetric emergencies in the maternity ward of the Ignace Deen national hospital CHU of Conakry: sociodemographic, therapeutic and maternal fetal prognosis aspects. 2020;9(12):4800.
24. Abie A, Getie Mehari M, Eseyneh Dagnew T, Mebrat Delie A, Melese M, Workie Limenh L, et al. Obstetric admission and maternal mortality in the intensive care unit in Africa: A systematic review and meta-analysis. 2025;20(4):e0320254.