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Point-of-care Ultrasound in Emergency and Internal Medicine: Expanding Clinical Applications

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Introduction

Point-of-care ultrasound has emerged as a transformative tool in both emergency and internal medicine, revolutionizing bedside diagnostics and procedural guidance. Unlike traditional imaging modalities that require formal radiology consultation and patient transport, POCUS offers real-time visualization at the bedside, enhancing rapid decision-making in time-sensitive scenarios. Its portability, increasing affordability, and user-friendly design have made it indispensable for frontline clinicians. In emergency medicine, POCUS allows for the immediate evaluation of critically ill patients, often serving as an extension of the physical examination. Similarly, in internal medicine, it is increasingly being integrated into daily rounds, enabling physicians to quickly assess organ function, fluid status, and procedural safety. The expansion of its clinical applications reflects a paradigm shift, where imaging is no longer confined to radiology suites but is becoming a dynamic part of routine patient care [1].

Description

In emergency medicine, POCUS plays a pivotal role in the rapid evaluation of life-threatening conditions, often guided by established protocols. The Focused Assessment with Sonography in Trauma (FAST) exam is widely used to detect intra-abdominal bleeding in trauma patients, offering a noninvasive and immediate alternative to diagnostic peritoneal lavage or delayed computed tomography scans. In cases of undifferentiated shock or cardiac arrest, protocols such as RUSH (Rapid Ultrasound for Shock and Hypotension) enable clinicians to systematically assess cardiac function, volume status, and possible obstructive causes like pericardial tamponade or pulmonary embolism. Furthermore, lung ultrasound has proven superior to chest radiography in diagnosing pneumothorax, pleural effusion, and pulmonary edema, conditions that demand swift recognition and intervention. The speed and accuracy of POCUS in these critical scenarios not only expedite diagnosis but also guide resuscitative measures, directly impacting patient survival. Central venous catheter placement under ultrasound guidance significantly reduces complications such as arterial puncture, pneumothorax, and catheter misplacement compared to the landmark technique [2].

Internal medicine has witnessed a parallel expansion in POCUS applications, with growing recognition of its value in managing chronic and complex diseases. Bedside echocardiography performed by internists can assess ventricular function, estimate ejection fraction, and detect valvular abnormalities, providing crucial insights in patients with heart failure or unexplained dyspnea. Similarly, renal ultrasound aids in differentiating pre-renal from intrinsic causes of acute kidney injury, while bladder scanning assists in diagnosing urinary retention. Hepatology applications include the assessment of ascites and guidance for paracentesis, reducing complications and improving procedural success rates. Moreover, in the era of value-based care, POCUS enhances diagnostic efficiency by reducing reliance on costly and time-consuming imaging studies, thereby streamlining patient management and resource utilization in inpatient and outpatient settings [3].

Despite its advantages, the widespread adoption of POCUS faces several challenges, particularly in training, standardization, and quality assurance. Competency in image acquisition and interpretation requires dedicated training programs, ongoing practice, and robust credentialing systems. Variability in clinician expertise can lead to misinterpretation, with potential diagnostic errors and patient harm. Additionally, integration into clinical workflows demands institutional support, including access to devices, structured documentation, and incorporation into electronic health records. Concerns also persist regarding the medico-legal implications of POCUS findings and whether they should be considered definitive or adjunctive to formal imaging. Addressing these barriers requires a multipronged approach: standardized training curricula, accreditation pathways, and continued research to validate emerging applications. Collaborative efforts between emergency medicine, internal medicine, and radiology are essential to ensure that POCUS use is safe, effective, and evidence-based. In emergency medicine, nerve blocks performed under ultrasound guidance provide targeted analgesia for fractures or trauma, reducing the need for systemic opioids. The procedural expansion of POCUS underscores its role not only as a diagnostic adjunct but also as a cornerstone of patient safety in invasive interventions [4,5].

Conclusion

Point-of-care ultrasound represents one of the most significant advancements in emergency and internal medicine, reshaping the way clinicians approach bedside diagnostics and procedures. Its versatility in evaluating critically ill patients, monitoring chronic conditions, and guiding invasive interventions highlights its broad clinical utility. While challenges remain in training, standardization, and implementation, ongoing innovations in technology and education promise to further expand its applications. By integrating POCUS into everyday practice, physicians can enhance diagnostic accuracy, improve patient safety, and optimize resource use, ultimately transforming the landscape of modern clinical care. As both emergency and internal medicine continue to evolve, POCUS is poised to remain at the forefront of patient-centered, efficient, and technologically enabled healthcare delivery.

Acknowledgement

None.

Conflict of Interest

None.

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