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POCUS IN CRITICALLY ILL PATIENTS IN THE ED

POCUS KOD KRITIČNO BOLESNIH PACIJENATA U URGENTNOM CENTRU

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Abstract: Point-of-care ultrasound (POCUS) is a focused, bedside imaging technique designed to address specific clinical questions in critically ill patients, offering rapid, goal-directed assessment. It is an essential tool in bedside diagnostics, primarily used to "rule in" or "rule out" specific conditions. Key applications include trauma assessment, lung, cardiac, and abdominal imaging, as well as evaluation of symptoms such as abdominal pain, dyspnea, and suspected small bowel obstruction. Case studies highlight its value in detecting conditions like hydronephrosis, aneurysms, and syncope in elderly patients.

Despite its advantages, POCUS has limitations, including operator dependency, limited field of view, and the need for structured training and documentation. Nevertheless, it facilitates faster diagnosis, earlier intervention, reduced patient transport, and minimized CT usage, contributing to shorter hospital stays and improved patient outcomes. Integrating POCUS into clinical practice enhances diagnostic accuracy and overall patient care in critical settings.

***Key words*:** Point-of-care ultrasound, emergency department

INTRODUCTION

Point-of-care ultrasound has ushered in a new era of bedside diagnostics and patient management within critical care environments, enabling clinicians to make swift and informed decisions that are pivotal for the well-being of critically ill individuals [1,2]. This non-invasive imaging modality facilitates timely and appropriate management of patients and can alleviate the necessity for more extensive diagnostic procedures, thus streamlining the diagnostic process [3]. The integration of POCUS into clinical practice brings multiple advantages, including expedited diagnoses and the facilitation of earlier interventions, which can substantially enhance patient outcomes [4]. The capability of POCUS to provide immediate results at the patient's bedside negates the delays often associated with conventional imaging modalities.

POCUS is a valuable diagnostic tool for various conditions, allowing clinicians to quickly confirm or exclude life-threatening conditions, which is crucial in cases involving trauma, shock, or sepsis [5]. Moreover, POCUS diminishes the necessity for transporting patients to radiology departments, a particularly advantageous feature for critically ill individuals who necessitate continuous monitoring. Given these benefits, it is crucial to expand POCUS training and implementation to improve diagnostic precision and patient outcomes.

REVIEW

The integration of point-of-care ultrasound into various medical specialties has revolutionized diagnostic and therapeutic approaches, as it extends the physical examination by providing real-time imaging that correlates directly with a patient's symptoms [4]. This method, characterized by its rapid and focused application at the bedside, serves specific diagnostic or therapeutic purposes, distinguishing it from conventional ultrasound. Its utility spans diverse clinical scenarios, enhancing diagnostic precision and enabling prompt clinical decision-making, especially in emergency and critical care settings [3,6]. The ability of point-of-care ultrasound to visualize internal structures in real-time allows healthcare providers to quickly assess and manage conditions, making it an indispensable tool for modern medical practice.

Point-of-care ultrasound (PoCUS) has become an indispensable standard in emergency medicine. Emergency medicine ultrasound (EMUS) is the application of bedside PoCUS by the attending emergency physician to assist in the diagnosis and management of many time-sensitive health emergencies [7,8]. POCUS is critical in trauma assessment, quickly identifying hemoperitoneum and guiding immediate surgical interventions [1]. In pulmonary care, it offers a non-invasive method to diagnose conditions such as pulmonary edema, pneumothorax, and pleural effusion, enhancing the evaluation of respiratory distress in critical patients [9]. Cardiac imaging with POCUS enables rapid bedside assessment of cardiac function, detecting left ventricular dysfunction, pericardial effusion, and signs of cardiac tamponade [10,11]. Furthermore, in abdominal imaging, POCUS aids in diagnosing conditions like small bowel obstruction, hydronephrosis, and free fluid, reducing reliance on more invasive techniques like CT scans, which expose patients to radiation and incur additional costs [12–17].

POCUS enables clinicians to extend their physical examinations, correlating real-time images with patients' symptoms to guide diagnostic and therapeutic interventions [4]. POCUS enhances diagnostic precision and accelerates clinical decision-making across various specialties. Even ten years ago, a patient with a swollen extremity would wait a few hours for radiological ultrasound to exclude thrombosis [18]. But with the emergence of the emergency medicine specialty, the length of stay of patients in the emergency department shortened due to better efficiency and probably due to the multidisciplinary use of ultrasound [19]. Better efficiency and faster patient flow could lead to better physician satisfaction, which we know

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to be low and plummeting even after one night shift [20]. Once educated in POCUS, emergency physicians should be able to independently and efficiently care for their patients using a variety of PoCUS skills [21]. In emergency medicine, POCUS is used for evaluating symptoms such as abdominal pain, dyspnea, and syncope, providing rapid diagnostic clarity and guiding immediate management [6]. The integration of POCUS into clinical practice offers numerous advantages. One significant benefit is faster diagnosis, as POCUS provides immediate bedside results, eliminating delays associated with conventional imaging techniques [3]. This rapid diagnostic capability is particularly crucial in time-sensitive situations such as trauma, shock, or sepsis. Moreover, POCUS facilitates earlier intervention by enabling clinicians to quickly confirm or rule out life-threatening conditions, leading to prompt treatment decisions and improved patient outcomes. By reducing the need for patient transport, POCUS offers considerable benefits, especially for critically ill patients who require continuous monitoring. POCUS also minimizes the use of CT scans, providing a radiation-free alternative that is particularly advantageous for pregnant women, pediatric patients, and individuals requiring frequent evaluations.

The integration of point-of-care ultrasound into modern medical practice represents a significant advancement in diagnostic and therapeutic capabilities, offering clinicians real-time imaging at the patient's bedside [4]. Its versatility spans various medical disciplines, enhancing diagnostic accuracy and treatment efficiency [6]. POCUS's ability to provide immediate, bedside assessments can lead to quicker treatment pathways, potentially reducing the length of hospital stays for patients [3]. However, despite its promise, POCUS is not without its limitations, including operator dependency, a restricted field of view, patient-related factors, and the necessity for rigorous training and documentation. Operator dependency is a critical consideration, as the precision of POCUS heavily relies on the proficiency and experience of the clinician conducting the examination; suboptimal images obtained by inexperienced users can lead to misdiagnoses, highlighting the importance of continuous training and standardized protocols to minimize such risks [9]. As a focused imaging modality, POCUS offers a limited field of view, which may not always provide a complete assessment, thus necessitating more comprehensive imaging techniques like CT or MRI for definitive diagnoses in certain conditions. Patient-related factors can also impede image acquisition, diminishing the effectiveness of ultrasound assessments. The successful implementation of POCUS requires well-structured training programs and standardized documentation protocols to ensure consistent and reliable results across diverse clinical environments.

CONCLUSION

Point-of-care ultrasound (POCUS) is a transformative tool in managing critically ill patients, offering advantages such as rapid diagnosis, early intervention, and reduced transport needs. Its applications in trauma, lung, cardiac, and abdominal imaging demonstrate its significant utility in acute care settings. However, challenges like operator dependency, limited imaging scope, and training requirements must be addressed to optimize its effectiveness. Future advancements in training, technology, and interdisciplinary collaboration will further solidify POCUS's role in modern healthcare, ultimately enhancing patient care and clinical decision-making.

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Sažetak: Point-of-care ultrasound (POCUS) je fokusirana tehnika dijagnostike dizajnirana da odgovori na specifična klinička pitanja kod kritično bolesnih pacijenata, nudeći brzu procenu usmerenu na cilj. To je suštinski alat u dijagnostici pored kreveta, prvenstveno se koristi za "rule in" ili "rule out" specifičnih uslova. Ključne primene uključuju procenu traume, snimanje pluća, srca i abdomena, kao i procenu simptoma kao što su bol u stomaku, dispneja i sumnja na opstrukciju creva. Studije slučaja naglašavaju njegovu vrednost u otkrivanju stanja kao što su hidronefroza, aneurizme i sinkopa kod starijih pacijenata.

Uprkos svojim prednostima, POCUS ima ograničenja, uključujući zavisnost od operatera, ograničeno vidno polje i potrebu za strukturiranom obukom i dokumentacijom. Ipak, olakšava bržu dijagnozu, raniju intervenciju, smanjen transport pacijenata i minimiziranu upotrebu CT-a, doprinoseći kraćem boravku u bolnici i poboljšanim ishodima lečenja pacijenata. Integracija POCUS-a u kliničku praksu poboljšava dijagnostičku tačnost i ukupnu brigu o pacijentima u kritičnim okruženjima.

Ključne reči: Point-of-care ultrasound, urgentni centar

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