



ULTRASOUND: REVIEW ON ITS ROLE IN EVALUATION OF CRITICALLY ILL PATIENT

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ABSTRACT

Accurate and rapid diagnosis and management are essential for patients in the intensive care unit. Several diagnostic imaging methods were developed. However, most of them lacked portability, sensitivity, and availability. Adding a short echocardiographic study to support the physical examination improves the diagnosis accuracy. Ultrasound had grown rapidly and had been accepted widely. A recent study shows that up to 36 percent of patients in the non-cardiac intensive care unit were found to have one or more occult defects in the heart. ICU patients with abdominal and thoracic pathologies are usually required to undergo ultrasound for prompt diagnosis and management and to prevent deterioration or death of the patient's disease. This review article discusses the role of ultrasound in the intensive care unit for diagnosing and managing critical patients. The Medline, Pubmed, Embase, NCBI, and Cochrane databases were searched for studies of patients who developed diverticular disease symptoms. The incidence, etiology, and management options were analyzed. The use of ultrasonography in ICU allows the acting clinicians to make real-time decisions in diagnoses and management. This article provides the reader with a broad overview of this important topic.

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Introduction

Ultrasound use has considerably expanded in critical care practice and research in the past decade. Even though this method is largely operator-dependent and has several inherent limitations, it enables clinicians to diagnose unstable patients quickly and inexpensively. The use of ultrasound in point-of-care applications is replacing conventional imaging methods gradually, like X-Ray and CT scans, while the use of ultrasound in the procedural guidance has demonstrated that patient safety increased and the complications are reduced [1]. Several papers in regards to this issue showed how essential is ultrasound in the intensive care unit. K. Stefanidis had previously used ultrasound-guided echogenic technology in the subclavian vein (SCV) and the internal jugular vein (IJV). Both of the case-control studies were carried out under controlled ICU conditions and included intubated patients in critical care. The use of echogenic technology improved the visibility of the cannula significantly and reduced the access time and technical complexity. As a result, maximizing ultrasound-guided central venous cancer in real-time regardless of the technique used [2]. Due to its usefulness in critically ill patients and its ease of use, ultrasound is

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considered to be a key tool for intensivists. Its main applications for various lung conditions were described as a valuable alternative to chest X-rays (CXR) and Computerized Tomography (CT) [3]. Over the past decade, lung ultrasound transthoracic (LUS) has proven to be one of the most revolutionary diagnostic tools in the intensive-care [3].

Materials and Methods

For the selection of articles, the PubMed database was utilized, and the keys used in the mesh are as follows; ("ICU" [Mesh]) AND ("Ultrasound" [Mesh]) OR ("Intensive Care Unit" [Mesh]).

Regarding the inclusion criteria, the selection of articles was based on the incorporation of one of the following subjects: ICU, Intensive Care Unit, Ultrasound.

The removal criteria were all other manuscripts, that did not possess one of these subjects as their main endpoint.

Out of 1,202 articles recorded in the last two years, close to 90 publications were selected as the most clinically important, and their full texts were checked. After a rigorous examination, 31 of the 90 were added. Using reference lists from the acknowledged and linked studies, additional research and publications were made. Where relevant, expert consensus recommendations and commentary were included to help practicing doctors evaluate chest pain in the easiest way possible.

Echocardiography in the Intensive Care Unit

It is acknowledged that the point of care in echocardiography might be important equipment that assists with the hemodynamic management and diagnosis of critically ill patients and it is carried out by intensive care physicians [1, 2, 4]. When a person is referred to a specialist, "third party providers," may suffer from a lack of adequate correlation with the clinical situation and might need delays. If necessary, a more detailed study could be carried out by specialists in the echocardiography laboratory consequently. By following a protocolized approach using standard echocardiographic windows in 97% of critically ill patients (Focus Assessed Transthoracic Echo), Jensen. were able to acquire fitting hemodynamic parameters for optimizing care [3]. An easy task to learn and do and is preferred more often is the transthoracic examination. If transthoracic windows are poor or for a detailed assessment of thrombi, vegetations, and prosthetic valves, transesophageal studies may be required. Transthoracic examination is what is focused on in this review [3].

Pericardial Effusion

In the pericardial space, fluid accumulation is easily diagnosed on transthoracic echocardiography and is noticed as an echo-free space surrounding the heart. The subcostal view normally offers a good option to envision pericardial fluid if more conventional windows are not obtainable. An immediately life-threatening emergency that is presented with features on echocardiography can be referred to as Cardiac tamponade [5]. The diastolic malfunction of the RV and right atrium (RA) is seen with tamponade; While RV collapse occurs later, RA collapse occurs in early diastole. Hemodynamically significant effusion is suggested by RA collapse that lasts for more than one-third of the R-R interval. Being present in 34% of patients without clinical evidence of tamponade in one study, right-sided collapse is less specific even though it is highly sensitive for tamponade [6]. A hemodynamically significant pericardial effusion may be safely drained under real-time echocardiographic guidance apart from confirming the diagnosis [6].

Pulmonary Embolism (PE)

Alongside drastic clinical retrogression, acute PE may be present. Diagnosis is often hard because of imprecise clinical symptoms. It may not be feasible to move an unstable patient to the radiology suite even though contrast-enhanced Computerized tomography (CT) scan of the lungs has good sensitivity for PE. An excellent tool to diagnose massive PE by the bedside is Echocardiograph [7]. RV dysfunction and dilation is the characteristic finding, however, for acute PE, this finding is not specific. With apical sparing, the pattern of RV dysfunction in PE is typically limited to the mid septum. This discovery may help to contrast it from other causes of RV dysfunction and dilation [8]. A tool suggested for acute PE is a tricuspid insufficiency pressure gradient of 60 mm Hg or less [9]. Even though more distal emboli cannot be seen, centrally located clots may be visible on transthoracic echocardiography [10].

Pleural Effusion

With ultrasonography of the chest, pleural effusion can be easily detected and compared to the computed tomography (CT) scan, it will provide a more detailed view of the fluid characteristics. Pleural effusions seem like septations of an anechoic pocket of fluid or may look like a complex pocket with cellular material. Studies reveal that anechoic effusions can be exudative or transudative while pleural effusions with echogenic material or septations within them are exudative [11, 12]. Unilateral pleural effusions are mainly seen in postcardiotomy syndrome or chronic mitral valve regurgitation. Ultrasonography is utilized regularly to pick out a safe spot for thoracentesis. Before the procedure commences, aberrant blood vessels along the needle path are identified using linear ultrasonography with color Doppler [13].

Lower Extremity Deep Vein Thrombosis

Despite the utilization of prophylaxis, deep vein thromboses take place in close to 12% of ICU victims [14, 15]. Taking a diagnostic test is not always possible when DVT is doubted. Furthermore, acute pulmonary embolism is regularly one of the

differential diagnoses of patients with large right ventricles on echocardiography and hemodynamic instability. The presence of an acute pulmonary embolism could be because of a lower extremity DVT. Compared to the performed duplex ultrasonography study, compression ultrasonography is fast and has a precision of 95% [16]. A normal vein can be squeezed easily. When the vein is not fully squeezed or a thrombus is seen in the vein, deep vein thrombosis is diagnosed. A five-point compression study in each leg is performed by intensivists: (1) CFV at the greater saphenous intake (2) CFV at the bifurcation of the common femoral artery to the superficial and deep femoral artery, (3) bifurcation of the CFV into the superficial and deep femoral vein, (4) common femoral vein (CFV) at the common femoral artery and (5) popliteal vein. The inclusion of color Doppler does not increase the sensitivity [17].

Abdominal and Retroperitoneal Ultrasonography

The chronically ill victims often have a lot of indications for abdominal and retroperitoneal ultrasonography.

Acute Kidney Injury

Rapid assessment in Acute kidney injury helps in its management as it happens in approximately 15–38% of chronically sick victims [18]. A small part of the patients diagnosed with bilateral hydronephrosis from ultrasonography and obstructive uropathy recognize this. The existence of bilateral hydronephrosis manifests the need for the evaluation of the bladder for distension, which may signify bladder outlet obstruction. Even though a skilled sonographer may be able to identify an obstructing ureteral stone requiring an urgent removal, unilateral hydronephrosis mostly requires a CT scan to determine its etiology [18]. To help doctors avoid the placement of indwelling Foley catheters and reduce catheter-associated urinary tract infections, bladder ultrasonography should be used in the evaluation of urine volume qualitatively or quantitatively [19].

Aortic Dissection

Most doctors do not carry out Screening abdominal aortic aneurysm examination regularly. Nevertheless, thoracic aortic and abdominal dissections and aneurysms can be recognized. If the patient is stable enough for the study, the recognition of an aortic aneurysm and dissection can be further assessed by CT scan [19].

Conclusion

Over the last 2 years, the amount of writings on the point of care ultrasound has been increasing very quickly. Not long ago, a growing body of proof strongly accompanies its role in a lot of fields with particular interest to the acute care settings. Our writing analysis solely concentrates on the thoracic point of care ultrasound, as well as one essay on diaphragm ultrasound, eight essays on lung ultrasound, and six essays on echocardiography. Finally, we do not reject the life-saving support of medical improvement. However, evidence-based medicine through curbed clinical trials has not affirmed the importance of CAT scans, routine blood analysis, or mechanical ventilators. So far, we hold these truths to be self-evident, and all intensivists must have a vast knowledge of these tools. The intensive care community is interested in various applications of point of care ultrasound in the intensive care unit. The writing is improving quickly. The major subjects of interest are thoracic applications, like lung, diaphragm, cardiac ultrasound, followed by brain ultrasound and procedural guidance. The new studies trend is to diagnostically show the accuracy of new points of the methods of care ultrasound and the impact they have on the critical care that is practiced daily.

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