

Point-of-care Ultrasound in ICU

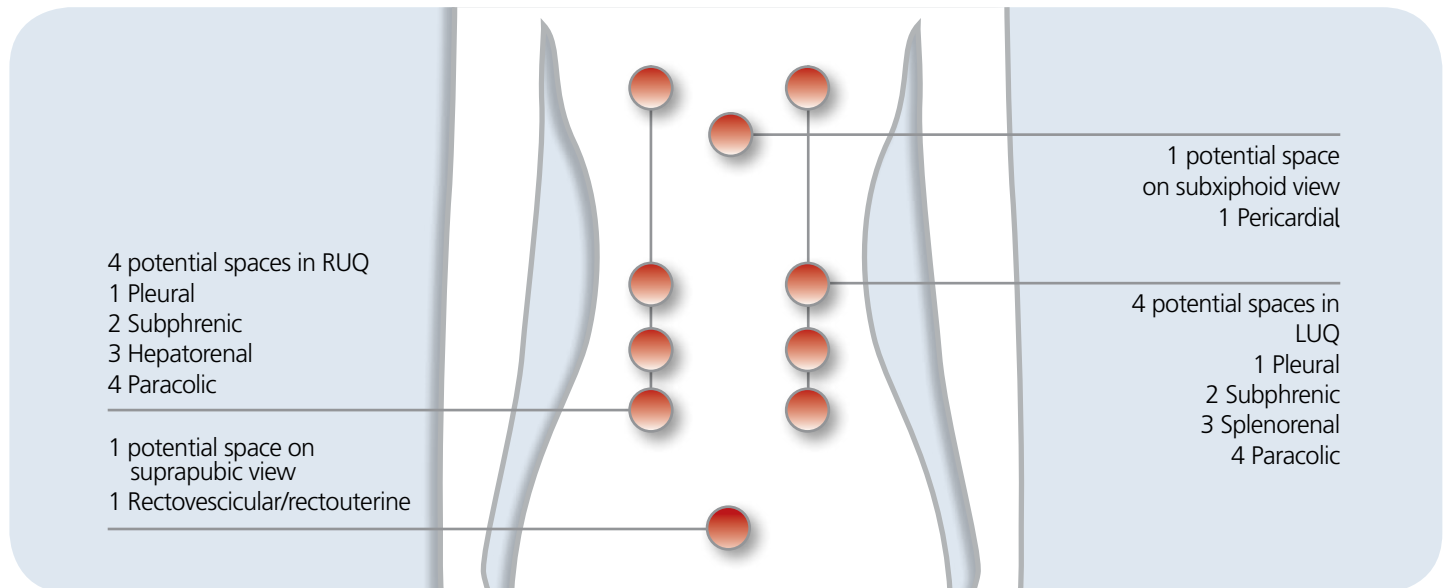
Clinical Experience and Perspective

Intensive Care Unit's daily activities and outcome is subject to extraordinary critical conditions. This is the setting where critically ill patients are admitted and where intensivists and anaesthetists must manage complex multisystem conditions. Ultrasound is currently one of the fastest growing applications in supporting and assisting trained intensivists with decision making and problem solving in extremely critical situations.

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Bedside ultrasound to enhance critically ill patients' evaluation

Region and potential spaces to be evaluated in the search of pathological fluid collections.



Vascular access

- Reduce procedural time
- Avoid complications

Many intensivists now believe that standards of care for non-emergent central venous catheterization require ultrasound guidance.

US-guidance reduces procedure and post-procedure complications in LT-CVC placement, increasing outpatients number and improving patient's comfort.

A. Peris et. al. Implantation of 3951 long-term central venous catheters: performances, risk analysis and patient's comfort after ultrasound-guidance introduction, *Anesthesia and Analgesia*, 2010

Others bedside approaches

- Venous thrombi
- Pleural effusions
- Abdominal fluid collections
- Aortic aneurysms
- Thick-walled gallbladders
- Paradoxically moving-diaphragms
- The heart
- Exclude hydronephrosis

Infection control in the ICU

Lung reaeration can be accurately estimated with bedside lung ultrasound in patients with ventilator-associated pneumonia treated by antibiotics. Lung ultrasound can also detect the failure of antibiotics to reaerate the lung.

B. Bouhemad et. al. Ultrasound assessment of antibiotic-induced pulmonary reaeration in ventilator-associated pneumonia, *Crit Care Med*, 2009

US offers great potential in hemodynamic assessment

- **Central venous and wedge** pressures have little value to predict fluid exchange
- Dynamic indexes, such as **respiratory pulse pressure and inferior vena caval diameter** variation (using ultrasound) are quite accurate when repeated

Real-time EVLW

Thoracic ultrasound as a useful method to evaluate real-time changes in EVLW and to assess a patient's physiologic response to fluid removal.

VE Noble et al. Ultrasound Assessment for Extravascular Lung Water in Patients Undergoing Hemodialysis Time Course for Resolution, CHEST, 2009

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Renal resistance index

Renal resistance index predicts renal recovery in critical septic patients with acute kidney injury. The development of AKI in ICU patients is always associated with increased RI values, which was remarkable in septic patients who showed a poorer renal function recovery. If our results will be further confirmed, RI could be proposed in ICU as a prognostic marker for functional renal recovery.

F. Barbani et al. WFSICCM, Minerva Anestesiologica, 2009

Transesophageal echocardiogram

- A systematic approach to perform a comprehensive transesophageal echocardiogram

- In life-threatening situation, TEE allows precise appraisal of mitral apparatus, left atrial appendage, interatrial septum, thoracic aorta, origin of coronary arteries and pulmonary artery.

Lung-US in ICU

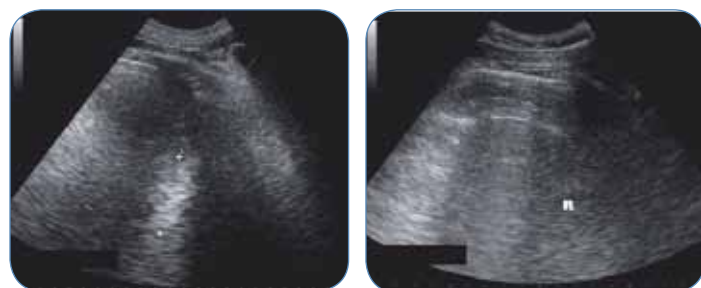
Routine use of LUS in ICU setting reduces the number of chest radiographs and CT-scans performed. This results in a safer and more efficient care of patients along with less expenses and reduced exposure to radiation and contrast dye.

A. Peris et al. Use of point-of-care bedside chest ultrasound significantly reduces the number of radiographs and CT-scan in critically ill patients, Anesthesia and Analgesia, 2010

ARDS H1N1 related

The sole imaging technique adopted during ICU stay for the management of respiratory failure due to N1H1 flu.

A. Peris et al. The value of lung ultrasound monitoring in H1N1 acute respiratory distress syndrome, Anaesthesia, 2009

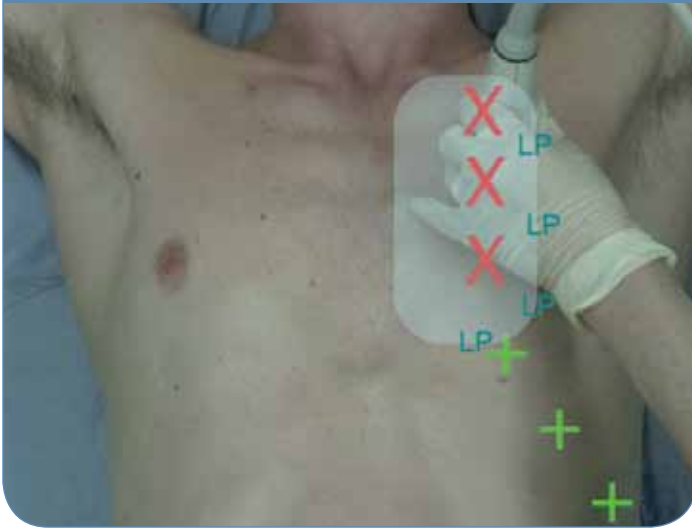


Bedside Ultrasound Screening for Pretracheal Vascular Structures may minimize the risks of Percutaneous Dilatational Tracheostomy (PDT)

Bedside ultrasound screening allows to easily identify pretracheal vascular structures that might pose a haemorrhage risk during PDT.

Alexander C. Flint et al. Neurocritical Care and Pulmonary Critical Care, Head and Neck Surgery, 2009

Lung points research



Deep venous thrombosis

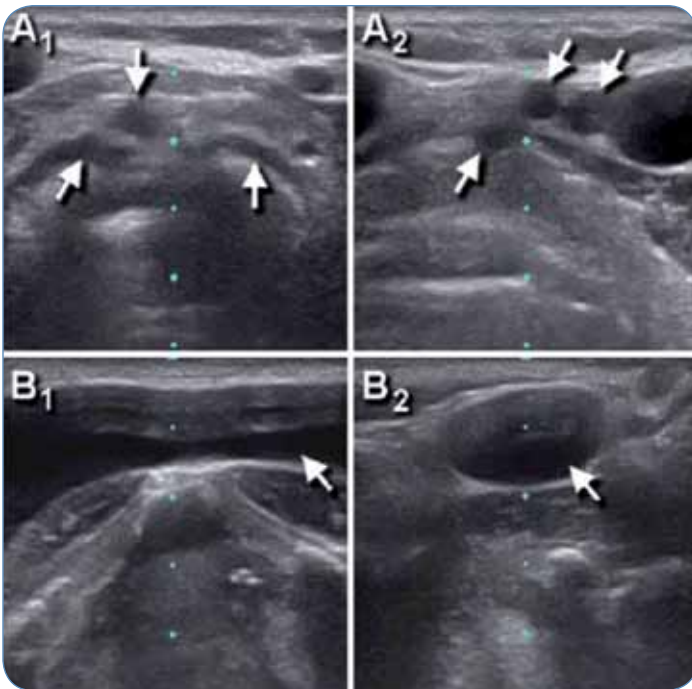
ICU physicians have demonstrated high accuracy in detecting DVT using portable ultrasound, with up to 98% agreement with formal duplex sonography.

M. Boddi et al. Reduction of deep vein thrombosis incidence in intensive care after a clinician education program, *Journal of Thrombosis and Haemostasis*, 2010

Bone injury

Ultrasound demonstrates high sensitivity and specificity to detect fractures in critical care/emergency.

Azzam S. Al-Kadi et al. Resuscitative Long-Bone Sonography for the Clinician: Usefulness and Pitfalls of Focused Clinical Ultrasound to Detect Long-Bone Fractures During Trauma Resuscitation, *European Journal of Trauma and Emergency Surgery*, 2009



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