Point-of-care Ultrasound in ICU
Clinical Experience and Perspective
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.


### 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.

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

**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
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.