



Diagnostic thoracic ultrasound within critical care

Description

Within critical care, the evolving role of diagnostic thoracic ultrasound (DTU)¹ challenges the conventional assessment methods of chest x-ray and auscultation.² Diagnostic thoracic ultrasound can be used to image pleural, alveolar and interstitial pathologies, and diaphragmatic movement.³

Validity/Reliability: For DTU, using computed tomography as the comparator, the sensitivity and specificity for the detection of pleural effusion are 93% and 96%,⁴ as compared to 65% and 81% for

chest x-ray.¹ For lung consolidation, DTU has a sensitivity and specificity of 90% and 98%,^{1,5-7} as compared to 38% and 89% for chest x-ray.^{1,2,8} In critically ill patients, the diagnostic accuracy for DTU ranges from 92% to 100% for pneumothorax, pleural effusion, pneumonia, interstitial oedema and lung consolidation.¹ There is also excellent agreement (kappa) between observers for the detection of interstitial syndrome (K = 0.92), pleural effusion (K = 0.95)⁹ and lung consolidation (K = 0.89).⁷

Commentary

There is conflicting evidence on the impact of chest physiotherapy on major patient outcomes such as mortality, time on mechanical ventilation or ICU length of stay.¹⁰ Outcomes based on respiratory physiology (eg, oxygenation, ventilation), clinical examination (eg, lung auscultation) and the portable chest radiograph,^{2,11} limit the accurate recognition of pulmonary pathology that may be amenable to chest physiotherapy. The increased accuracy of DTU, as compared to the portable chest x-ray, to differentiate between pathology such as pleural effusion and lung consolidation, introduces a new diagnostic tool for physiotherapists to incorporate within critical care. Diagnostic ultrasound is not new to the physiotherapy profession,¹² therefore it should be a skill readily acquired. Of note, important aspects to the implementation of DTU by physiotherapists within critical care include: training; competence; feasibility; documentation; and governance, especially around the identification of acute pathology that may require medical intervention (eg, significant pneumothorax or pleural effusion). Clinical indicators for DTU, such as unexplained gas exchange deterioration or suspected pathology such as pneumothorax, pleural effusion, atelectasis, pneumonia or interstitial oedema are associated with a significant impact on clinical decisions (reclassification of diagnoses, unsuspected diagnoses) and changes therapeutic management of both invasive (eg, chest drain, bronchoscopy, hemofiltration) and non-invasive interventions (eg, ventilation changes, lung recruitment, chest physiotherapy).¹³ Such acute indicators for DTU may be incorporated by physiotherapists to determine the need for ultrasound imaging over and above routine clinical assessment procedures,

but this requires investigation. Accurate and timely point of care diagnosis of acute lung pathology would be highly valuable for the critical care physiotherapist, particularly when determining whether the pathology is amenable and responsive to chest physiotherapy or requires medical review. As DTU is accurate, non-invasive, portable, repeatable, and does not emit any ionising radiation, it may prove to be a valuable addition to the critical care physiotherapy assessment and warrants further exploration.

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