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Thoracic ultrasound: it's not all about the pleura

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As clinicians who deal with acutely and critically unwell adult and paediatric patients we welcome the recently published guidelines aspiring to provide a 24/7 service to deliver safe pleural procedures to patients.[1] The move away from the previously unwritten mandate that all pleural procedures sampling fluid require Royal College of Radiologists (RCR) 'level one' ultrasound competence can only be of benefit; as the guideline concedes, confusion around which standard this required (focused vs non-focused) has not been useful. We entirely agree with the authors that the training requirements for the RCR standards do not fit well with the way pleural interventions are currently delivered. In our practice we are very aware that delays in treating pleural disease can lead to rapid patient deterioration and on occasions may be the trigger for admission to intensive care.

The vertical integration model chosen for the delivery of thoracic ultrasound (TUS) with emergency-level operators at the bottom, overseen by advanced operators at the top is also to be commended. This system is similar to existing models of ultrasound training and delivery within our specialties. Core UltraSound in Intensive Care (CUSIC) training has advanced operators known as supervisors who are experienced intensive care and acute medicine clinicians, and consultant radiologists. To date there are 170 CUSIC mentors and supervisors around the country. Similar structures exist in other established point-of-care ultrasound training pathways such as Focused Acute Medicine UltraSound (FAMUS), Focused Intensive Care Echocardiography and Children's ACuTe UltraSound.

It must also be said that the move to separate the process of ultrasound guidance and procedural competency is sensible, since these are two very separate skills that have often been conflated. Of course they will frequently be undertaken by the same appropriately trained operator, but not necessarily.

Where we do have concerns with this consensus statement is the paragraph titled 'Other diagnostic uses of TUS', and we were surprised to see this included in a document pertaining to the management of pleural disease. Acute respiratory failure is estimated to occur in 77 per 100 000 population per year,[2] and its initial management is ostensibly delivered by acute medical and intensive care services. We do not think that a guideline on the management of pleural disease is the best place to comment on the role of TUS in the diagnosis of acute respiratory failure.

The authors state that there is robust evidence for the role of TUS in pleural disease but that 'there is minimal data to support its use in identifying lung parenchymal pathologies in acute breathlessness even when performed by experienced operators.' We disagree; there are international guidelines on the use of TUS that were published in 2012, citing 80 peer-reviewed publications.[3] These guidelines used the Delphi method and Grading of Recommendations Assessment, Development, and Evaluation methodology to make recommendations on the diagnosis and management of pneumothorax, lung consolidation, cardiogenic pulmonary oedema, non-cardiogenic pulmonary oedema and pleural effusion, including in the neonatal and paediatric populations.

The consensus statement discusses more extensively the role of ultrasound in diagnosing and treating pneumothorax, stating the findings are 'not specific' and 'are much more operator dependent than fluid assessment'. The sonographic appearances to rule in and rule out pneumothorax are well characterised, with an 'A' level of evidence and a strong recommendation to rule pneumothorax out. From the same section of the international guidelines, lung ultrasound is considered to more accurately rule out the diagnosis of pneumothorax than supine anterior chest radiography, with level 'A' evidence and a strong level of recommendation. While the signs required for this are more nuanced than 'assessment of pleural apposition on ultrasound', they are consistent, easy

to identify and teach. Indeed, the meta-analysis on the use of TUS in pneumothorax diagnosis quoted in the consensus statement summarises that 'bedside ultrasonography performed by clinicians had a higher sensitivity and similar specificity compared with chest X-ray in the diagnosis of pneumothorax.'

The recommendation of rapid CT scanning for the diagnosis of pneumothorax is interesting, and there is no doubt it would give accurate, clear information about the size and extent of the pneumothorax (as well as delineating the presence of other pulmonary pathology). However, there are clearly resource implications for the use of CT in all cases of pneumothorax (particularly out of hours), and we would suggest without an associated interventional radiologist available will not be of practical use for drainage in most acute settings. Additionally, we are not aware of data showing hard clinical outcomes supporting the use of CT scanning in the acute management of pneumothorax.

The consensus guidelines make the following statement regarding the use of TUS in breathlessness: 'Although taught in many introductory courses and rapid assessment protocols, its application in routine practice remains contentious and, in our view, is much more operator dependent than fluid assessment.' We would argue that the sonographic signs found in the breathless patient are often consistent and reproducible, and are certainly no less operator dependent than the interpretation of chest X-rays (which are currently considered the standard of care). The importance of operator dependence could be said of the reliable identification of complex, septated pleural effusions, which may well be an out-of-hours scenario requiring urgent intervention for source control of sepsis. It all depends on the focus of the training and of the accreditation pathways, and as we have alluded to above the identification of pneumothorax and parenchymal pathologies are the focus of many Point of Care Ultrasound (POCUS) accreditations, and therefore are the skills acquired.

With regard to the use of TUS in respiratory failure, the Bedside Lung Ultrasound in Emergency study reported by Lichtenstein and Mezière in 2008[4] provides an easily reproducible system of examination. It uses an algorithmic, dichotomous approach to refining the diagnosis in acute respiratory failure. The diagnostic accuracy of this protocol was reported at over 90%, when considering the most common causes of acute respiratory failure (pneumonia, pulmonary embolism, asthma/COPD, pneumothorax and pulmonary oedema). This was achieved despite the sonographers being blinded to clinical or biochemical parameters for each patient. These data can be criticised for being single centre—and it has not yet been fully validated outside of that centre—however it included 270 consecutive patients presenting with acute respiratory failure and so cannot be dismissed as minimal evidence. Since 2012 there have been numerous other studies showing that TUS in respiratory failure meets or exceeds current standard of care both in speed to diagnosis and diagnostic accuracy.[5–9]

Finally, we reject the statement that 'there are no robust evidence-based criteria or curricula on TUS training and competence for this indication [acute breathlessness].' As we have already mentioned, there are curricula for point-of-care ultrasound in intensive care (CUSIC) and acute medicine (FAMUS) that have been published and are in routine clinical practice. The training pathways are based on the above evidence, and for TUS use a protocolised approach to examination to improve reproducibility and reduce variation. The numbers of scans undertaken during these accreditations exceed those recommended in the RCR focused ultrasound standards, with candidates having to complete a report sheet with images for every training scan undertaken. In order to achieve accreditation, candidates must complete an e-learning module and assessment on the theory and physics of ultrasound, and all supervisors are registered on a database to ensure transparency and governance for the whole process. We would contend that these training pathways compare very favourably with alternative TUS pathways available, both in their robustness and in their governance structures.

It is worth reiterating, if it is not clear already, that despite our differences in opinion on alternative uses of TUS beyond pleural disease, we share the common aim of the authors to improve the care of patients with pleural pathology. All of us are actively involved in the care of patients with pleural disease, and we intend to continue working collaboratively to deliver the specified aims of this consensus statement. We wholeheartedly support the concept of improving the evidence base for all forms of point-of-care ultrasound, and are heartened there is much active research currently being undertaken in this field. We absolutely support the drive to improve the care of patients with pleural disease, but would also like to be clear that TUS extends beyond the pleura into the parenchyma, and integrating POCUS into the management of patients with acute respiratory failure can only lead to benefits for this group of patients as well.

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