

References

1. Smith MJ, Hayward SA, Innes SM, Miller A. Point-of-care lung ultrasound in patients with COVID-19 - a narrative review. *Anaesthesia* 2020; **75**: 1114–24.
2. Narasimhan M, Koenig SJ, Mayo PH. A whole-body approach to point of care ultrasound. *Chest* 2016; **150**: 772–6.
3. Guo T, Fan Y, Chen M, et al. Cardiovascular implications of fatal outcomes of patients with coronavirus disease 2019 (COVID-19). *Journal of the American Medical Association: Cardiology* 2020. Epub 27 March. doi.org/10.1001/jamacardio.2020.1017
4. Shi S, Qin M, Shen B, et al. Association of cardiac injury with mortality in hospitalized patients with COVID-19 in Wuhan, China. *Journal of the American Medical Association: Cardiology* 2020. Epub 25 March. doi.org/10.1001/jamacardio.2020.0950
5. Wang J, Hajizadeh N, Moore EE, et al. Tissue plasminogen activator (tPA) treatment for COVID-19 associated acute respiratory distress syndrome (ARDS): a case series. *Journal of Thrombosis and Haemostasis* 2020; **18**: 1752–55.

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Point-of-care ultrasound in respiratory and critical care: consolidation and expansion of imaging skills

We thank Drs Sikachi and Agrawal [1] for their response to our article [2] and wholeheartedly agree that point-of-care ultrasound imaging has a valuable role to play across a range of organ systems and disease presentations [3], including those of relevance in COVID-19 disease.

The real value in ultrasound imaging is premised upon the competency and experience of the operator in terms of performing and interpreting the sonographic images [4]. Mechanisms to gain and demonstrate competency in multi-organ imaging within a critical care setting are well established in the UK via bodies such as Focused Ultrasound in Intensive Care (FUSIC) and Focused Acute Medicine Ultrasound (FAMUS).

In our article [2], we presented mechanisms by which a sub-set of these skills could be rapidly gained by clinicians with a range of pre-existing ultrasound imaging and/or respiratory and critical care experience. Ensuring that an ultrasound operator works within their area of competency is a cornerstone of safe and effective practice [4]. In identifying a narrow remit and application of ultrasound imaging in COVID-19 disease, our publication empowers the deployment of workforces to address one of the principal organs compromised by COVID-19 disease.

As the peak of the pandemic curve starts to flatten, the opportunity presents itself to re-evaluate the skill-set and configuration of healthcare workforces. In the UK, vascular technologists already provide a highly skilled service in specific clinical scenarios, including critical care. In the same way, we postulate that a 'lung ultrasound' workforce to provide dedicated services in this area could be a highly valuable addition to respiratory and critical care.

In parallel, upskilling of point-of-care clinicians in lung, as well as multi-organ system, imaging should be seen as a high priority. However, three essential elements must be

addressed, regardless of the professional background of the individual or the healthcare configuration into which point-of-care ultrasound imaging is incorporated. In each case the scope of sonographic practice should be clarified and this should reflect the necessary governance requirements; alignment with the training undertaken and demonstrable competency must be assured [4].


The scope of sonographic practice incorporates the imaging performed, the findings communicated and the subsequent clinical inferences derived from them. By omission, they crucially also exclude tissue or disease processes not within scope and for which the scan cannot be relied upon to identify, confirm or exclude. Governance considerations include awareness by other members of the care pathway regarding the limitations of the scan and are framed by what is permissible for that individual or profession to undertake, along with litigation considerations.

Alignment with the education undertaken and demonstrable competency underpin all of the above. Essential considerations include fundamental physics as applied to ultrasound imaging, including limitations of the modality. Directly supervised scanning experience with a suitably experienced mentor and formal assessment of competency are other essential components, as is access to a second opinion, self-awareness of limitations and scanning audit. Within all of the above we strongly encourage point-of-care scanning clinicians to work in partnership with ultrasound imaging specialists (such as radiologists, career sonographers, vascular technologists, etc) to elevate the standard of imaging across the board [5]. One 'silver lining' of the pandemic might therefore be more widespread, shared cross-disciplinary learning.

Therefore, although we endorse the view of Drs Sikachi and Agrawal that 'consideration be given to the

consolidation of skills and expertise to a whole body approach to point-of-care ultrasound', we urge individuals and professions to ensure that consolidation and expansion of point of care ultrasound is framed by quality and rigour.

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References

1. Sikachi R, Agrawal A. Whole body point-care ultrasound for COVID-19: a multi-system approach to a multi-system disease. *Anaesthesia* 2020; **75**: 1114–5.
2. Smith MJ, Hayward SA, Innes SM, Miller A. Point-of-care lung ultrasound in patients with COVID-19 – a narrative review. *Anaesthesia* 2020; **75**: 1096–104.
3. Expert Round Table on Ultrasound in ICU. International expert statement on training standards for critical care ultrasonography. *Intensive Care Medicine* 2011; **37**: 1077–83.
4. Dietrich C, Goudie A, Chiorean L, et al. Point of care ultrasound: a WFUMB position paper. *Ultrasound in Medicine and Biology* 2017; **43**: 49–58.
5. Cormack C, Wald A, Coombs R, Kallos L, Blecher G. Time to establish pillars in point-of-care ultrasound. *Australasian Journal of Ultrasound Medicine* 2019; **22**: 12–4.

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Personal protective equipment and possible routes of airborne spread during the COVID-19 pandemic

We welcome Professor Cook's article clarifying the use of personal protective equipment (PPE) in protecting staff during the current COVID-19 pandemic [1].

There remains considerable debate about the extent to which airborne spread of SARS-CoV-2 occurs. Small droplets ($< 5 \mu\text{m}$) are thought to remain suspended in the air and could theoretically be inhaled into the lungs causing infection [2]. Loose fitting 'surgical' masks will not prevent such inhalation and only a tight-fitting filtering mask is adequate. Conversely larger ($> 5 \mu\text{m}$) particles do not remain suspended in the air [2] and can only cause infection if they are immediately inhaled, or after contact with a surface they land on.

We applaud the clarity brought to the complex issue of PPE, but we have concerns about the relative proportion of particles generated during a normal cough or sneeze. Nicas et al. is cited as evidence that 99.9% of the fluid volume ejected during a cough is in large particles [3]. We believe that this should be interpreted with caution because there is also evidence suggesting that a much higher proportion of particles emitted are in the small, potentially airborne, range [2]. Given the uncertainty regarding the infectivity of SARS-CoV-2 and the inoculum required to cause infection, it is possible that the sheer number of small particles is more relevant than the weight of the larger droplets.

The World Health Organization (WHO) has defined a number of healthcare-related aerosol generating procedures (AGPs) [4] but we believe this list is outdated in the context of COVID-19. Much of the evidence used by WHO is epidemiological, based on SARS and other respiratory outbreaks [5]. Many of the procedures, which were defined as aerosol generating, may in fact be a risk precisely because they generate coughing. Bronchoscopy and physiotherapy would likely fit this description.

Cook points out that air accelerating across a wet surface generates aerosols [1, 4]. Typically, the faster the airflow, the more aerosols are generated. Although we agree there is some evidence supporting tracheal intubation as an AGP, in our experience, very few airway procedures generate rapid airflows unless they cause coughing (e.g. at tracheal extubation). Many of the other AGPs listed do not generate high airflows and we question why they are considered a higher risk than coughing. Procedures such as manual ventilation and suctioning the airway (unless coughing) are unlikely to generate high gas flows. Manual ventilation, continuous positive airway pressure and non-invasive ventilation may generate a leak around a mask but high gas flows in the airway itself seem unlikely.

There are many other factors other than particle size (such as viral shedding) which might affect spread of SARS-