

## Guest Editorial

---

# Making Waves: Lung Ultrasound and Physiotherapy Practice

Simon Hayward\*

*Critical Care Physiotherapist, Blackpool Teaching Hospitals NHS Foundation Trust, Blackpool, UK  
Tel.: +44 7904 526368; E-mail: simon.hayward@bfwhospitals.nhs.uk*

Physiotherapists who work in respiratory care spend a great deal of time developing expertise in the use of a range of assessment tools including: observation, palpation, auscultation and percussion. Further specialist skills are needed for the interpretation of arterial blood gas (ABG); chest radiographs (CXR) and computed tomography (CT), in order to ensure the most accurate diagnosis can be made and best treatment delivered. However, many physiotherapists still rely on other professionals for some specialist aspects of the patient assessment (e.g. CXR or CT) which necessitates convincing others to perform such tests and may result in delayed treatment. The boundaries between professional roles are blurring, for example a competent physiotherapist can take ABG and the results used to inform clinical reasoning right at the point of care.

The earliest evidence I can find of a respiratory physiotherapist using an ultrasound scan to inform practice was a paper published in 1997 by Blaney and Sawyer [1]. In this paper the physiotherapist aimed to compare the effects of three different breathing techniques on diaphragmatic excursion, after upper abdominal surgery. While, back in 1997, the scan of the diaphragm was done by a sonographer, the question is now posed, have we reached the time when lung diagnostic imaging has come into the crosshairs of physiotherapists and should physiotherapists learn how to image?

Professor Daniel Lichtenstein is one of the pioneers of point-of-care ultrasound (POCUS) in critical care and he strongly advocates the use of diagnostic lung ultrasound to inform clinical reasoning. In his book, “Lung Ultrasound in the Critically Ill: The

BLUE Protocol” [2], when discussing physiotherapy contribution to patient care in ICU he argues that physiotherapists should acquire ultrasound imaging skills and that ‘ultrasound should change many aspects of the [physiotherapy] protocols, since the result can be seen on site.’ (p293).

Lung ultrasound (LUS), also known as thoracic ultrasound, uses diagnostic ultrasound to image the pleura, lung parenchyma and diaphragm. Two narrative reviews around the use of LUS by physiotherapists have previously been published. Leech et al. [3] focused on the diagnostic performance of LUS when compared to auscultation and CXR and found that LUS increased diagnostic accuracy when identifying acute pulmonary pathology, but these authors reported a lack of training standards for physiotherapists. Le Neindre et al. [4] focused on the basic aspects of LUS, its semiology and how to apply LUS in practice. They report that LUS performs better than CXR and auscultation and should be considered as an outcome measure and used to inform clinical decision making. A number of recent systematic reviews have advocated the use of LUS to assess pathologies such as pneumonia [5], pleural effusion [6] and diaphragmatic dysfunction [7]. The potential benefits of LUS make it a powerful tool to assist clinicians to differentially diagnose many lung pathologies and conditions.

Historically physiotherapists have relied on radiographers to provide imaging with or without an accompanied report. However, the findings from a CXR or CT image become less reliable as time passes which may result in physiotherapists being vulnerable to over treating conditions that have

resolved or under treating new unknown conditions that have developed [3]. In some cases CXR, and more commonly CT imaging, cannot be performed on a critically ill patient for medical reasons, leaving the whole medical team reliant on other assessment techniques. LUS can provide immediate, repeatable, real-time images that can be performed in almost any location due to the portability of most machines. LUS allows decisions on the appropriateness or type of treatment to be made, based on the most up-to-date information.

It must be noted, of course, that LUS should not replace other assessment skills but rather adds to the repertoire of skills the physiotherapist brings to each patient. If LUS has the potential to become a specialist respiratory skill, then training opportunities and issues around competency need to be considered. LUS is highly dependent on operator skill and international training recommendations [8] focus on gaining competency with support from a designated mentor. Unfortunately mentors with the appropriate skills are not readily available and will need to come exclusively from non-physiotherapy professions, for now.

It should also be noted that there are excellent medical and radiological clinicians who can see the benefits LUS could afford physiotherapists in respiratory care and are willing to help physiotherapists develop their skills. LUS emits no ionising radiation and is a non-invasive technique, meaning many aspects of governance are fairly simple to navigate. When competent, physiotherapists have the skills to answer goal-directed questions quickly, which will inform decision making at the point-of-care. LUS, with superior sensitivity and specificity than auscultation and CXR for many pathologies, can be used to guide immediate patient management and care.

In 1821, when commenting on the stethoscope, Dr John Forbes M.D. wrote;

“I have no doubt whatever, from my own experience of its value, that it will be acknowledged to be one of the greatest discoveries in medicine by all those who are of a temper, and in circumstances, that will enable them to give it a fair trial. That it will ever come into general use, notwithstanding its value, I am extremely doubtful; because its beneficial application requires much time, and gives a good deal of trouble both to the patient and the practitioner; and because its whole hue and character is foreign, and opposed to all our habits an association.”

The stethoscope has rightfully earned its place over the last 200 years and LUS will not replace it. However, new diagnostic technology presents opportunity and if LUS is demonstrated to be effective then all professions, including physiotherapists, should embrace it. At the very least, sound research needs to establish the scope with which LUS could affect respiratory physiotherapy practice in critical care or elsewhere.

LUS takes time and a great deal of dedication to incorporate into practice. As a competent practitioner of LUS I can confidently state that LUS has positively influenced my own practice when treating deteriorating patients in critical care, the wards or while on-call. I firmly believe that physiotherapists should positively engage with the opportunity LUS presents to widen the scope of our profession, enhance our practice and most importantly to improve the care and outcomes for our patients.

## References

- [1] Blaney F, Sawyer T. Sonographic measurement of diaphragmatic motion after upper abdominal surgery: A comparison of three breathing manoeuvres. *Physiotherapy Theory and Practice* 1997;13:207-15. DOI: 10.3109/09593989709036464
- [2] Lichtenstein DA. *Lung ultrasound in the critically ill: The blue protocol*. Springer International Publishing. 2016:p93. ISBN 978-3-319-15370-4
- [3] Leech M, Bissett B, Kot M, Ntoumenopoulos G. Lung ultrasound for critical care physiotherapists: A narrative review. *Physiotherapy Research International* 2015;20:69-76.
- [4] Le Neindre A, Mongodi S, Philippart F, Bouhemad B. Thoracic ultrasound: Potential new tool for physiotherapists in respiratory management. A narrative review. *Journal of Critical Care* 2016;31:101-9.
- [5] Chavaz MA, Shams N, Ellington LE, Naithani N, Gilman RH, Steinhoff MC, Santosham M, Black RE, Price C, Gross M, Checkley W. Lung ultrasound for the diagnosis of pneumonia in adults: A systematic review and meta-analysis. *Respiratory Research* 2014;15:50. DOI: 10.1186/1465-9921-15-50
- [6] Grimberg A, Shigueoka DC, Atallah AN, Ajzen S, Iared W. Diagnostic accuracy of sonography for pleural effusion: Systematic review. *Sao Paulo Medical Journal* 2010;128(2):90-5.
- [7] Zambon M, Greco M, Bocchino S, Cabrini L, Beccaria PF, Zangrillo A. Assessment of diaphragmatic dysfunction in the critically ill patient with ultrasound: A systematic review. *Intensive Care Medicine* 2017;43:29-38. DOI: 10.1007/s00134-016-4524-z
- [8] Cholley BP. International expert statement on training standards for critical care ultrasonography. *Intensive Care Medicine* 2011;27:369-73. DOI: 10.1007/s00134-011-2246-9