

ARTP statement on pulmonary function testing

Brendan G Cooper,¹ James H Hull,² Julie K Lloyd¹

To cite: Cooper BG, Hull JH, Lloyd JK. ARTP statement on pulmonary function testing. *BMJ Open Res* 2020;7:e000664. doi:10.1136/bmjresp-2020-000664

Received 5 June 2020
Revised 11 June 2020
Accepted 15 June 2020

The publication, in this journal,¹ of new lung function testing guidance from the Association for Respiratory Technology & Physiology (ARTP), updates the original version from 1994, published in conjunction with British Thoracic Society.² This new guidance will undoubtedly be welcomed by physiologists and physicians and provides both a pragmatic and logical update, helping to inform and shape best practice in lung function departments across the UK. Contributors to this document are all senior widely experienced respiratory clinical physiologists±clinicians.

The document says a lot about how respiratory medicine and physiology has changed in 25 years. We have seen several iterations of American Thoracic Society/European Respiratory Society (ATS/ERS) technical standards for lung function testing,^{3–8} relatively dramatic changes in the training of respiratory physiology practitioners, improvements in testing innovation and technology as well as completely new approaches to the diagnosis of lung disease using imaging and other technology during this time. This statement thus very aptly provides a state-of-the-art update in the measurement and interpretation of lung function assessments.

While it does not always agree exactly with recent ATS/ERS technical standards documents,⁷ it has been written specifically with the UK health service in mind and as such adheres to much of the guidance and evidence provided by the ATS/ERS standards (eg, bronchodilatation section). Furthermore, this reflects the improved and higher level education and training standard in UK clinical respiratory physiology in recent decades, which encourages ‘thinking practitioners’ rather than ‘following technicians’.⁹ As such, the authors should be commended on improving the old guidance immensely by expanding the detail, adding the rationale for changes and thus helping those unfamiliar with the physiology/technology to understand why certain methods and criteria are used. This may in part be due to the fact that this document will have online material

which means the size of the document is less critical than it was previously.

The document has a fine balance between making recommendations and encouraging the practitioner to decide for themselves which option to consider. This can be best seen in the height measurement sections. It is also not afraid to tackle controversial issues such as recording patient sex and not gender, and the use of lower limit of normal (LLN) and the fixed ratio for forced expiratory volume in 1 s/forced vital capacity (FEV₁/FVC) that have produced enormous overdiagnosis of chronic obstructive pulmonary disease, in the elderly, in the past.¹⁰

It has been written with an extensive list of citations which are included within text, which is a major improvement on the original 1994 document (180 vs 17 in the original). Moreover, there are many new sections (eg, patient consent, sniff nasal inspiratory pressure tests, paediatric testing and several sections have benefited from extended details, especially quality control, reference values, lung volume testing by all methods, blood gases and muscle function testing). Two changes which may be noticed by purists are (1) the change in repeatability for FEV₁ and FVC changing from 100 to 150 mL; and (2) the bronchodilator significant response becoming the change in Z-score. Both these changes are evidence based; the former may help primary care spirometry practitioners, whereas most lung function staff will usually achieve the 100 mL target in >90% of tests.¹⁰ The use of Z-scores and LLN will help clinical utilisation and interpretation of the bronchodilator response which has always been problematic in defining what’s a meaningful change.¹⁰

The document has evolved over 4 years and has had to accommodate the new global guidance that has been published in that time^{7,8} but even so, there was no anticipating the COVID-19 pandemic and particularly the changed perceptions and emerging evidence around infection control and personal protective equipment for lung function



▶ <http://dx.doi.org/10.1136/bmjresp-2020-000575>



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Lung Function and Sleep, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK

²Department of Respiratory Medicine, Royal Brompton and Harefield NHS Foundation Trust, London, UK

Correspondence to

Prof Brendan G Cooper;
brendan.cooper@uhb.nhs.uk



staff. Fortunately, this has been addressed elsewhere by ARTP.^{11 12}

While the calibration section could have been part of the quality control section, it actually fits logically in the practical guidance for testing. As a guide for writing clinical operating procedures this document will be of great use to many departments as they achieve service accreditation (UK Accreditation Scheme, Improving Quality in Physiological Services) for lung function departments.

It is slightly disappointing that the guidance was not expanded to include other routine tests such as oscillometry, airways resistance, fractional exhaled nitric oxide and Transfer factor for the lung for nitrohen monoxide (TLNO) measurements, as its initial statement to build on the innovation is not quite fulfilled, nevertheless it is an excellent document that needs to be used by clinical services as well as clinical trials and research projects. Some would argue that ATS/ERS technical standards cover this area well, but they are written for a larger audience and have to satisfy the North American markets (carbon monoxide diffusing capacity vs carbon monoxide transfer factor), and their standards are largely aimed at the equipment manufacturer's so are more relevant to a global respiratory equipment market including the UK. These current ARTP standards are aimed at routine UK lung function service delivery and so are specific to our healthcare system. Any overlap with ATS/ERS standards should not act as a barrier to equipment manufacturers and ARTP have done well to harmonise those areas where they can.

Overall this document has achieved its remit and requires consideration by measurement practitioners, users of lung function and those who interpret the tests. Unfortunately, this may require the updating of other publications and guidelines such as quality-assured diagnostics spirometry guidance, ARTP handbooks and ARTP training course content, but such revision is never a bad thing for teachers or students. The ARTP leadership has delivered this guidance which continues to underline the importance of ensuring high-quality physiological

measurement being undertaken in the UK and to help others to ensure quality-assured and robust diagnostics are undertaken to deliver the highest quality of care.

Contributors All three authors have contributed to the development and production of this editorial equally.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Commissioned; internally peer reviewed.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

REFERENCES

- 1 Sylvester KP, Clayton N, Cliff I, *et al*. ARTP statement on pulmonary function testing. *BMJ Open Resp Res* 2020:e000575.
- 2 BTS/ARTP. Guidelines for the measurement of respiratory function. recommendations of the British thoracic Society and the association of respiratory technicians and Physiologists. *Respir Med* 1994;88:165–94.
- 3 Miller MR, Crapo R, Hankinson J, *et al*. General considerations for lung function testing. *Eur Respir J* 2005;26:153–61.
- 4 Miller MR *et al*. Standardisation of spirometry. *Eur Respir J* 2005;26:319–38.
- 5 Wanger J, Clausen JL, Coates A, *et al*. Standardisation of the measurement of lung volumes. *Eur Respir J* 2005;26:511–22.
- 6 Pellegrino R, Viegi G, Brusasco V, *et al*. Interpretative strategies for lung function tests. *Eur Respir J* 2005;26:948–68.
- 7 Graham BL, Steenbruggen I, Miller ML, *et al*. Standardization of spirometry 2019 update. *Am J Respir Crit Care Med* 2019:e70–88.
- 8 Graham BL, Brusasco V, Burgos F, *et al*. 2017 ERS/ATS standards for single-breath carbon monoxide uptake in the lung. *Eur Respir J* 2017;49:1650016:1600016.
- 9 Shakespeare J, Parkes E, Bryce M, *et al*. Advanced roles in respiratory healthcare science: it's not just spirometry. *Breathe* 2019;15:267–9.
- 10 Swanney MP, Ruppel G, Enright PL, *et al*. Using the lower limit of normal for the FEV1/FVC ratio reduces the misclassification of airway obstruction. *Thorax* 2008;63:1046–51.
- 11 Jones MH, Taylor JS, Shakespeare J, *et al*. Laboratory compliance with published acceptability criteria for spirometry and influencing factors. *Europ Respir J* 2006;24:P710s.
- 12 Hull JH, Lloyd JK, Cooper BG. Lung function testing and COVID-19. *Lancet Respir Med* 2020.