Open Respiratory Archives 6 (2024) 100441

Sociedad Española de Neumología y Cirugía Torácica SEPAR

Open Respiratory Archives

www.elsevier.es/ora

Editorial

Innovation in Home Spirometry, as a New Out-of-Hospital Circuit in Patients: More Reality, Less Fiction

Innovación en espirometría domiciliaria como nuevo circuito asistencial extrahospitalario: más realidad, menos ficción

Nowadays, telemedicine, including telemonitoring and telediagnosis, is widely applied across various clinical settings. It is increasingly common for patients to actively participate in the collection of biometric data, which is essential for the accurate evaluation of their conditions. In this context, the assessment of lung function and chronic respiratory diseases necessitates a transition toward more modern and digitalized approaches.

Home-based testing has long been implemented, including ambulatory blood pressure monitoring, Holter ECG, and various self-sampling techniques such as fecal occult blood testing, HPV detection, capillary glucose monitoring, and SARS-CoV-2 testing, all performed outside clinical settings. In respiratory medicine, home-based diagnostic tools have been adopted for the evaluation of obstructive sleep apnea, including respiratory polygraphy and overnight oximetry, made feasible by the portability and user-friendliness of modern devices. Even CPAP titration is now commonly performed at home, with in-hospital studies reserved for complex cases requiring more comprehensive assessments.

In lung function assessment, strategies such as peak flow have been used for diagnosis and home monitoring in asthma. However, its relevance has declined due to limitations in standardization, reproducibility, and adherence. In contrast, forced spirometry remains essential, offering multiple functional parameters in a single test. In restrictive diseases—such as fibrosing or neuromuscular conditions—FVC serves as a prognostic marker and guides clinical decisions. FEV_1 is a well-established predictor of mortality and exacerbation risk in airway diseases including COPD, asthma, cystic fibrosis, and bronchiectasis.[1,2] Moreover, a positive bronchodilator response is often linked to clinical instability or suboptimal symptom control, particularly in asthma patients undergoing pharmacological treatment.[3]

Several studies have evaluated the feasibility and usability of home spirometry for monitoring lung function in various respiratory diseases from the patient's own environment. Previous experiences, including those in pediatric populations, have demonstrated good adherence and results comparable to other home-based interventions.[4–7] This strategy is particularly relevant in chronic respiratory diseases, where long-term functional monitoring is essential. Currently, such assessments are performed almost exclusively in clinical settings, generating dependence on in-person visits, loss of working hours, travel, and increased use of healthcare resources. Shifting part of this monitoring to the home could enhance care efficiency and reduce system burden. Nevertheless, its implementation remains limited, likely due to technical and logistical challenges and the need to standardize measurement quality criteria.[7]

One of the main concerns regarding home spirometry is the accuracy and reproducibility of the measurements. Research in various chronic respiratory diseases has shown that home-based values tend to be slightly lower, particularly for FEV_1 and FVC, compared to those obtained under technical supervision in clinical settings.[7–9] This supports the notion that conventional spirometry remains the preferred method when diagnostic precision is required. Nevertheless, the correlation between hospital and home measurements is high. In fact, unsupervised home spirometry meets ATS/ERS quality and reproducibility standards in 75–86% of cases,[10–12] and patients are often able to perform bronchodilator testing at home without difficulty. These findings highlight its potential as a reliable tool for longitudinal monitoring in previously diagnosed patients, enabling more frequent and contextually relevant assessments with reduced dependence on hospital-based care.[13,14]

Training in forced spirometry has traditionally been directed at nursing and physiotherapy staff, with variable outcomes depending on the healthcare setting. High staff turnover, limited experience, and poor adherence to quality standards particularly affect its effectiveness in primary care. In light of these challenges, there is a growing need to simplify procedures and actively involve patients in the monitoring process. Patient education and training in the use of pulmonary function devices will be critical to the success of out-of-hospital monitoring strategies. The usability of these devices—including ease of use, efficiency, and user satisfaction—will play a decisive role in their effectiveness. Studies assessing patient satisfaction report over 90% of users finding the devices easy to use and user-friendly.[13,14]

While not all patients will be suitable candidates for home spirometry, a considerable proportion is likely to benefit from this approach. Recent studies have shown no significant differences in measurement accuracy between patients trained by healthcare

https://doi.org/10.1016/j.opresp.2025.100441

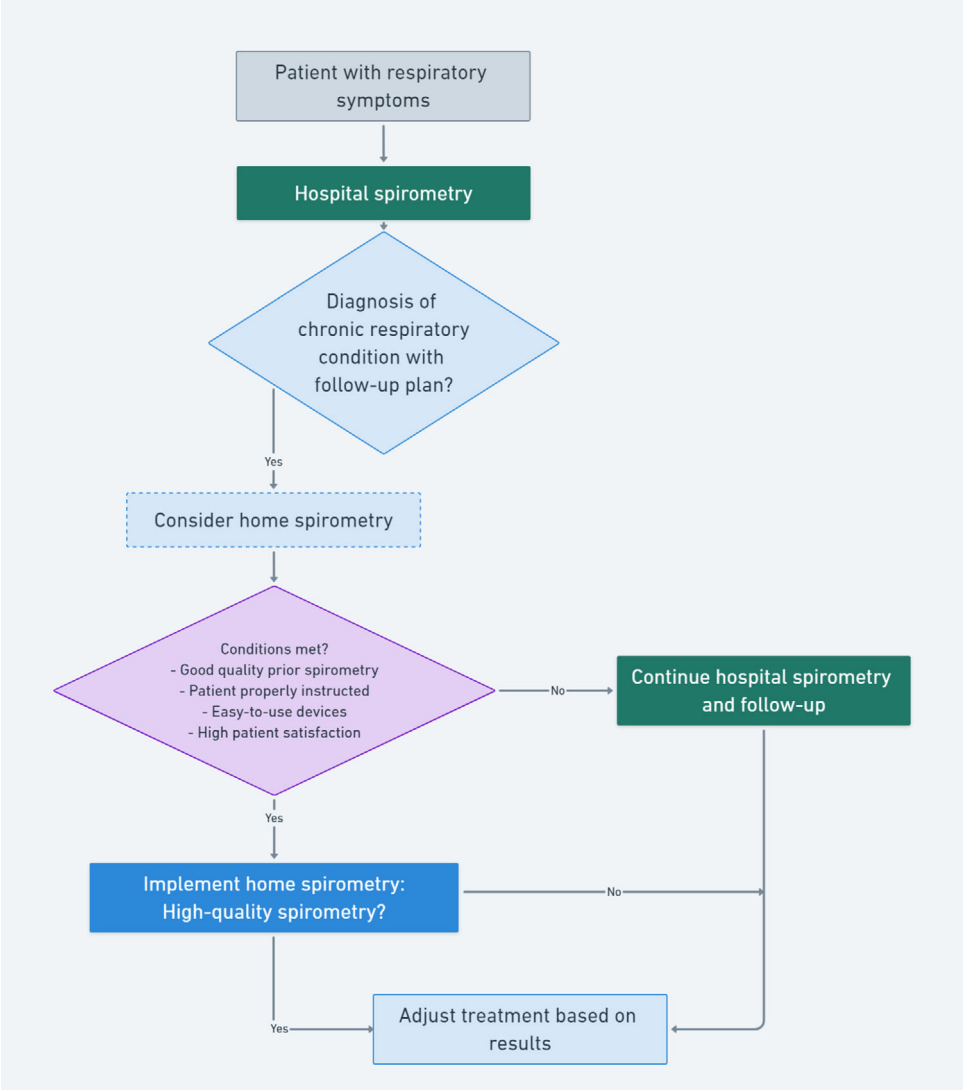

Fig. 1. Proposed use of home spirometry in the context of chronic respiratory diseases.

professionals and those who underwent self-directed training, suggesting growing flexibility in educational strategies.[15] In Fig. 1, we propose a conceptual framework for the use of home spirometry in the context of chronic respiratory diseases, highlighting its potential role in patient monitoring and longitudinal disease management. However, there are currently no standardized regulations governing the use of portable spirometers in non-clinical settings. It is essential to advance in the identification of the most appropriate, accessible, and cost-effective devices, and to define clear criteria for their use at home, including specific recommendations on technical quality and reproducibility when performed without direct supervision.

In conclusion, home spirometry represents a promising alternative for monitoring chronic respiratory diseases. However, since the data obtained in home settings do not yet reach the diagnostic precision of spirometry performed under controlled conditions, its use should be limited to follow-up rather than diagnosis. Its limited implementation reflects the lack of regulatory consensus, highlighting the need for further evidence and standardized quality criteria for safe and effective integration into clinical practice.

AI use statement

During the preparation of this work, the authors used ChatGPT with GPT-4-turbo to enhance readability and language. Fig. 1 is created using Whimsical diagrams to visually represent the content. After using these tools, the authors reviewed and edited the material as needed and take full responsibility for the content of the publication.

Funding

The authors declare that they received no funding for the preparation of this manuscript.

Authors' contributions

All authors contributed to the preparation of the manuscript. Mariana Muñoz-Esquerre and Héctor Cabrerizo were responsible for the review. All authors revised and approved the final version and are accountable for its content.

Conflicts of interest

Mariana Muñoz-Esquerre has attended advisory boards for AstraZeneca, ALK-Abello, Chiesi, GlaxoSmithKline, TEVA, and Sanofi; has given lectures at meetings supported by AstraZeneca, Chiesi, GlaxoSmithKline, Novartis, TEVA, Sanofi, Ferrer; has taken part in clinical trials sponsored by AstraZeneca, GlaxoSmithKline, Regeneron, Palobiofarma, Chiesi and Novartis; and has received educational and research grants from AstraZeneca, Novartis, ALK-Abello, TEVA, GlaxoSmithKline, Chiesi and Sanofi.

Hector Cabrerizo have no conflicts of interest to declare related to this manuscript.

References

1. Osborne ML, Pedula KL, O'Hollaren M, Ettinger KM, Stibolt T, Buist AS, et al. Assessing future need for acute care in adult asthmatics: the Profile of Asthma Risk Study: a prospective health maintenance organization-based study. Chest. 2007;132:1151–61, http://dx.doi.org/10.1378/chest.05-3084. Epub 2007 Jun 15: PMID: 17573515.
2. Agusti A, Fabbri LM, Baraldi E, Celli B, Corradi M, Faner R, et al. Spirometry: a practical lifespan predictor of global health and chronic respiratory and non-respiratory diseases. Eur J Intern Med. 2021;89:3–9, http://dx.doi.org/10.1016/j.ejim.2021.04.027. Epub 2021 May 18. PMID: 34016514.
3. Heffler E, Crimi C, Campisi R, Sichili S, Nicolosi G, Porto M, et al. Bronchodilator response as a marker of poor asthma control. Respir Med. 2016;112:45–50, http://dx.doi.org/10.1016/j.rmed.2016.01.012. Epub 2016 Jan 22. PMID: 26823211.
4. Gerzon FLGR, Jöbsis Q, Bannier MAGE, Winkens B, Dompeling E. Discrepancy between lung function measurements at home and in the hospital in children with asthma and CF. J Clin Med. 2020;9:1617, http://dx.doi.org/10.3390/jcm9061617. PMID: 32466623; PMCID: PMC7355967.
5. Wilson CL, McLaughlin C, Cairncross A, Gabbay E, Noble PB, Blakey JD, et al. Home spirometry appears accurate and feasible for monitoring chronic respiratory disease. ERJ Open Res. 2024;10:00937–2023, http://dx.doi.org/10.1183/23120541.00937-2023. PMID: 38770006; PMCID: PMC11103683.
6. Huang C, Izmailova ES, Jackson N, Ellis R, Bhatia G, Ruddy M, et al. Remote FEV_1 monitoring in asthma patients: a pilot study. Clin Transl Sci. 2021;14:529–35, http://dx.doi.org/10.1111/cts.12901. Epub 2020 Nov 9: PMID: 33048470; PMCID: PMC7993258.
7. Williams Z, Hull JH, Ge Y, Ming J, Roberts C, Rhamie S, et al. Feasibility and value of a domiciliary spirometry programme in the assessment of severe asthma: a real-world evaluation. ERJ Open Res. 2023;9:00635–2023, http://dx.doi.org/10.1183/23120541.00635-2023. PMID: 38152082; PMCID: PMC10752269.
8. Anand R, McLeese R, Busby J, Stewart J, Clarke M, Man WD, et al. Unsupervised home spirometry versus supervised clinic spirometry for respiratory disease: a systematic methodology review and meta-analysis. Eur Respir Rev. 2023;32:220248, http://dx.doi.org/10.1183/16000617.0248-2022. PMID: 37673426; PMCID: PMC10481332.
9. Oppenheimer J, Hanania NA, Chaudhuri R, Sagara H, Bailes Z, Fowler A, et al. Clinic vs home spirometry for monitoring lung function in patients with asthma. Chest. 2023;164:1087–96, http://dx.doi.org/10.1016/j.chest.2023.06.029. Epub 2023 Jun 27: PMID: 37385337.
10. Khan F, Howard L, Hearson G, Edwards C, Barber C, Jones S, et al. Clinical utility of home versus hospital spirometry in fibrotic interstitial lung disease: evaluation after INJUSTIS interim analysis. Ann Am Thorac Soc. 2022;19:506–9, http://dx.doi.org/10.1513/AnnalsATS.202105-612RL. PMID: 34534053.
11. Kerwin EM, Hickey L, Small CJ. Relationship between handheld and clinic-based spirometry measurements in asthma patients receiving beclomethasone. Respir Med. 2019;151:35–42, http://dx.doi.org/10.1016/j.rmed.2019.03.010. Epub 2019 Mar 20. PMID: 31047115.
12. Oppelaar MC, van Helvoort HA, Bannier MA, Reijers MH, van der Vaart H, van der Meer R, et al. Accuracy, reproducibility, and responsiveness to treatment of home spirometry in cystic fibrosis: multicenter retrospective, observational study. J Med Internet Res. 2024;26:e60892, http://dx.doi.org/10.2196/60892. PMID: 39626236; PMCID: PMC11653036.
13. Kupczyk M, Hofman A, Kołtowski Ł, Kuna P, Łukaszyk M, Buczyłko K, et al. Home self-monitoring in patients with asthma using a mobile spirometry system. J Asthma. 2021;58:505–11, http://dx.doi.org/10.1080/02770903.2019.1709864. Epub 2020 Jan 6: PMID: 31877056.
14. Cabrerizo-Carreño H, Bellver C, Romero-Ortíz A, Santos S, Aso-González S, Bordas-Martinez J, et al. Viability of a new home program of forced spirometry with bronchodilator response measurement in the assessment of patients with asthma. Multidiscipl Respir Med. 2025 [in press].
15. Morgan C, Higbee D, Dixon C, Buckroyd E, Adamali H, Barratt S, et al. A randomised controlled trial of self vs clinician-taught home spirometry. Eur Respir J. 2023;62 Suppl. 67:PA3976, http://dx.doi.org/10.1183/13993003.congress-2023.PA3976.

Mariana Muñoz-Esquerre*, Héctor Cabrerizo-Carreño
Department of Respiratory Medicine, Bellvitge University Hospital – IDIBELL, University of Barcelona, L'Hospitalet de Llobregat, Barcelona, Spain

* Corresponding author.
E-mail address: mmunoze@bellvitgehospital.cat
(M. Muñoz-Esquerre).