

Response from Authors to Letter to Editor

Response To: Initial Results Do Not Support That Fully Virtual Pulmonary Rehabilitation Widens Reach to Underserved Patients With COPD

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Abbreviations:

6MWT=6-minute walk test; **COPD**=chronic obstructive pulmonary disease; **EMR**=electronic medical record; **PFT**=pulmonary function testing; **PR**=pulmonary rehabilitation; **SVI**=Social Vulnerability Index; **VPR**=virtual pulmonary rehabilitation

Funding Support:

not applicable

Citation:

Schultz EA, Frank M, Eppler SL, et al. Response to: initial results do not support that fully virtual pulmonary rehabilitation widens reach to underserved patients with COPD. *Chronic Obstr Pulm Dis*. 2026;13(5):436-438. doi: <https://doi.org/10.15326/jcopdf.2026.0886>

Publication Dates:

Date of Acceptance: September 2, 2026

Published Online Date: September 25, 2026

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Keywords:

pulmonary rehabilitation; socioeconomic status; chronic airways obstruction

Dear Editor:

We thank Dr. Marilyn Moy and colleagues for their thoughtful comments in their [Letter to the Editor](#).¹ The correspondents correctly note the absence of a center-based, in-person pulmonary rehabilitation (PR) cohort for direct comparison. We agree that this is an important limitation and explicitly acknowledge it in our manuscript. Importantly, our study was intentionally descriptive: our objective was to characterize patients who did and did not enroll in virtual pulmonary rehabilitation (VPR) after referral and generate real-world data to inform future investigations. It was not designed to establish the comparative effectiveness, reach, or superiority of VPR relative to center-based PR.

Patients were referred to VPR at the discretion of their treating clinicians based on a clinical diagnosis of chronic obstructive pulmonary disease (COPD). Some patients carrying a clinical diagnosis of COPD have not undergone spirometry or do not have documented fixed airflow obstruction. Furthermore, Medicare coverage for virtual PR is limited to moderate-to-very-severe COPD (Global initiative for chronic Obstructive Lung Disease [GOLD]² grades 2–4), and coverage policies vary across insurers and delivery models.^{3,4} Consequently, patients considered clinically appropriate for referral by their clinicians may subsequently be found ineligible for coverage because they lack documentation of prior pulmonary function testing (PFT) or do not meet an insurance company's PFT criteria for coverage. Similarly, our retrospective assessment of reasons for declining VPR was limited to information documented by referral coordinators during routine interactions. These reasons should be considered descriptive rather than a comprehensive assessment of barriers to enrollment.

The correspondents note that the mean distance of 12.6 miles from a center-based PR program among VPR participants is comparable to distances reported previously and thus, does not support an increased reach of VPR programs. We, however, respectfully disagree with this interpretation. In our cohort, distance to the nearest center-based program ranged up to 67.1 miles, and more than

one-fifth of participants lived more than 20 miles from an in-person PR program. The mean distance, therefore, masks substantial geographic barriers experienced by a meaningful subset of patients. Indeed, the study by Malla et al,⁵ cited by the correspondents to question the potential reach of VPR, instead underscores the substantial limitations in geographic access to center-based PR. That study evaluated geographic access rather than actual PR enrollment and found that the mean distance to the nearest center-based PR program was 12.4 miles (SD 16.6), remarkably similar to the 12.6 miles (SD 14.6) observed in our cohort. Importantly, Malla et al noted that this finding supported a lack of geographic access for Medicare beneficiaries to PR programs. The 2026 GOLD Report and the 2023 American Thoracic Society Clinical Practice Guidelines similarly highlight the geographic barriers and the burden of repeated travel required for participation as barriers to participation in PR, which may be ameliorated by VPR programs.^{2,6}

Moreover, as the correspondents acknowledge, distance alone does not capture the full burden of attending center-based PR, including transportation challenges, travel time, program capacity, and wait times. Although we did not measure actual travel times in our cohort, the distances observed—within the context of the highly congested San Francisco Bay Area—likely translate into a considerably greater travel burden than mileage alone would suggest. Collectively, these data demonstrate that geographic availability and transportation burden are well-established barriers to participation in center-based PR. We believe that the substantial variation in distance within our cohort, together with the well-documented transportation and geographic barriers to center-based PR, provides initial evidence for improved geographic access with VPR.

The correspondents also raise the possibility of a “digital divide,” noting that only 42 patients (15%) were in the highest Social Vulnerability Index (SVI) category. However, the proportion of highly socially vulnerable patients likely reflects, at least in part, the population referred from our single academic center and should not, itself, be interpreted as evidence that VPR preferentially serves socially advantaged patients. Importantly, among referred patients, SVI did not differ significantly between those who enrolled and those who did not. Thus, our data indicate that among patients referred to VPR, greater social vulnerability was not associated with lower enrollment.

Regarding referral volume, despite electronic medical record (EMR) integration, referral remained at the discretion of individual clinicians, who could refer to either virtual or center-based PR during the study period. We did not capture center-based referrals during the same period; therefore, VPR referrals alone do not represent overall PR referral volume. More broadly, we agree that PR remains profoundly underutilized. In a recent analysis by Robinson et al of

more than 1.78 million patients with stable COPD in the VA system, where insurance coverage is not as significant an issue as in other patient populations, only approximately 2% received center-based PR during the eligibility period, despite its established benefit.⁷ Thus, low referral and participation rates are not unique challenges.

We agree that validated exercise assessment and individualized exercise prescription are essential components of PR. While an in-person assessment prior to pulmonary rehabilitation is ideal, it is not always feasible and is subject to many of the same geographic, transportation, and logistical barriers that limit participation in center-based PR, underscoring the need for an acceptable surrogate. Although the 1-minute sit-to-stand test (1-min STS) is not equivalent to a 6-minute walk test (6MWT) or cardiopulmonary exercise test, it should not be characterized solely as a measure of frailty. It has been validated as a functional exercise capacity measure in COPD and elicits a physiologic response that correlates with the 6MWT.⁸ Its limited space requirements and feasibility for remote administration make it a pragmatic measure for assessing and tracking functional performance in virtual settings. We agree, however, that optimal approaches to exercise assessment, prescription, progression, and safety monitoring in fully virtual PR warrant further investigation.

Finally, the closure of Stanford’s center-based PR program occurred independently of the implementation of an EMR-based referral pathway to Kivo Health. The adoption of VPR was a pragmatic response to the broader decline in local PR availability following the COVID-19 pandemic and to substantial barriers to accessing the remaining center-based programs in the area, including wait times exceeding 6 months at programs nearest to our institution.

We share the correspondents’ view that patients with chronic respiratory diseases such as COPD deserve access to PR. This should include patients who face barriers to attending in-person, center-based PR due to long distances, protracted wait times, transportation difficulties, and lack of insurance coverage. The continued accumulation of data demonstrating improvements in dyspnea, health-related quality of life, and mortality with PR is encouraging.^{7,9} Yet, if PR reaches only a small fraction of the eligible population, this is neither acceptable nor equitable, and we should continue striving to do better for our patients.

We hope the data we have generated will motivate future prospective comparative studies examining how to best deliver pulmonary rehab to reach as many patients as possible, whether through virtual, center-based, or hybrid models.

We thank the correspondents for the opportunity to clarify these points and for advancing this important discussion.

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