

To further put these changes into clinical context, we previously measured IOS in response to propranolol-induced bronchoconstriction in patients with asthma where there was a 0.05 (kPa/L) · s increase in R5 – R20 corresponding to a 104.1% (95% CI, 22.6 to 185.6%) change, along with a subsequent bronchodilator response to salbutamol of –0.17 (kPa/L) · s and –115.6% (95% CI, –55.6% to –175.7%), respectively (2). Moreover, in a health informatics evaluation of 302 patients with asthma, there was a 45% increased risk for worse control in relation to oral corticosteroid use, and 47% in relation to inhaled albuterol use measured during a 2-year period when comparing cohorts of patients with asthma, using a cutoff value for R5 – R20 of less than or greater than 0.07 (kPa/L) · s (3).

Hence, the small airway asthma phenotype reflected by abnormal R5 – R20 is associated with poorer control. We believe the findings of Foy and colleagues (1) are important in further validating the use of IOS in determining effects of treatments on small airways of patients with asthma. ■

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Reply to Lipworth and Kuo

From the Author:

I thank Prof. Lipworth and Dr. Kuo for their comments on our manuscript (1). Our attempt is the first of its kind to link patient-based computational models of the small airways with patient outcome measures. In line with the comments made by Prof. Lipworth with respect to resistance at 5 Hz (R5) – resistance at 20 Hz (R20) and asthma risk in cross-sectional studies, I and others recently reported the

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results of the ATLANTIS (Assessment of Small Airways Involvement in Asthma) study, a large multinational study evaluating the association of small airway disease with adult asthma outcomes (2).

ATLANTIS clearly identified that the oscillometry measure R5 – R20 was one of the strongest predictors of both asthma control and prior asthma exacerbations among all the potential small airway indices.

The combination of our findings (1) with the ATLANTIS study results (2) should now enable investigators to test interventions that target the small airways, with R5 – R20 as an outcome measure. ■

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Not All Home-based Exercise Programs Are Home-based Pulmonary Rehabilitation Programs

To the Editor:

I read with great interest the article by Bhatt and colleagues entitled, “Video Telehealth Pulmonary Rehabilitation Intervention in Chronic Obstructive Pulmonary Disease Reduces 30-Day Readmissions” (1).

The authors delivered pulmonary rehabilitation (PR), using two-way live videoconferencing on a smartphone to 80 patients after hospitalization for a chronic obstructive pulmonary disease (COPD) acute exacerbation (AE), and compared them with 160 matched patients. They report 30-day readmission rates, either all-cause or for COPD AE, in the patients who participated in video PR that are approximately three times lower than in the comparison group.

This study highlights the question of whether issues of access and adherence to conventional in-center PR can be safely addressed by using technology to bring a program directly to patients in their

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homes, while maintaining fidelity to the core components of conventional PR that are known to be efficacious (2–4).

Bhatt and colleagues speculate that PR's positive effects on “physical, psychological, and social resilience” increased the “symptomatic threshold” for an AE, and thus reduced readmission rates (1). The authors made great efforts to mirror conventional PR with 36 sessions of aerobic exercise, strength training, and education over the course of 12 weeks. Nevertheless, there are enough differences (the use of a portable foot pedaler rather than a treadmill, resistance bands instead of free weights, videoconferenced education rather than group education, and a single provider rather than a multidisciplinary team of PR professionals) that efficacy of the video intervention should be robustly assessed. Within the video PR group, at the very least, assessments of changes in exercise capacity, dyspnea, and health-related quality of life before and after the intervention should document that this new model of PR is efficacious before it is called PR and before its effects can be attributed to benefits of conventional PR. An alternative explanation of the observed results could be that these patients received individualized counseling and intensive monitoring after hospital discharge, which led to early detection of mild exacerbations treated as outpatients, thereby avoiding hospitalizations. Assessment of all AEs, including those that did not lead to hospital readmissions, is needed to support the observed results and conclusions.

If patients cannot access conventional in-center PR, the use of any intervention that can effectively promote physical activity and exercise is certainly better than nothing. Bhatt and colleagues' video-delivered intervention may have an important role in patients with COPD. Therefore, it is critical to understand details of patient selection criteria, the intervention itself, and implementation barriers/facilitators. It is unclear whether enrolled patients were initially referred to conventional PR but refused. Also, knowing how many patients refused the video program and how many were unable to complete the 36 sessions would help define the potential for large-scale uptake of and compliance with this delivery method. Understanding how many patients achieved 60–80% target heart rate and safely tolerated exercise progression would provide a sense of the intensity of exercise delivered and physiologic training effects. Details on whether patients were directly monitored during exercise sessions and by whom would help gauge the burden of personnel resources needed. Finally, understanding the Health Insurance Portability and Accountability Act compliant application used on the smartphone would help overcome current barriers of ensuring patient privacy and information security of home-recorded data.

The authors note that the results using an “active telehealth intervention” require confirmation with a randomized controlled trial. Three groups (video PR, conventional PR, and no PR) would need to be compared before the program can be called a “video telehealth PR intervention.” ■

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Reply to Moy



From the Authors:

We thank Dr. Moy for her interest in our study and her thoughtful comments. The central premise of her letter is that home-based pulmonary rehabilitation (PR) programs are not equivalent to traditional center-based PR because of perceived differences in the level of exercise achieved and the professionals administering the intervention. We agree with Dr. Moy that there are many unanswered questions, for which we also support further study. Our team was indeed multidisciplinary and involved an exercise physiologist to administer live instructions and monitoring, a respiratory therapist to provide education on disease management and inhaler training, a psychologist to deal with anxiety and depression, and a pulmonologist to manage disease and comorbidities. Patients also received smoking cessation and dietary advice when applicable. We agree with her that although we mimicked the components of traditional PR, the intensity of exercise achieved was different, and in most cases lower. We also agree with her that the intensity of exercise is linearly associated with improvements in exercise endurance, but there is now ample evidence to suggest that home-based interventions that use minimal equipment and are less intense result in improvements in 6-minute-walk distance and quality of life that are similar to those achieved with traditional PR (1, 2). Although there were significant improvements in 6-minute-walk distance, muscle strength, and quality of life in the telehealth arm, our research letter did not describe these results because these measures were not acquired in control subjects. One also has to weigh the physiological benefits of a traditional PR intervention that has a 50% chance of completion against those of a less intense intervention that has a higher likelihood of completion (3). Our intervention was safe and none of the subjects reported any adverse events. We first approached potential patients to

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