

How do we provide ICS-containing treatment to those who will benefit the most with the fewest side effects, in particular pneumonia? Blood eosinophils is undoubtedly a step in the right direction (13, 14), but better understanding and application of this and future biomarkers could help us better identify those with the biggest benefit. In the meantime, we can appreciate that for patients with COPD with frequent exacerbations we can already provide treatments that make them live both better and longer. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

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⊕ Increasing Pulmonary Rehabilitation Uptake after Hospitalization for Chronic Obstructive Pulmonary Disease Exacerbation

Let's Rise to the Challenge

Acute exacerbations of chronic obstructive pulmonary disease (COPD) worsen the symptoms, airflow obstruction, functional disability, and quality of life, and increase mortality risk for those with the disease (1), particularly among those requiring hospitalization. Recovery from COPD exacerbations is often slow; symptoms may take months to resolve and hospital readmissions are common (1, 2). Pulmonary rehabilitation (PR) is an essential

component of the integrated care of individuals with COPD and other chronic respiratory diseases (3) and is effective in fostering patients' recovery after hospitalization for COPD exacerbation (4, 5). When delivered within 4 weeks of exacerbation, it improves exercise capacity, symptoms, and quality of life and reduces hospital readmission risk (4); it is recommended in disease management guidelines (1, 6). Studies have also shown a survival advantage related to postexacerbation PR (4, 7). However, few patients are referred to PR after hospitalization for COPD exacerbation (8, 9). Moreover, when offered, patients' uptake of PR is low (10, 11).

In this issue of the *Journal*, Barker and colleagues (pp. 1517–1524) report the findings of a randomized controlled trial evaluating the effects of a novel video intervention on PR uptake

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Originally Published in Press as DOI: 10.1164/rccm.202003-0705ED on April 27, 2020

after hospitalization for COPD (12). There was no difference in PR uptake rates between the control and intervention groups. There were also no between-group differences in time to uptake of PR, referral, completion or adherence rates, mortality or all-cause readmission rates, or clinical outcomes.

This trial had several strengths. It was a well-designed randomized controlled outcome-blinded trial in which the intervention and control groups were balanced regarding age, sex, lung function, frailty, naivety to PR, and availability of transport to a rehabilitation program. Importantly, the investigators used an experience-based codesigned model in which patients with past experience with hospitalization for COPD and PR participated in the design of the intervention. Provision of a video to impart information about PR guarantees that the patient hears the information at least once; whereas, when given an informational leaflet, there is no guarantee that patients will actually read it.

The trial by Barker and colleagues (12) has some limitations. First, as recognized by the authors, overall uptake of PR was higher than previously reported, which may have reduced the ability to detect an intervention signal. Second, the video provided in the trial did not focus on behavior change, an essential component of fostering health-enhancing behaviors such as engaging in PR. Third, although the intervention targeted the contribution of poor patient awareness to low uptake of postexacerbation PR, there are many additional barriers to program uptake (13). It is, therefore, not surprising that a unifaceted one-size-fits-all approach was unsuccessful. The PR community has adopted a model of “opt in” for posthospitalization rehabilitation, unlike our colleagues delivering cardiac rehabilitation in which the model is one of “opt out,” arguably changing the clinicians’ dialogue and patient expectations. Finally, the optimal timing for delivery of postexacerbation PR is not certain. Cognitive function is frequently impaired postexacerbation (14); this may be a suboptimal time to discuss a complex intervention! In addition, an in-hospital and posthospital rehabilitation trial (15) showed significant spontaneous recovery in the control group, hinting that rehabilitation could be postponed beyond four weeks. This is supported in part by a qualitative study (16) using semistructured interviews of healthcare professionals and patients with COPD who had previously been hospitalized that revealed conflicting views regarding the optimal timing and structure of PR, and highlighted several medical, psychological, and logistic barriers to its uptake.

What solutions might there be to this problem? Opportunities to enhance PR uptake at the time of an exacerbation may include educational programs for clinicians, pop-up reminders in electronic medical records, pamphlets regarding PR in clinicians’ offices as a prompt for clinicians, and patient-facing posters on the wards. The above-noted strategies, as well as provision of lists of local or regional PR programs; clarification, simplification, or automation of the referral process; and focus on care-quality metrics can help to foster healthcare professionals’ referrals of patients to PR (17).

In addition to enhancing referrals, increasing uptake remains a priority that may require a different approach altogether. Such an approach would require obtaining significant input from patients regarding barriers to uptake and participation, not only

retrospectively but also regarding motivations and priorities at the actual time of COPD exacerbation and hospitalization. Patients recovering from COPD exacerbation have numerous diverse and, at times, conflicting issues to deal with. To foster participation in PR, it is likely essential to understand patients’ treatment priorities, expectations, and goals vis-à-vis their recovery. What, specifically and stepwise, do they feel they need?

Discussions between healthcare professionals and patients regarding a planned approach to recovery in the event of hospitalization (including advanced planning for participation in PR) during a period when patients are well and not acutely stressed or ill may help to establish patients’ expectations regarding the role of PR in their care after exacerbation. This would clarify the benefits of and enable people to learn more about PR, ask questions, express fears or concerns, and consider and plan for participation should a hospitalization occur. Avoidance of the decision-making during the time of acute illness and stress may in turn foster program uptake.

Likewise, a stepwise collaborative approach, using shared goal setting between patients, their families and other caregivers, healthcare providers, and home-care service providers at or around the time of hospital discharge, may help patients to prepare for and enroll in PR. Initiation of individualized rehabilitation in the home, in collaboration with providers of center-based PR programs, may help patients recover to where they feel confidence to progress to the outpatient program setting. Given the wide circumstances faced by patients, and differences in styles, preferences, beliefs, adaptations, and coping skills of individuals, no single type of intervention is likely to increase the uptake of PR among all.

The optimal solutions to increase uptake of PR, especially in the postexacerbation period, remain to be discovered. Although the video intervention in the trial by Barker and colleagues (12) did not lead to a significant change in PR uptake in the month after discharge, this should not discourage but, rather, should encourage ongoing research in this important area. The barriers and enablers of uptake and participation should be explored further, and future research should continue to include input from both patients and healthcare professionals. Different types of interventions may be needed across different patient groups, countries, health systems, and cultures. Culture change is needed away from the current prescriptive approach in which healthcare professionals recommend treatments, often without having considered or assessed patients’ priorities. Discovery and implementation of strategies to increase uptake of PR, including after COPD exacerbation, is a worthy and important goal. We should rise to the challenge. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

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Rapid Changes in Arterial Carbon Dioxide Levels Caused by Extracorporeal Membrane Oxygenation The Temptation of a Fascinating Technology

Since 2009, the publication year of the CESAR (Conventional Ventilatory Support Versus Extracorporeal Membrane Oxygenation for Severe Adult Respiratory Failure) trial (1), the fascinating technique of extracorporeal support for the failing lung or for life-

threatening cardiac instability has celebrated a triumph that continues to this day (2). Without doubt, the application of new technologies, such as extracorporeal membrane oxygenation (ECMO), may save life in many cases. Yet, ECMO is a complex and risky measure, and it may be accompanied by severe adverse events, such as bleeding or neurologic injuries (3). The precise knowledge of ECMO management in critically ill patients is crucial for survival and for ensuring the health-related quality of life after transfer from the ICU. Interprofessional teamworking and a high level of expertise are required in terms of mechanical ventilation during ECMO (4), anticoagulation, positioning of the patients,

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Originally Published in Press as DOI: 10.1164/rccm.202004-1060ED on April 28, 2020