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Patients Choose Hypoxemia over Social Isolation

8 Susan S. Jacobs, R.N., M.S.¹, and Jerry A. Krishnan, M.D., Ph.D.²

¹Division of Pulmonary, Allergy and Critical Care Medicine, Stanford University, Stanford, California; and ²University of Illinois at Chicago, Chicago, Illinois

ORCID IDs: 0000-0002-8808-0038 (S.S.J.); 0000-0001-5525-4778 (J.A.K.).

Investigations around the provision of long-term oxygen therapy (LTOT) have generated a long-overdue call for action on behalf of the 1.5 million oxygen users in the United States. The goal of LTOT is to decrease dyspnea, to decrease comorbidities such as pulmonary hypertension, and to improve survival, physical activity, cognitive function, and mobility outside of the home. However, consistent findings of patient dissatisfaction highlight equipment malfunction, excessive weight of portable systems, short supply duration, and inadequate flow rates (1–4).

In a 2017 survey of 1,926 supplemental oxygen users in the United States, 38% of respondents reported a portable oxygen supply of 2 hours or less, although 66% desired 5 to 6 hours (1). Because of cumbersome equipment and inadequate supply duration, the prescription of supplemental oxygen therapy relegates many hypoxemic patients to an isolated lifestyle with limited ability to travel, socialize, care for family members, work outside the home, attend school, and exercise. Distant air travel using portable oxygen concentrators (POCs) is prohibitive because of Federal Aviation Administration (FAA) requirements to carry multiple batteries to cover 150% of flight time; airline power outlets either malfunction, do not exist, or work randomly throughout the plane.

High-flow oxygen users (>3 L/min) suffer the highest burden and confinement

because they and their caregivers maneuver multiple pieces of portable equipment with limited supply duration or capacity. Recent American Thoracic Society guidelines suggest the use of liquid oxygen tanks for high-flow patients on the basis of benefits to health-related quality of life, improved adherence, and increased time spent outside of the home (5). Unfortunately, access to more costly liquid oxygen systems is now rare because of the decline in reimbursement to durable medical equipment companies. Instead of patient-centric care, the basis for oxygen equipment and treatment selection is driven by financial constraints. Many patients pay out of pocket to obtain portable equipment or accessories so that they can leave the home (2, 5), including purchasing POCs. Despite providing a portable battery-powered option, POCs are not an option for many patients because of inconsistent triggering of oxygen flow, variability in the volume of oxygen delivered in each pulse across devices when using pulse-dose settings, differences in pulse-dose versus continuous-flow requirements during exertion for individual patients, lack of POC options for patients who need more than 3 L/min of continuous flow, short battery life, and noise (6).

In this issue of *AnnalsATS*, Dakkak and colleagues (pp. 1498–1505) investigate patient-reported experiences with portable oxygen therapy with the critical purpose of guiding equipment innovation from the patient's perspective (7). Online survey data were collected from 836 respondents with chronic obstructive pulmonary disease (COPD), interstitial lung disease, or pulmonary hypertension, with 50% reporting oxygen requirements of more than 3 L/min (presumably continuous flow) at rest and 40% reporting using more than 5 L/min with activity.



Social isolation related to lack of portability was a prominent finding noted by a third of respondents, who cited their need for assistance from another individual to carry their equipment; compressed gas tanks were ranked as the most “burdensome” oxygen device. These findings echo those of Jacobs and colleagues (1), who reported that 51% of their cohort of 1,926 oxygen users answered “yes” to experiencing oxygen problems around equipment and service delivery. Respondents experiencing oxygen problems ranked “lack of portable systems I can physically manage” fourth, after equipment malfunction, travel oxygen problems, and delivery problems. “Give me more portable tanks or supplies so I can leave the house more frequently and for longer periods of time” was the most frequent response when patients were asked the “... one thing you could change to improve your home oxygen experience.” Arnold (8) (in a qualitative COPD study) and Lindell (4) also identified inappropriate equipment and fear of “running out of oxygen” as key patient-reported concerns. Taken together, these findings confirm a consistent and disturbing pattern of barriers to accessing supplemental oxygen, especially by patients who require high-flow (>3 L/min continuous) oxygen,

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cannot afford out-of-pocket costs to purchase a POC (\$2,000–\$4,000), or live alone and cannot manage equipment without assistance.

Dakkak and colleagues present a notable and novel finding about the trade patients may make to preserve their mobility. Nearly half (47%) of respondents used a POC despite knowing that the device did not produce sufficient oxygen to meet their needs. This finding should raise alarms, given the known survival benefits of LTOT in patients with severe resting hypoxemia (9, 10).

Whereas respondents frequently listed duration of all three portable devices as a

problem, when they were asked to prioritize device design needs, portability was ranked as a higher priority than device duration. Notwithstanding limitations in study methodology in the report by Dakkak and colleagues (unclear psychometric properties of the questionnaire, uncertain flow rates, missing data about sex in a substantial number of respondents, lack of objective data about weight of oxygen equipment), the verdict from the study by Dakkak and colleagues is clear—patients are likely to choose hypoxemia over social isolation when considering home oxygen equipment.

Clinicians frequently prescribe pulmonary rehabilitation and exercise to their patients with chronic pulmonary problems, yet the technology for portable oxygen devices continues to impede mobility. We hope that oxygen equipment manufacturers, researchers, the healthcare provider community, and policymakers take notice of the need for lightweight, long-lasting portable equipment that can consistently deliver high-flow continuous oxygen. ■

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

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Just as the Twig Is Bent, the Tree's Inclined

Ⓞ Kenneth R. Chapman, M.D., M.Sc.^{1,2}

¹Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada; and ²Asthma and Airway Centre, University Health Network, Toronto, Ontario, Canada

ORCID ID: 0000-0002-2498-9859 (K.R.C.).

A time-honored remedy for respiratory symptoms has been to expose the cough sufferer to increased airborne moisture. A simple homemade approach has been the

readily available hot shower, an option when one's child begins to cough and wheeze unexpectedly in the middle of the night. But concerned and conscientious parents of children with chronic or recurrent cough will often invest in small commercial humidifiers meant to be run at a child's bedside through the night. By the late 20th century, epidemiologists expressed concern when they identified strong associations between bedroom



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