

Original Research

Clinical Practices Surrounding the Prescription of Home Oxygen in Patients With COPD and Desaturation

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Abstract

Purpose: While home oxygen therapy increases survival in patients with chronic obstructive pulmonary disease (COPD) who have severe resting hypoxemia, recent evidence suggests that there is no survival benefit of home oxygen for patients with COPD who have isolated exertional desaturation. We aimed to understand clinician practice patterns surrounding the prescription of home oxygen for patients with COPD.

Methods: We conducted semi-structured qualitative interviews via videoconference with 15 physicians and 3 nurse practitioners who provide care for patients with COPD. Clinicians were recruited through the American Lung Association Airways Clinical Research Centers. Interview guides were created with the assistance of patient investigators and included questions regarding clinician practices surrounding the prescription of oxygen for patients with COPD and the use of clinical guidelines. Interviews were recorded, transcribed, and coded for themes.

Results: Of the 18 clinician interviewees, one-third were women, with most participants (n=11) being <50 years old. Results of the semi-structured interviews suggested research evidence, clinical experience, and patient preferences contributed to clinician decision-making. Most clinicians described a shared decision-making process for prescribing home oxygen for patients, including discussion of risks and benefits, and developing an understanding of patient values and preferences. Clinicians did not use a structured tool to conduct these conversations.

Conclusion: Clinicians consider a number of patient and clinical factors when prescribing home oxygen therapy, often using a shared decision-making process. Tools to support shared decision-making about the use of home oxygen are needed.

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Abbreviations:

ACRCs=Airways Clinical Research Centers; **ATS**=American Thoracic Society; **CAT**=COPD Assessment Test; **CMS**=Centers for Medicare and Medicaid; **COPD**=chronic obstructive pulmonary disease;

COREQ=Consolidated Criteria for Reporting Qualitative Research; **DLCO**=diffusing capacity for carbon monoxide; **GOLD**=Global initiative for chronic Obstructive Lung Disease; **LOTT**=Long-Term Oxygen Treatment Trial; **PIs**=principal investigators; **PFT**=pulmonary function test

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This article has an online supplement**Introduction**

Chronic obstructive pulmonary disease (COPD) affects more than 16 million Americans and is the fourth leading cause of death in the United States.¹ Patients with COPD are frequently prescribed chronic home oxygen therapy, with more than 1 million Medicare recipients receiving oxygen therapy at an annual cost of \$2 billion.² Two landmark trials performed in the 1970s established the survival benefit of oxygen therapy for patients with severe resting hypoxemia.^{2,3} For some time afterward, the utility of oxygen therapy for other populations, such as patients with isolated exertional desaturation, remained uncertain. Nevertheless, the potential benefits of oxygen therapy were extrapolated to this patient population, and prescribing oxygen therapy for patients with isolated exertional desaturation became accepted practice, in part due to reimbursement coverage by the Centers for Medicare and Medicaid (CMS).⁴

The benefits of using home oxygen for isolated exertional desaturation are unclear, with a recent report suggesting inconsistent effects on patient-reported outcomes, but with the potential for home oxygen to increase exercise capacity and reduce breathlessness during exercise testing in a laboratory setting.⁵ In addition, the Long-Term Oxygen Treatment Trial (LOTT) study included 319 patients with COPD and isolated exertional desaturation; in this population, time to death or first hospitalization was not improved by home oxygen compared to usual care alone.⁶ Secondary outcomes, including quality of life and 6-minute walk distance, were also not improved.⁶ Oxygen therapy is also associated with harms. Home oxygen use can: (1) restrict social and physical activities, (2) increase the risk of falls from tripping over equipment, (3) cause burns or house fires, (4) cause physical discomfort or epistaxis, and psychological factors such as stigma and embarrassment, and (5) create unnecessary expense.⁷ Despite the possible risks of home oxygen use and recent results from LOTT, oxygen therapy continues to be widely prescribed to patients with isolated exertional desaturation, perhaps in

part because CMS continues to cover chronic home oxygen therapy for this indication.

Both the American Thoracic Society (ATS) 2020 home oxygen guidelines and the Global initiative for chronic Obstructive Lung Disease (GOLD) 2023 report emphasize the importance of shared decision-making and the consideration of individual patient factors when evaluating the need for oxygen in patients with COPD who desaturate only with exertion, with ATS guidelines providing a conditional recommendation for ambulatory oxygen and the GOLD report recommending against routine prescription for ambulatory oxygen.^{5,8}

Prior literature regarding clinical practices surrounding oxygen prescription for patients with COPD has discussed barriers to adequate oxygen services, including: (1) inadequate evaluation and documentation of oxygen needs,⁹ (2) challenges in interactions with durable medical equipment companies,^{10,11} (3) lack of effective patient instruction regarding oxygen use,¹¹ (4) unclear patient adherence to oxygen,¹² and (5) lack of deimplementation of oxygen following hospital discharge.¹³ There has been a call for clinicians to improve the patient experience with oxygen by better understanding prescription requirements, ensuring patient equipment meets patient needs, and providing patients with better education regarding oxygen use.¹⁰

Within clinical practices surrounding oxygen prescriptions for patients with COPD, the drivers of clinician prescription patterns of chronic home oxygen therapy for patients with COPD remain poorly understood. In this study, we conducted semi-structured interviews with clinicians to explore their thought processes and practice patterns surrounding the prescription of chronic home oxygen therapy for COPD patients. Improved understanding of these factors has the potential to inform strategies to promote evidence-based use of oxygen therapy for patients with COPD.

Study Design and Methods**Participants**

Physician (both attendings and pulmonary and critical care fellows) and dedicated pulmonary nurse practitioner participants were recruited from the American Lung Association Airways Clinical Research Centers (ACRCs) network using convenience sampling, with assistance from the principal investigators (PIs) of ACRC clinical sites. To meet inclusion criteria for the study, participants were required to provide clinical care for patients with COPD.

Procedures

The University of Illinois Chicago (2021-0141), Johns Hopkins University School of Medicine (00280675), and

Yale School of Medicine (2000031384) institutional review boards approved this protocol. The project was introduced through ACRC group meetings and emails sent to the PIs of ACRC clinical sites. Clinicians interested in participating in the study were asked to contact research staff who scheduled them for an interview. At the time of the scheduled interview, clinician participants first completed an oral informed consent, with the opportunity to have questions answered prior to participation in the study.

Semi-structured videoconference interviews were conducted by a single researcher (SZ), a pulmonary and critical care medicine fellow with expertise in qualitative interviewing. The interviewer had no prior direct relationship with participants. Only the interviewer and participant were present during videoconference interviews. Following the interview, participant demographic data were collected. Participants were offered a \$50 gift card as compensation for completing the interview. All interviews were audio recorded and transcribed by a professional medical transcriptionist. Transcripts were deidentified prior to being analyzed.

Interview Guide

The interview guide was developed by the study authors, including pulmonologists, a clinical psychologist, and patients with COPD (Supplement 1 in the online supplement). The guide included open-ended questions regarding clinician practices surrounding prescription of oxygen for patients with COPD, including the use of shared decision-making. Prior to initiation of the study, the interview guide was piloted with 2 clinicians who care for patients with COPD and modified for clarity based on feedback.

Analysis

A thematic analysis approach was used to analyze qualitative interview data. Transcripts were analyzed using NVivo 12.0 software (QSR International Pty Ltd, Doncaster, Australia). Two investigators (SZ and ME) read transcripts and inductively developed a codebook (Supplement 2 in the online supplement). After creation of the codebook, investigator SZ performed line-by-line coding of all transcripts, iteratively updating the codebook as needed. An independent investigator, MC, then used the codebook to double code each interview. Investigators SZ and MC met with the senior qualitative investigator, ME, to resolve discrepancies in coding and discuss any changes made to the codebook. Coding comparison between SZ and MC was calculated using Cohen's kappa coefficient and through calculating a percentage agreement. It was determined that thematic saturation occurred when no new codes emerged for at least 3 interviews.

Codes were organized into themes using content analysis

to create conceptual themes related to clinician practices surrounding the prescription of oxygen for patients with COPD.¹⁴ Clinician participants did not formally provide feedback on study findings. The Consolidated Criteria for Reporting Qualitative Research (COREQ) was used to guide comprehensive reporting of interviews (Supplement 3 in the online supplement).¹⁵

Results

Eleven PIs from the ACRC who expressed interest in the study were approached regarding participation in the study, with 9 PIs agreeing to participate in the study and recruit additional colleagues. Ultimately, 19 clinicians expressed interest in participating in the study and 18 were consented and completed the interviews (15 physicians and 3 pulmonary nurse practitioners). Among the 15 physicians, 3 were fellows who had completed at least their first year of pulmonary fellowship training. Most participants were men (N=12, 66%) and between the ages of 31 and 50 (N=11, 61%). Participants were closely divided in their years of clinical practice with 6 (N=33%) in practice from 5–10 years, 7 (N=39%) in practice for 10–15 years, and 5 (N=28%) in practice from 15–20 years. Ten participants reported they spent 50% or less of their time in clinical practice and 8 participants said they spent over 50% of their time in clinical practice. The mean length of time of the interviews was 34.4 minutes with a standard deviation of 6.05 minutes.

The kappa for inter-rater reliability of all codes was $K=0.78$, indicating substantial agreement. The percentage of agreement was calculated to be 98.7%.

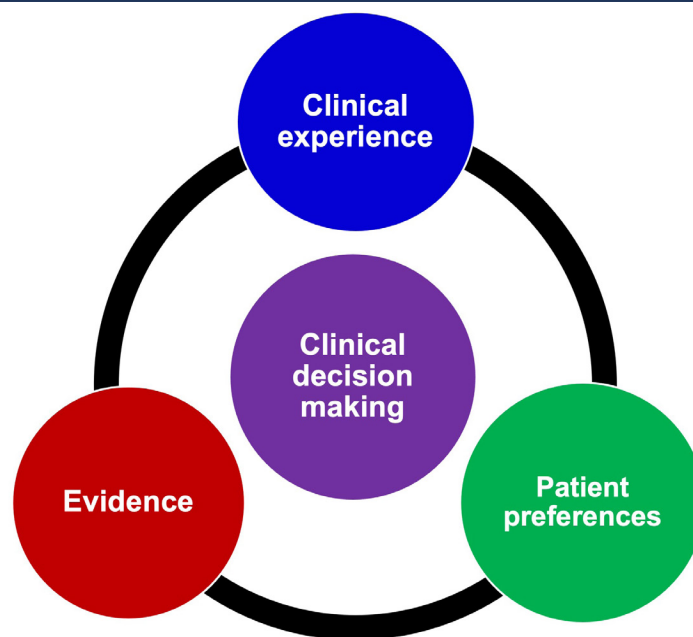
Factors Impacting Clinician Decision-Making

Clinicians expressed several factors which impacted their decision-making surrounding the prescription of home oxygen for patients with COPD. Specifically, clinicians reported that their decisions were impacted by their assessment of research evidence, clinical experience, and patient preferences regarding the use of oxygen (Figure 1).

Evidence

Several clinicians acknowledged that the “evidence base is quite thin” surrounding home oxygen use in patients with COPD, but most noted that the available prior evidence supported prescribing oxygen for patients with COPD who have resting hypoxemia (Table 1). One physician explained that prior to LOTT:

“The recommendation to use [oxygen] that was also with exercise was somewhat of an extrapolation.”

Figure 1. Factors in Clinician Decision-Making Regarding Home Oxygen Use

The LOTT study results led to variability of clinician opinion regarding whether oxygen should be prescribed for patients with COPD who desaturate only with exertion. Some clinicians expressed the strength of evidence supporting the lack of benefit of oxygen use for this patient population. As one physician said:

“The LOTT trial that came out a few years ago is pretty good evidence and a well-designed trial, and so I think it’s evidence that is worthy of adopting into clinical practice.”

Another physician stated:

“Looking at the exertional hypoxemia group, I don’t think the data there is very convincing that there’s a benefit in that population [of oxygen use]. I don’t know that the field has caught up with that.”

Other clinicians recognized that there may be limitations in using a randomized control trial such as LOTT to determine if patients with COPD and desaturation only with exertion should use home oxygen. As one physician said:

“I think this is really an area that one study doesn’t cover...it won’t apply to every single patient, right? Of course, when you do those trials, there are selected populations, probably different from people who we see...it is a case-by-case scenario.”

Additionally, some clinicians acknowledged that their prior clinical experience differed from the results of LOTT, leading them to prescribe home oxygen for patients with COPD who desaturate only with exertion. As one nurse practitioner said:

“Despite the LOTT trial, I have to say that I am very pro-oxygen. I get the primary outcomes didn’t necessarily support its use, but I do find for the majority of patients they feel better, they can do more with supplemental oxygen if they have it with activity, and if they’re using it with sleep, they feel better in the morning.”

Clinicians reported that they used ATS and CMS coverage decisions to help guide their prescription of home oxygen for patients with COPD. Regarding the ATS guidelines, a nurse practitioner explained:

“There’s a high recommendation for prescribing oxygen, but it’s less clear if it’s with activity. That is where it goes case by case.”

Some physicians explained that they use CMS coverage decisions most frequently regarding the prescription of home oxygen because “otherwise we can’t get it covered.”

Clinical Experience

Clinicians considered a number of factors based on their clinical experience that influenced their decision to prescribe home oxygen for patients, including: (1) degree of desaturation, (2) degree of patient symptoms, (3) improvement in patient tolerance to exercise with oxygen, (4) whether the patient was recovering from an exacerbation, and (5) the patient’s additional comorbidities (i.e., if they had underlying pulmonary hypertension) (Table 2). As one physician stated:

“If they’re not symptomatic, I usually don’t get excited about it...knowing the fact that this large study from the NIH did not show any benefit. If

Table 1. Factors in Clinician Decision-Making: Evidence

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| Assessment of Research Evidence | <p>“That evidence coming out...since 2014 when I started training, did change my practice from ‘Everyone gets oxygen’ to ‘Let’s talk about oxygen.’” – C8, Physician</p> <p>“The long-term oxygen therapy trial showed that there was no benefit for people who desaturated who had exertional hypoxemia. And so that is part of what informs my decision making there.” C15, Clinical fellow</p> |
| Limitations to Evidence | <p>“I think that the evidence on exertion, it’s unclear to me yet. ... I do not think that we have a clear understanding whether this is useless or helpful. I think we need to understand better what population could benefit the most in regards to oxygen on exertion.” – C4, Physician</p> <p>“I think like everything, when we’re looking at the average response to certain treatment, we do miss the extremes, or the small groups of patients that may benefit. The evidence is good, but I don’t think it’s something that is completely written in stone, and that those cutoffs are as clear as the literature tries to make us believe.” –C11, Physician</p> |
| Use of Guidelines | <p>“I know that there [are] ATS guidelines I think that came out last year, and the strongest evidence really is for patients with severe resting hypoxemia and are clinically stable. We don’t really know for the patients who are not clinically stable what the benefits are of oxygen, but I know that people tend to prescribe it and that’s sort of the expert recommendation, so I usually go with that.” – C13, Clinical fellow</p> <p>“The ATS came out with a statement on the use of oxygen which really didn’t value the Long-term Oxygen Therapy Trial results. I don’t necessarily agree with those recent recommendations.” – C3, Physician</p> <p>“I follow the Medicare guidelines because most of our patients are on Medicare, and I can’t even get oxygen paid for unless they meet the Medicare requirements.” – C9, Nurse practitioner</p> |

ATS=American Thoracic Society

they’re symptomatic, it’s different. I’m very tempted to prescribe it and try to justify it to the insurance company.”

Patient Preferences

Patient preferences played a large role in clinician decision-making regarding prescription of home oxygen use for patients with COPD (Table 3). Clinicians described a spectrum of patient preferences regarding oxygen, from some patients being interested in oxygen use and others refusing oxygen. As one physician said:

“I think the range is from, ‘by all means, if it’ll help me walk a little bit farther and do a little bit more, I want to get it as soon as possible’ to, ‘there’s no way I would ever use supplemental oxygen, no matter what.’ And then there is everything in-between.”

Some clinicians reported feeling that, “I don’t really need to convince patients; it is either one way or the other” regarding oxygen use as patients had an opinion regarding how they wished to proceed. Other clinicians described working with patients who insisted on oxygen use to try to “craft a plan in terms of, ‘Ok, we’re going to use it, but we’d like to see if this actually is benefiting you in some way or manner.’”

Clinicians reported several patient concerns related to home oxygen use, including association of the need for oxygen with terminal disease, social stigma and interference with one’s job, fear of addiction, cost, and mobility. As one nurse practitioner said:

“It’s something that is a marker of disease severity for a lot of people. They always have somebody in

mind that they know who was on oxygen. And maybe not long before they died, they started oxygen.”

A physician described the stigma of oxygen use:

“I think in COPD in particular, there’s unfortunately some stigma because of the association with tobacco use and even some kind of self-flagellation for you know, having been a smoker and having done this to myself...we all do things to ourselves sometimes that are not the best thing for our physical or mental health.”

Clinicians also described the benefits that patients perceive about oxygen use; specifically, oxygen providing comfort and leading to improved dyspnea or exertional tolerance. As one nurse practitioner said:

“I think people maybe like the thought of a safety net.”

Clinical Decision-Making Regarding the Prescription of Home Oxygen

There were a range of clinical practices described by clinicians surrounding the decision to prescribe home oxygen for patients with COPD, with some clinicians offering oxygen to all patients who qualify and others trying to avoid oxygen use if possible (Table 4). As one nurse practitioner stated:

“I offer it to pretty much everybody. I don’t order it if they’re the ones that say they don’t want it.”

One clinical fellow reported:

“We know that in some scenarios, over-oxygenating people can potentially lead to worse outcomes, and so I tend to favor not using it.”

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Table 2. Factors in Clinician Decision-Making: Clinical Experience

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| <p>Clinical Experience</p> | <p><u>Degree of Desaturation:</u> “When we see hypoxia, it depends on how bad it is to [determine] how eager I would be to initially do it or not, especially if somebody is pretty resistant. If it just barely goes down briefly...or if it’s really mild and if they’re absolutely doing okay, I might just talk with them about, ‘Well, it’s pretty mild, it might benefit, it might not, we have some data that it may actually not,’ and then let them decide.” – C1, Physician</p> <p><u>Degree of Symptoms:</u> “I think it’s more of a judgment about...what their exercise tolerance is and whether supplemental oxygen would be likely to improve that, or if they have secondary pulmonary hypertension, then I’ll probably make a strong case that they should be on oxygen.” – C7, Physician</p> <p><u>Ability to Participate in Exercise:</u> “[Patients] should be encouraged to exercise, and if/when they exercise they do desaturate, and so with either which could be a cause of their exercising less or actually put them at some risk, then I think it’s important to provide them with [oxygen], despite the fact that the evidence isn’t there that there is any improvement in the course of a clinical trial.” – C10, Physician</p> <p><u>Other Comorbidities:</u> “I don’t think it’s such a clear-cut group, in the sense [that] for most patients, there is not a mortality benefit. However, if I find a patient who has bad coronary artery disease, or has had any cardiac issues, or if we see them in pulmonary rehab and they look like they’re exercising and doing better while they’re on oxygen, then we start to have a conversation and see whether those benefits are good enough that the patient is willing to use oxygen, even though there’s no clear mortality benefit.” – C11, Physician</p> <p><u>Whether Recovering from an Exacerbation:</u> “There is some strong evidence in certain scenarios [to prescribe oxygen], but there is not great evidence in other scenarios, particularly I think in those who are recovering from an exacerbation. I’m not sure what an ethical and feasible clinical trial would be in that scenario. I don’t imagine that people are going to be sending people who are hypoxemic home without oxygen and comparing those that were. So, I think that’s an area where we’re really just going to have to extrapolate from the evidence that we do have.” – C13, Clinical fellow</p> |
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Clinicians described the process of prescribing home oxygen for patients with COPD, starting with whom and how to test. Most clinicians emphasized the core components of shared decision-making with patients, including discussing the benefits and risks regarding oxygen use, communicating evidence to patients, and aiming to understand patient goals and preferences for treatment. Information included within these conversations varied and was not based on a shared decision-making tool. Some clinicians acknowledged that they make the decision themselves regarding home oxygen use for patients, rather than having a shared decision-making conversation.

Clinical Practice: Whom and How to Test and Challenges With Testing

Clinicians described variable practices in deciding whom to test among patients with COPD for home oxygen needs. Some clinicians tested every patient with COPD for resting and ambulatory desaturation. Others reported that the patient’s clinical status or pulmonary function testing results determined if the patient should be tested for ambulatory desaturation. As one nurse practitioner said:

“If I have a suspicion that patients are desaturating

with activity, then I order the walk test, or if they complain of excess dyspnea with exertion, I’ll order the walk test.”

Finally, some clinicians described having a conversation with patients to determine patient preference for testing prior to ordering an ambulatory saturation. As one physician said:

“I normally talk with them... ‘Well, your oxygen saturation is a little bit low...and it may actually go down to some level that you might need oxygen, so would you like to be tested?’ Some people [say]... ‘I’m not going to wear it,’ so we don’t do it.”

Clinical practices regarding how to perform testing ranged from clinicians performing walk testing on their own in the clinic, to obtaining formal 6-minute walk testing with pulmonary function testing and an annual arterial blood gas test through the pulmonary function testing laboratory.

Clinicians acknowledged there were challenges in testing patients for home oxygen needs. As one physician said:

“When somebody dips below 88%, they are immediately put on oxygen. It’s not a true walk test to determine a nadir saturation.”

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Table 3. Factors in Clinician Decision-Making: Patient Preferences

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| Patient Preferences | <p>"In my experience, some patients really like using oxygen. They think it helps them breathe better, makes them less short of breath, they can do more. And there are other people who really don't like it, they don't want to use it." – C13, Clinical fellow</p> <p>"The patient preference side really factors in the social stigma with oxygen [and] the derived or perceived salutary benefits of oxygen. Do they feel better with it? There's clearly a patient phenotype that really wants oxygen because they think it helps them, and sometimes there's objective data to support that and sometimes there's objective data to refute that. But there are also patients who you really think, as a provider, it will help them, but they actually have no interest in wearing it for social reasons, maybe cost reasons, associations with progression of disease, etc." – C17, Physician</p> |
| Clinician Perceived Patient Concern: Association of Needing Oxygen With Terminal Disease | <p>"They [ask], 'Am I going to die?' They link oxygen with increased risk of mortality, appropriately. 'Is this it? Is this the end?' They also link oxygen with, 'Oh my God, this is a terminal disease.' These are things that I hear from patients when we start them on oxygen. ... When they come with COPD to my clinic, they don't want to hear that they are needing oxygen, because that's one of the things that they link with end-stage disease." – C2, Physician</p> |
| Clinician Perceived Patient Concern: Social Stigma/ Interference With Job | <p>"I actually have a lot of realtors—that profession, I think it's very presentation [oriented]. So, a lot of them tell me like, 'I can't do my job, I can't show a home, if I'm wearing this big tank or I'm having this cloud-pulsed machine.' And so, they just refuse to do it. Then there's some people who work in a kitchen, or waitresses, or this or that, and they're just like, 'It's just not going to work for me.'"</p> <p>– C18, Nurse practitioner</p> <p>"Answers that people might give... One is, 'it's too embarrassing to be seen in public with oxygen.' And particularly if they're working, they don't want their work colleagues to think that they're sick or there may be professional reasons why they don't want to give the appearance of being sick." – C7, Physician</p> |
| Clinician Perceived Patient Concern: Fear of Addiction | <p>"They think that they'll become addicted to it. I hear that a lot, the words 'addicted to oxygen.' They assume that they'll start oxygen and it'll be the addiction [that makes it so] they can't ever get off of it again, not realizing that it's the progression of their lung disease that's made them have this new requirement. That's a big conversation to have." – C9, Nurse practitioner</p> <p>"They'll want to know if they [can] become addicted to oxygen. That's a common question I hear." – C7, Physician</p> |
| Clinician Perceived Patient Concern: Cost | <p>"A lot of people have questions about their insurance coverage. 'Who's going to pay for this? How much is it going to cost?' That's something that comes up frequently." – C11, Physician</p> |
| Clinician Perceived Patient Concern: Mobility | <p>"People don't want to have oxygen because they see these huge canisters that are not really portable or easy to take around, especially [for] somebody that's already hypoxemic and already having shortness of breath... I don't understand why it's so challenging to get a device for oxygen that is reasonable for a 75-year-old cachectic COPD patient to carry around." – C12, Clinical fellow</p> <p>"They all see the Inogen commercials, and they all want an Inogen. Then we have to go through a big conversation about Medicare not paying for that, and they can't understand why Medicare won't." – C9, Nurse practitioner</p> |
| Clinician Perceived Patient Concern: Inconvenience | <p>"Some people do not want oxygen... it's inconvenient. Trying to interface with home health agencies, getting the equipment services stuff, it's an extra hassle for them." – C5, Physician</p> |
| Clinician Perceived Patient Benefit: Oxygen as Comfort | <p>"Some people it's like they want that O2... [It's a] comfort thing for them to have that oxygen." – C16, Nurse practitioner</p> <p>"I think it's very reassuring to them. Because I think there's a sort of attitude and perception that we all need oxygen, which is true." – C13, Clinical fellow</p> |
| Clinician Perceived Patient Benefit: Improved Dyspnea/ Exertional Tolerance | <p>"Some people really want oxygen, because they feel like this is it—this is what's going to get them up and going. And it's true, it may help them with exercise." – C2, Physician</p> |

Clinicians also reported that the devices patients use at home are often different than those used for home oxygen testing in clinics.

Clinicians discussed the benefits of oxygen use with patients with COPD including possible improvement in exercise tolerance and prevention of complications for specific patients (i.e., those who desaturate with rest or underlying pulmonary hypertension). One nurse practitioner said she counsels patients by saying:

"Oxygen may make it easier to do your day-to-day activities...you may be able to go further and feel better with supplemental oxygen."

Some clinicians stated that discussion of oxygen use benefits with patients can be challenging because, "...it's hard to

say, 'well, you'll feel better,' because they don't necessary feel better."

Clinicians discussed risks of oxygen use with patients, including cost, inconvenience, impaired mobility, and the risk of fire and burns if the patient continues to smoke while using oxygen. As one physician said:

"The big three that I talk about are costs, tripping, and burns. Cost is real – patients often, especially those who want to remain mobile, end up having to pay out of pocket for a portable oxygen concentrator. We talk about the tripping hazard, especially those who are in the house with longer chords. And then, unfortunately, many of my patients continue to smoke despite having chronic lung disease."

Table 4. Clinical Decision-Making Regarding the Prescription of Home Oxygen

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| Clinical Practice: Deciding on Supplemental Oxygen | <p>"I still prescribe them oxygen for activity and usually I tell them to wear it...at nighttime if they need it with activity." – C12, Clinical fellow</p> <p>"We're not prescribing oxygen to everyone with oxygen desaturation on exercise. I have done it...[but] unless they're symptomatic, I don't usually prescribe oxygen." – C2, Physician</p> <p>"[I] would probably initiate a discussion with the patient where I would get a sense of, 'are they short of breath when they walk...how much oxygen would be a burden to them'? I would not be opposed to start[ing] oxygen [for] that patient if the patient perceived benefit. We'd give it a trial, and if it became too burdensome we'd probably stop it. But...I wouldn't automatically sort of push for oxygen in that patient." – C5, Physician</p> |
| Clinical Practice: Deciding Whom to Test | <p>"If I think they're borderline, either based on kind of middling resting oxygen saturations or a low DLCO on recent PFTs, I would have them get ambulatory stats." – C15, Clinical fellow</p> <p>"If...I saw a patient in clinic and they expressed exertional breathlessness—commonly we use the CAT score—and if I see on there, they've rated it high for exertional breathlessness and if their saturation when they're checked in is borderline—89, 90, 91—I kind of talk about, 'Have you thought about using supplemental oxygen? Should we test to see if you might need it?'" – C18, Nurse practitioner</p> |
| Clinical Practice: How to Test | <p>"At least once a year, they get full pulmonary function tests, including arterial blood gas, and then there is a 6-minute walk test... And during the 6-minute walk test if the patient desaturates or is desaturating from the get-go [then I would consider prescribing oxygen]. This is done by our pulmonary function tests laboratory." – C11, Physician</p> <p>"It's usually me... I just walk them. I would get obviously a baseline heart rate and the saturation and then start walking them, and then if their O2 starts to decrease... just titrate it up and until the patient stays above like 88%" – C16, Nurse practitioner</p> |
| Clinical Practice: Challenges in Testing | <p>"One of the things that I find the most challenging in clinic is, we do all these titrations, measurements and so on. And then the devices are very different to what people use at home." – C11, Physician</p> <p>"I don't think [6-minute walk tests] are realistic...because most patients don't walk as fast as they can." – C10, Physician</p> |
| Benefits of Oxygen Use | <p>"If they have secondary pulmonary hypertension, then it's easier to make a strong case that they would benefit from it, but if they don't have secondary pulmonary hypertension, it would be primarily about improving their exercise performance and ability to walk outside and do things." – C7, Physician</p> <p>"We move on to talking to them and discussing that it may improve the amount of exercise that you can do. By improving the amount of exercise that you can do, it may make you feel better overall. If a patient is having all sorts of cardiac issues, perhaps potentially, they may experience some benefit from it as well." – C11, Physician</p> |
| Risks of Oxygen Use | <p>"Most of the time, I do talk about the inconvenience [of carrying] around [oxygen]. And then probably, mostly about if they're a heavy smoker, [I] talk about people who can get burns and fire and things like that." – C1, Physician</p> <p>"I think the biggest one is to not smoke with the oxygen on and/or be around flames. And one that I should discuss more is when they have the long tubing, just the like physical risk of tripping and falling. I don't really actually discuss that. I think I really just talk about the combustibility" – C12, Clinical fellow</p> |
| Counseling: Communicating Evidence to Patients | <p>"I talk about, you know, that in some patients they feel like they can do more. It's not clear that, or there's no evidence that, it really helped you to necessarily live longer. You know, and so we sort of talk about what's important and try to figure out from the patients, if for the exertional isolated exertional, do they feel better when they're on oxygen or not? Because if they don't feel better, I'm not convinced they're going to live longer. So, I'm not really sure that there's a strong, compelling rationale for it." – C17, Physician</p> |
| Counseling: Understanding Patient Values | <p>"My approach is always, like I said, I'll tell them, 'This is what I know, this is the medicine, this is the evidence, this is the data, how will this fit into your life? What do you think about this?' I like giving people options too. Because, I could say, 'This is what I recommend, but you don't have to do that, you could also do this, even though I don't think that's the best thing.' But it's pretty common for patients to have a difference in opinion than I do about what's best for them and their life. And I just don't think I'm in a position to ever, like, tell somebody what's best for them, they have to tell me what's best for them, I have to tell them, 'This is the medical side of things. This is what is best for your health but it's really up to you whether or not you want [oxygen] and you can do that.'" – C13, Clinical fellow</p> |
| Physician Makes the Decision for Patients | <p>"I still prescribe them oxygen for activity and usually I tell them to wear it...at nighttime if they need it with activity." – C12, Clinical fellow</p> <p>"I usually like to measure their resting and exercise oxygenation, so [I] usually do a 6-minute walk test, and then if the saturation is less than 88% on room air, then I usually prescribe oxygen." – C2, Physician</p> |

DLCO=diffusing capacity for carbon monoxide; PFT=pulmonary function test; CAT=COPD Assessment Test

Counseling: Communicating Evidence and Understanding Patient Values

Some clinicians described communicating evidence to patients to help them make an informed decision regarding home oxygen use. Notably, no clinicians reported using a shared decision-making tool to assist with this conversation. One physician reported that they:

"...reviewed previous studies looking at the treatment of COPD-associated hypoxemia [with patients]. And that there is no sort of proven long-term benefits for using oxygen only with exertion."

Several clinicians emphasized the importance of understanding what is important to patients in helping them determine whether to pursue home oxygen therapy. As a

physician said:

“The purpose of us having this consultation is to try to help you achieve the goals you have for yourself. If your goal is to be able to go out and play with your dog, or take your kids to the zoo, or just to do your grocery shopping without help...we’re going to try to help you achieve that goal. And if oxygen is part of that plan, then great. And if it’s not, or if you really don’t want it, let’s talk about the reasons that you have for not wanting to do this.”

One clinical fellow did explain:

“It makes it easier when there’s not a clear best opinion in that whatever they’re most comfortable with, then it’s fine to support them doing.”

Finally, some clinicians acknowledged that they primarily made the decision for patients regarding home oxygen use, and that there could be improvement to their shared decision-making conversation with the patient. As one physician said:

“It’s a shared decision. But when we prescribe oxygen, we often don’t do that. It’s a one-way highway. We just tell them, ‘Ok, here you go, this is what you need.’”

Discussion

We aimed to investigate clinician practice patterns surrounding the prescription of home oxygen for patients with COPD. Our results suggest there are several factors which contribute to a clinician’s decision to prescribe home oxygen for patients with COPD, including research evidence, clinical experience, and patient preferences regarding oxygen use. These factors influenced clinical decision-making for clinicians differently, with some clinicians offering oxygen to most patients, and others trying to avoid prescribing home oxygen if possible. Most clinicians described a shared decision-making process for prescribing home oxygen for patients, including discussion of risks and benefits and developing an understanding of patient preferences and values. Information included within these shared decision-making conversations was variable and not based on a structured shared decision-making tool.

This study contributes to the literature by developing a better understanding of the approach clinicians use when deciding whether to prescribe home oxygen for patients with COPD. The themes highlighted by clinicians within our study as being influential to their decision-making – research evidence, clinical experience, and patient preference – align well with the framework of evidence-based medicine. The practice of evidence-based medicine involves integrating individual clinical expertise, which incorporates patient rights and preferences regarding care, with the best available

external clinical evidence.¹⁶

There was variability in clinician practices in the decision to prescribe home oxygen for patients with COPD. We suspect this variability largely reflects clinicians weighing patient preferences highly within their decision-making process, as a form of patient-centered care. Notably, this variability is reflective of the uncertainty that exists in clinical practice guidelines, with ATS guidelines providing a conditional recommendation for ambulatory oxygen and the GOLD guidelines recommending against routine prescription for ambulatory oxygen.^{5,8} There was also variability in whom and how clinicians performed testing to assess for the need for home oxygen, which we suspect was largely driven by a lack of high-quality evidence in this area.

Additionally, clinicians within our study highlighted the need for shared decision-making prior to prescribing home oxygen for patients with COPD and isolated exertional desaturation, in concordance with the 2020 ATS guidelines emphasizing the need for shared decision-making with this patient group.⁵ Shared decision-making is “an approach where clinicians and patients share the best available evidence when faced with the task of making decisions, and where patients are supported to consider options, to achieve informed preferences.”¹⁷ Within shared decision-making, patients are encouraged to consider the likely benefits and harms of screening, treatment, or management options to select the best course of action.¹⁸ The 2023 GOLD strategy report, released after the completion of these interviews, similarly recommends taking individual patient factors into account when evaluating a patient’s need for supplemental oxygen with COPD patients who desaturate only with exertion.⁸

Shared decision-making is considered the pinnacle of patient-centered care¹⁹ and an ethical imperative in clinical medicine today.²⁰ It has been shown to improve the quality of patient-physician communication, improve the overall satisfaction of patients and physicians, and increase adherence to the treatment regimen selected.²¹ Clinical decision support tools or decision aids can play an important role in shared decision-making by helping to provide evidence-based information to patients and helping patients clarify their values.²² Patient decision aids have been shown to increase patient involvement, improve the accuracy of participants’ perceptions of their risks, decrease decisional conflict, and lead to value-based care decisions.²³

Shared decision-making has been used in several clinical scenarios related to COPD, including inhaler choice,²⁴ referral to pulmonary rehabilitation,²⁵ and the decision to perform a lung cancer screening. A recent systematic review suggests that shared decision-making tools for lung cancer screenings may improve knowledge and reduce decisional conflict, while being acceptable to patients and providers.²⁶ However, to our knowledge, there are no published shared

decision-making tools that could inform discussions between patients and their providers about the use of home oxygen. Development of a shared decision-making tool to help support patients and physicians regarding home oxygen use may be the next step to improve shared decision-making regarding home oxygen in patients with COPD.

There were limitations to the study. The study included a small number of participants, but thematic saturation was reached with no new codes emerging for at least 3 interviews. Potential sampling bias may exist, as clinicians who were enrolled were affiliated with an obstructive lung disease clinical trials network, and were primarily academic clinicians, with half of participants spending 25% or less of their time in clinical practice. The results of the study might be different in the setting of community pulmonologists, who spend a larger percentage of their time seeing patients clinically. Additionally, most of the clinicians interviewed for this study were pulmonary physicians. Thus, the sample population may limit generalizability of these findings to other populations caring for patients with COPD, including non-physician practitioners, primary care providers, and non-academic clinicians. Finally, this study focused on clinician factors regarding home oxygen use but does not include the perspectives of patients regarding home oxygen use, which have been described previously.¹¹

In conclusion, a number of factors including research evidence, clinical experience, and patient preference may impact clinicians in deciding whether or not to prescribe home oxygen for patients with COPD. A shared decision-making tool could facilitate discussions between providers and patients about the home use of oxygen.

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Declaration of Interest

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