Q: Which patients with chronic obstructive pulmonary disease (COPD) benefit most from long-term oxygen therapy?

A: Long-term oxygen therapy (LTOT) improves both the length and quality of life of hypoxemic patients with COPD.\textsuperscript{1,2} It is the only therapy that clearly increases survival for selected patients with advanced stable COPD.\textsuperscript{1}

LTOT is prescribed both for patients with exacerbations of COPD and for those with advanced disease.

**Exacerbations of COPD.** LTOT may be prescribed for hypoxemic patients at discharge from the hospital following an acute exacerbation. Hypoxemia is defined as a resting arterial oxygen saturation ($\text{SaO}_2$) of 88% or less, which corresponds to a partial pressure of arterial oxygen ($\text{PaO}_2$) of 55 mm Hg or less. Many hypoxemic patients recover sufficient lung function so as not to need oxygen for physiologic indications. After about 60 to 90 days of LTOT, retest these patients once they have not received oxygen for 20 minutes to determine if significant hypoxemia is still present. In many patients, LTOT can be discontinued if normoxia is found with pulse oximetry or, better yet, arterial blood gas analysis.

**Advanced disease.** The second group of candidates for LTOT are those with stable advanced COPD characterized by compelling symptoms, such as dyspnea on exertion, evidence of right-sided heart failure, or morning headache.\textsuperscript{3,4} These patients are typically being treated with a maintenance regimen of inhaled bronchodilators (anticholinergics, $\beta$-agonists, or both); theophylline when appropriate; and, often, inhaled corticosteroids. Patients with an $\text{SaO}_2$ of 88% or less and a $\text{PaO}_2$ of 55 mm Hg or less qualify for third-party reimbursement (Table). Reimbursement is also allowed for an $\text{SaO}_2$ as high as 89% if a patient has secondary polycythemia with a hematocrit of 55% or more or clinical signs of cor pulmonale (verified on chest radiography and ECG).

**Table — Indications for long-term oxygen therapy (standard reimbursement criteria)**

<table>
<thead>
<tr>
<th>Obligatory</th>
<th>For a patient who has been treated with an optimal medical regimen for at least 30 days* and whose values are $\text{PaO}_2 = 55 - 59$ mm Hg or $\text{SaO}_2 = 88%$.†</th>
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<td>For a patient with cor pulmonale or erythrocytosis (hematocrit &gt; 55%) whose values are</td>
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\*For patients with exacerbations of COPD. \textsuperscript{1,2} 

†For patients with advanced disease. \textsuperscript{3,4}
Once a patient with chronic stable COPD requires oxygen, he or she will need it for life. There is no need to retest for hypoxemia after LTOT has been administered for months. Because oxygen is a potent bronchodilator and vasodilator, it has a restorative effect in some patients. Thus, if LTOT improves ventilation/perfusion matching, room-air PaO$_2$ may rise. It is as inappropriate to withhold oxygen from patients with this successful outcome as it would be to withhold insulin from a patient with diabetes after blood glucose is controlled or to withhold systemic antihypertensives after serious hypertension is controlled.

### JUDGING THE NEED FOR LTOT

Should all patients with a PaO$_2$ of 55 mm Hg or less or an SaO$_2$ of 88% or less be treated with LTOT? Absolutely not! If this were the norm, virtually the entire population of Leadville, Colo (at an altitude of 10,000 ft), for example, would qualify. Persons with normal cardiovascular and respiratory function can compensate for moderate and even severe hypoxemia—witness those who climb the Himalayas. Patients with compromised respiratory or cardiovascular functions often cannot compensate.

Many patients and their physicians believe that the purpose of LTOT is to reduce dyspnea on exertion. Although dyspnea may diminish following a period of pulmonary rehabilitation during which oxygen may be used, oxygen alone has little effect on dyspnea. This is because dyspnea is associated with altered pulmonary mechanics and the increased work of breathing, not the hypoxemic state.

The best way to judge the need for LTOT is to interpret the physiologic abnormalities in the context of the patient's symptoms, quality of life, and evidence of end-organ dysfunction. My view is that the criteria for LTOT are too restrictive, but I have never been able to convince third-party payers of this. In ambulatory patients, continuous oxygen from a portable liquid system has been associated with lower mortality than oxygen used for shorter periods (such as nocturnally) from a stationary system.$^1$

### References:

1. Nocturnal Oxygen Therapy Trial Group. Continuous or nocturnal oxygen therapy in hypoxemic

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