

# Appropriateness of Domiciliary Oxygen Delivery

## EV TİPİ OKSİJEN SİSTEMLERİNİN UYGUNLUĞU

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### Summary

**Background:** Long term oxygen therapy (LTOT) has an important place in the treatment of chronic obstructive pulmonary disease (COPD).

**Objective:** The aim of the study was to investigate characteristics of five hundreded patients receiving LTOT.

**Setting:** The chest disease department at the Atatürk Chest Disease and Surgery Centre, Ankara, TURKEY.

**Results:** Four hundreded ten patients were male and ninety patients were female. Four hundred thirty patients had COPD and/or corpulmonale (CP), 45 had sequel of pulmonary tuberculosis, 36 had bronchiectasis, 26 had pulmonary malignancy, 20 had diffuse interstitial fibrosis, 8 had destroid lung, 7 had kyphoscoliosis. All patients were evaluated with respect to arterial blood gases analysis (ABG), hematocrit, chest radiography and length of hospitalization. The most commonly prescribed O<sub>2</sub> system were oxygen concentrator (53%), compressed gas cylinder (45.2%), liquid oxygen reservoir (1.8%).

**Conclusion:** Our results showed that the characteristics of 90.2 % were compatible with LTOT indication criteria of ERS and ATS

**Key Words:** Chronic obstructive pulmonary disease, Long term oxygen therapy, Delivery oxygen system

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The role of LTOT in hypoxemia in patients with chronic COPD is well established. Long-term oxygen therapy is the only intervention known to increase life expectancy in such patients (1,2).

Specific benefits include amelioration of corpulmonale, enhancement of cardiac function, increased body weight, reversal of polycythemia, improved neuropsychiatric function and exercise performance, reduced pulmonary hypertension, improved skeletal-muscle metabolism, and

### Özet

Uzun süreli oksijen tedavisi (USOT) kronik obstruktif akciğer hastalıklarının tedavisinde önemli yer tutar.

**Amaç:** Uzun süreli oksijen tedavisi verilen 500 hastanın özelliklerinin retrospektif olarak araştırılması

**Çalışmanın yapıldığı yer:** Atatürk göğüs hastalıkları ve Göğüs Cerrahisi Merkezi-Ankara

**Bulgular:** Çalışmaya alınan hastalardan 410'u erkek (82%) olup, ortalama yaş, erkeklerde 58±11 ve kadınlarda ise 60±13 idi. Hastaların 430'u KOAH ve/veya corpulmonale, 45'i tüberküloz sekeli, 36'sı bronşektazi, 26'sı akciğer kanseri, 20'si diffüz interstisyel fibrozis, 8'i destroid akciğer, 7'si kifoskolyozdu. Bütün hastaların arterial kan gazları, hematokrit değerleri, akciğer grafileri ve hastanede kalış süreleri değerlendirildi. Sıklık sırasına göre reçete edilen oksijen sistemleri, oksijen konsantratörü (%53), oksijen tüpü (%45.2), likid oksijen (%1.8) olarak saptandı.

**Sonuçlar:** Uzun süreli oksijen tedavisi verilen 500 hastada %90.2 oranında American Thoracic Society ve European Thoracic Society' nin LTOT kriterlerine uyulduğu saptandı.

**Anahtar Kelimeler:** Uzun süreli oksijen tedavisi, KOAH, Oksijen sistemleri

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possible reversal of sexual importance. In addition, use of ambulatory oxygen therapy reduces the need for hospitalization (1-3).

In Turkey, government and private insurance systems provide coverage for domiciliary oxygen in eligible patients. This study's results are of importance to any health-delivery system that includes the provision of domiciliary oxygen.

For this reason, this study was designed with the following purposes;!) to reviw demographic

data of 500 patients begun to LTOT between 1995 and 1999 years 2) to investigate correspondence with American Thoracic Society (ATS) and European Respiratory Society (ERS) criteria, and 3) to reveal prescription for delivery oxygen systems.

### Patients and Methods

The study was conducted in the Ankara, the Middle East region of Turkey. Atatiirk Chest Disease and Surgery Center is a teaching hospital providing secondary and tertiary care for the population.

In this study the clinical features of 500 patients prescribed LTOT between 1995 and 1999 were reviewed retrospectively.

Patients were evaluated with regard to sex, age, disease, arterial blood gases analyses (ABG), chest radiography, and pulmonary function tests (PFT). The data of the patients were evaluated for correspondance with ATS, and ERS LTOT criteria.

ATS, LTOT indication includes the following; 1) Arterial  $P_{O_2} < 55\%$  mmHg or saturated  $O_2 < 88\%$  mmHg, 2) Arterial  $P_{O_2}$  56-59 mmHg or saturated  $P_{O_2}$  89% with either one of the following; evidence of cor pulmonale by electrocardiogram, erythrocyte (hematocrit  $> 56\%$ ) or arterial  $PO_2 < 60$  mmHg or  $SaO_2 > 90\%$  compelling medical justification.

Requirements; Optimal medical management before certification for long term oxygen therapy.

Mesurement of a arterial blood gases or arterial oxygen saturation by qualified laboratory.

Completion of a form by the physician or an employers of the physician with physician's signature (4).

ERS LTOT criteria; stable ambulatory patients should meet these criteria after being on optimal treatment regimes for at least 30 days. This treatment is indicated in patients whose resting arterial  $P_{O_2}$  level is between 56 and 59 mm Hg. LTOT is indicated if they demonstrated erythrocytosis (hematocrit 55% or more) or evidence of cor pulmonale (5).

### Results

The registration records of all of the 500 patients were reviewed retrospectively. They were mostly male (82%). The mean age was  $58 \pm 11$  for males and  $60 \pm 13$  for females. The principle cause of respiratory failure was COPD and/or CP.

All patients underwent chest xRay, ECG, hematocrit, and PFT. Out of 500 patients, 467 (93.4%) underwent ABG analysis and 46 (9.1%) were applied echocardiography. The mean  $PO_2$  value was  $52.2 \pm 14.8$  mm Hg and  $PCO_2$  was  $50.8 \pm 12$  mm Hg. Three hundred forty-seven of these 476 patients were found to have  $PCO_2$  value over 45 mm Hg and mean htc value was  $53 \pm 8\%$ . The patients' demographic and physiologic data were given in Table 1.

Forty-six (9.2%) were prescribed LTOT on an out-patient basis. The mean lenght of the hospital stay for in- patients was  $36 \pm 9$  days.

The most commonly prescribed oxygen delivery device was mostly oxygen concentrators. The prescribed oxygen delivery device were shown Table 2.

**Table 1.** Patients characteristics

Male	410(82%)
Female	90(18%)
Mean age	
Male	$58 \pm 11$ (26-82)
Female	$60 \pm 13$ (35-79)
FEV <sub>1</sub> %	$35.4 \pm 19.1$
FVC%	$42.7 \pm 4.3$
FEF 25-75%	$52.2 \pm 4.1$
ABG results	
Mean $PO_2$ mmHg	$52.2 \pm 14.8$
$P_{O_2} < 55$ mmHg	341(73%)
Mean $PCO_2$ mmHg	$50.8 \pm 12.1$
$PCO_2 > 45$ mmHg	347 (74.5%)

**Table 2.** Prescribed oxygen device system

$O_2$ concentrator:	265 (53%)
Gas cylinder:	226 (45.2%)
Liquid $O_2$ :	9(1.8%)

### Conclusion

Several studies have shown that LTOT extends life in hypoxemic COPD patients and the 24 hour regime is more beneficial than the 12 hour regime. Other benefits of LTOT are reduction in hematocrit, modest neurophysiologic improvement and same improvement in pulmonary hemodynamics. Oxygen therapy may also improve dyspnea and exercise capacity by reducing airway resistance.

In this study the principle causes of respiratory failure were COPD and/or CP, bronchiectasis, sequel of tuberculosis, and diffuse interstitial fibrosis. Apart from patient with COPD, others, prescribed LTOT have hypoxemia. And recent studies show that patients with comparable levels of hypoxemia as a result of nonobstructive lung disease or chronic heart failure are also likely to live longer if they receive continuous oxygen therapy (6).

From reviewed record, it was found that three hundred forty-one (73%) of the 467 patients had  $PO_2 < 55$  mmHg, 87 (18.6%) were  $PO_2$  55-59 and 38 (8.3%) were  $60 >$  mmHg. This results show that  $PO_2 < 55$  mmHg, breathing room air at rest, is the first criteria on prescribed LTOT. Also, according to the Association Nationale Pour le Traitement a Domicile de l' Insuffisance Respiratoire (ANTADIR) network, the patients prescribed home-oxygen with arterial oxygen tension  $> 60$  mmHg, were shown to have severe COPD on the basis of spirometry and their survival was similar to that of more hypoxemic patients (7).

Smoking is most important etiologic and prognostic factor in COPD and smoking cessation is first step of COPD treatment. Before being prescribed LTOT, patients should quit smoking. This study was done retrospectively and smoking status was not recorded in patients' files. Therefore we had no information on patients' smoking habits.

Supplemental oxygen for use in the home is supplied by three types of satisfactory source; oxygen concentrators, compressed gas cylinders, and liquid oxygen reservoirs. In this study prescribed oxygen source was; oxygen

concentrators 265 (53%), oxygen tubes 226 (45.2%), liquid oxygens 9 (1.8%) (Table 2). As its cost lower than concentrator, oxygen tubes were prescribed to patients who have not social insurance. For this reason, in our study, percentage of oxygen tube is nearly to oxygen concentrator. These results are correspondent with previous studies (8).

In this study, discordant LTOT criteria was found only 9.8%, which ANTADIR network were shown  $PO_2$  was  $> 60$  mmHg in 18% patients (7). Erdem's study, including 174 patients, was shown that characteristics of 2.8% patients were not compatible with LTOT criteria (9). In the UK, it has been shown that compliance with guidelines is often weak. Twenty seven of 61 patients fulfilled official criteria for the LTOT at the time of prescription therapy (10). Only 54% of the patients had basal arterial oxygen saturations of  $< 90\%$  in Waterhouse's study, and only 14 % had all of the relative criteria for the prescription of LTOT in the study of Marrison et al. (11,12).

Levi-Valensi found that 30% of patients meeting criteria for domiciliary oxygen after 1 month of apparent stability no longer met the same criteria after an additional 3 months of observation (13). Similar study was performed by Guyatt et al. They reported that 40.5% of patients receiving home oxygen neither met the criteria for home oxygen nor any criteria that strongly mandate domiciliary oxygen use. Also they found not only a high rate of inappropriate oxygen use, but an unstandardized approach to determining oxygen flow rates.

Eaton reported that only 71% of the patients prescribed home-oxygen therapy met LTOT criteria after discharge from hospital (14). A significant proportion of these patients did not subsequently fulfill criteria for LTOT. They suggested that further prospective studies are required in order to develop evidence-based guidelines.

Turkey has not extensive systems to follow-up patients prescribed LTOT, so we have no information about neither these patients meet the

LTOT criteria after discharge from hospital, nor the rate of appropriate oxygen flow use.

In conclusion; the current guidelines may need revision and prospective studies on the effect of long term oxygen therapy in these patients are needed.

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