Original Article

Preliminary study of the effect of outpatient oxygen therapy on patients with chronic respiratory insufficiency receiving home oxygen therapy

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Background: Chronic respiratory insufficiency is mainly the result of ventilatory dysfunction due to various causes, which results in decreased respiratory function. The most important cause of chronic respiratory insufficiency is chronic obstructive pulmonary disease, which has a high incidence and places a great burden on families and society. Therefore, it is important to find an effective treatment for this disease.

Methods: This study was a retrospective self-controlled study. Thirty-eight patients receiving home oxygen therapy who visited the outpatient oxygen therapy clinic from November 2020 to August 2021 were selected. After a comprehensive and systematic diagnosis and treatment, home oxygen therapy as standardized, and 38 patients were followed up for 6 months. Oxygen therapy compliance, the average daily oxygen therapy duration, arterial blood gas analysis, activities of daily living (ADL), and modified Medical Research Council Dyspnea Scale (mMRC) scores before and 6 months after outpatient oxygen therapy intervention were compared. The number of hospital visits for acute exacerbation of chronic respiratory insufficiency and the medical costs incurred within 6 months before and after the outpatient oxygen therapy intervention were also compared.

Results: After 6 months of outpatient oxygen therapy intervention, the compliance with oxygen therapy was significantly improved, the average daily oxygen therapy duration was significantly prolonged, the oxygen saturation (SaO_2) and partial pressure of oxygen (PaO_2) values were significantly increased, and the mMRC score was significantly decreased ($P<0.05$), while the differences in the ADL scores were not statistically significant ($P>0.05$). The number of hospital visits and the medical expenses due to acute exacerbation of chronic respiratory insufficiency within 6 months after the outpatient oxygen therapy intervention were significantly lower than those in the 6 months before the intervention ($P<0.05$).

Conclusions: As a relatively new clinical service in China, outpatient oxygen therapy can improve the efficacy of home oxygen therapy for patients with chronic respiratory insufficiency through patient assessment, personalized selection of oxygen therapy equipment, and standardization of the implementation of home oxygen therapy. It provides an economically valuable treatment.

Keywords: Outpatient oxygen therapy; chronic respiratory insufficiency; home oxygen therapy; oxygen therapy compliance

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Introduction

The main cause of chronic respiratory insufficiency is the irreversible pathomorphological changes and dysfunction of ventilation disorder, which leads to asthma, limited movement, and low daily life activities and cannot be completely cured. Hypoxia can cause many organogenesis disorders, therefore, drug therapy, oxygen therapy, physical therapy and other symptomatic therapies must be carried out uninterrupted for a long time. In addition, standardized diagnosis and treatment processes have also become important in diagnosis and treatment, follow-up, and efficacy evaluation. Outpatient oxygen therapy is a professional hospital service for patients requiring oxygen therapy. Standardized pulmonary rehabilitation procedures and provide detailed oxygen therapy programs to improve lung function.

The number of patients with chronic respiratory insufficiency in China is increasing, and chronic obstructive pulmonary disease has risen to become the third leading cause of death in China (1). As an important element of out-of-hospital treatment for severe chronic respiratory insufficiency, home oxygen therapy is gaining increasing attention. After nearly 40 years of development, developed Western countries have established a complete home oxygen therapy system. Taking France as an example, its home oxygen therapy system consists of hospital specialists, community general practitioners, family treatment institutions, and medical insurance providers (2,3). Home oxygen therapy in China started late, and there is no unified home oxygen therapy standard, nor is there a department or system to manage the implementation of home oxygen therapy. To promote the development of home oxygen therapy in the Suzhou area, our research group implemented the "Establishment, Promotion and Application of a Home Oxygen Therapy System in Suzhou" project in 2018. According to the implementation of the project and actual needs, the Outpatient Oxygen Therapy and Post-Intensive Care Unit (ICU) Service (hereinafter referred to as the Outpatient Oxygen Therapy Service) was opened in November 2020 as part of the Three-in-One Oxygen Therapy System. The outpatient oxygen therapy service includes (I) a clinical unit; (II) a respiratory status detection unit; and (III) an oxygen therapy and respiratory support experience unit. Among them, the home oxygen therapy program (see Figure S1 for details) and the specific procedures for each part of the service were developed with reference to the international home oxygen therapy guidelines (4,5), and a home oxygen therapy database was established. Importantly, standardized outpatient oxygen therapy can reduce breathing difficulties, enhance the tolerance of exercise, improve the patient's mental and psychological state. It also plays an important therapeutic role in the improvement of patient pulmonary hemodynamics, sleep quality and respiratory function and chronic pulmonary insufficiency. Whether its role on patients with chronic respiratory insufficiency also has certain clinical significance and therapeutic economic value is worth further exploration

To evaluate the effect of outpatient oxygen therapy on the efficacy of home oxygen therapy, we selected patients with chronic respiratory insufficiency who were treated at the outpatient oxygen therapy service of our hospital and compared the difference in the effects of oxygen therapy before and after standardized diagnosis and treatment were provided at the outpatient oxygen therapy service. The aim of this study was to explore the clinical significance of the outpatient oxygen therapy service and determine its socioeconomic value. We present the following article in accordance with the STROBE reporting checklist (available at https://apm.amegroups.com/article/view/10.21037/apm-21-3745/rc).

Methods

General information

This study was a retrospective self-controlled study. Patients with chronic respiratory insufficiency (6) who were receiving home oxygen therapy and visited the outpatient oxygen therapy service from November 2020 to August 2021 were selected.

All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee of the Second Affiliated Hospital of Soochow University (approval number: JD-HG-2021-43). Individual consent for this retrospective analysis was waived. Inclusion criteria: (I) Indications for long-term oxygen therapy: (i) partial pressure of oxygen (PaO_2) ≤55 mmHg or arterial oxygen saturation (SaO_2) ≤88%; (ii) PaO_2 of 55–60 mmHg or SaO_2 <89% combined with pulmonary arterial hypertension, edema caused by heart failure, or polycythemia (hematocrit >0.55); (iii) Transcutaneous oxygen saturation (SPO_2) ≥90%, but SPO_2 <90% during exercise or sleep. (II) Visiting the outpatient oxygen therapy service, undergoing the standardization of long-term home oxygen therapy, and participating in regular follow-up. (III)

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Having received home oxygen therapy for ≥6 months.

Exclusion criteria: (I) no previous home oxygen therapy or a previous oxygen therapy duration <6 months. (II) Outpatient oxygen therapy follow-up <6 months or loss to follow-up. (III) Patients with severe chronic respiratory failure requiring long-term noninvasive mechanical ventilation. (IV) Patients with severe heart, liver, and kidney diseases.

Treatment methods

The outpatient oxygen therapy process includes five steps, i.e., medical history evaluation, indicator testing, equipment experience, oxygen therapy prescription, and regular follow-up. The details are as follows: (I) medical history evaluation: The patient was treated by the attending physician. His or her medical history was collected, and a physical examination was performed to preliminarily assess whether the patient had indications for oxygen therapy or respiratory support. The nurse in charge recorded the patient's previous oxygen therapy status, and an oxygen therapy compliance questionnaire (7), the Activities of Daily Living (ADL) (8) assessment scale, and the Modified Medical Research Council Dyspnea Scale (mMRC) (9) were completed. (II) Indicator testing: Medical staff performed special tests such as SPO_2, arterial blood gas analysis, pulmonary function, and 6-minute walk tests according to the specific conditions of the patient and assessed the oxygenation status at rest and during exercise and sleep. (III) Equipment experience: The outpatient experience unit is equipped with a variety of oxygen therapy and respiratory support equipment. Based on the developed oxygen therapy plan, the medical staff guided the patient to choose a reasonable oxygen therapy method and use the oxygen therapy or respiratory support equipment. The selected oxygen therapy equipment was adjusted based on its efficacy, and the medical staff helped the patients to choose equipment that was suitable for their disease status and finances. (IV) Oxygen therapy prescription: The attending physician prescribed oxygen therapy based on oxygenation indicators and patient experience, selecting parameters such as the oxygen therapy method, oxygen flow rate, daily oxygen inhalation duration and target value; home oxygen therapy was standardized; home oxygen therapy education manuals and oxygen therapy logs were distributed; and home oxygen therapy education and training (e.g., how to correctly complete the oxygen therapy logs) were provided for the patients and their families. (V) Regular follow-up: Seven days after the first visit, the nurse in charge asked about the patient's physiological condition, the implementation of home oxygen therapy, and the oxygen therapy log maintained via phone or WeChat. Follow-up visits took place every month; the patient went to the outpatient oxygen therapy service every 3 months. During the follow-up visits, medical staff performed special tests based on the patient's condition, checked his or her oxygen therapy log, and assessed the effect of oxygen therapy and whether the oxygen therapy prescription needed to be adjusted. Every 6 months, arterial blood gas analysis, pulmonary function, a 6-minute walk test, and questionnaires for oxygen therapy compliance, ADL and mMRC were completed, and the patients were asked about acute exacerbations of chronic respiratory insufficiency in the 6 months since their last visit to comprehensively assess the efficacy of the oxygen therapy.

The outpatient oxygen therapy service developed a home oxygen therapy patient registration form (including the above diagnostic and treatment information), which is completed via an interview conducted by a nurse, who records each item and enters the responses into the home oxygen therapy database.

Observation indicators

The basic characteristics of the patients included sex, age, disease course, education level, and disease type.

Effect evaluation indicators: (I) oxygen therapy compliance: The oxygen therapy compliance questionnaire comprised a total of 14 items (see Table S1 for details), including behavior and attitude toward oxygen therapy; responses are divided into four levels: "always", "frequently", "occasionally" and "never", with scores ranging from 1 to 4 points. All of the item scores were added together. A score of 14 to 28 indicates poor compliance, a score of 29 to 42 indicates moderate compliance, and a score of 43 to 56 indicates good compliance. (II) Average daily oxygen therapy duration: The average daily oxygen therapy duration before the outpatient oxygen therapy intervention was provided by the patients; the average daily oxygen therapy duration after the outpatient oxygen therapy intervention was calculated according to the daily oxygen therapy duration recorded in the oxygen therapy log during the 6th month. (III) Arterial blood gas analysis of SaO_2 and PaO_2 in the resting state without oxygen inhalation. The ADL score included 10 items, including eating, dressing and washing, and walking on the ground; the Barthel index score ranged from 0 to 100 points, and the higher the

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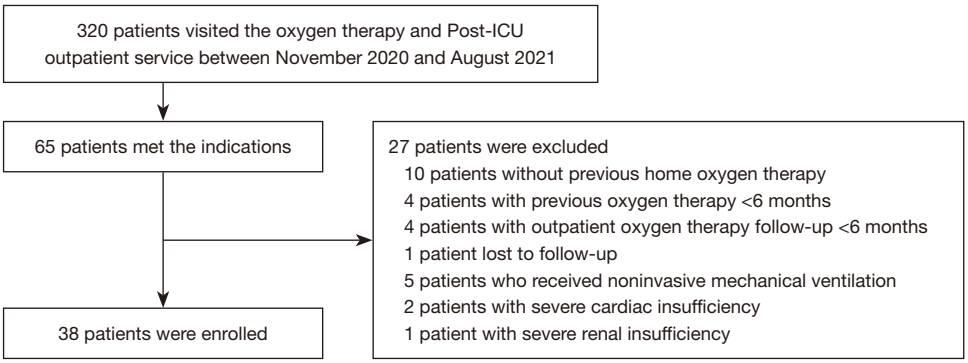

Figure 1 Flowchart of study subject selection.

Table 1 Basic characteristics of patients

Characteristics	Value
Sex (cases, %)	
Male	24 (63.2)
Female	14 (36.8)
Age (years, mean ± SD)	71.47±10.69
Course of disease (cases, %)	
1–9 years	9 (23.7)
10–20 years	15 (39.5)
More than 20 years	14 (36.8)
Education level (cases, %)	
College degree or above	7 (18.4)
Secondary or technical secondary school	22 (57.8)
Elementary school	8 (21.1)
Illiterate	1 (2.6)
Type of disease (cases, %)	
Chronic obstructive pulmonary disease	28 (73.7)
Bronchiectasis	4 (10.5)
Interstitial lung disease	6 (15.8)

score was, the better the patient's ADL ability. (V) mMRC score: According to the severity of the patient's shortness of breath, the mMRC score was divided into five levels of 0–4, and the higher the score was, the more severe the dyspnea. (VI) Number of visits (including outpatient visits and hospitalizations) and medical expenses (including outpatients and hospitalizations) due to acute exacerbation of chronic respiratory insufficiency within 6 months. The differences in the above indicators before and after 6 months of outpatient oxygen therapy intervention were compared.

Statistical analysis

Statistical analysis was performed using SPSS 26.0. Measurement data were subjected to a normality test. Measurement data that conformed to a normal distribution are expressed as the mean ± standard deviation (mean ± SD), and the paired *t*-test was performed. For nonnormally distributed measurement data, data are expressed using the median and interquartile range [$M(_{Q25}, _{Q75})$] and analyzed using the Wilcoxon signed-rank test. Count data are expressed as the number of cases (percentage, %) and were analyzed using the χ^2 test. $P<0.05$ indicated that the difference was statistically significant.

Results

A total of 320 patients were admitted to the outpatient oxygen therapy service, of which 65 patients met the indications for long-term oxygen therapy, and 27 patients were excluded according to the exclusion criteria. Thirty-eight patients were eventually enrolled in this study (*Figure 1*).

Basic characteristics of the patients

Among the 38 patients, 24 (63.2%) were males; the majority were elderly adults (71.47±10.69) years old; the disease course was mostly more than 10 years (76.3%); and the education level of most of the patients was elementary or middle school (78.9%). Chronic obstructive pulmonary disease was the most common disease (73.7%, *Table 1*).

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Table 2 Changes in patient compliance with oxygen therapy before and after outpatient oxygen therapy intervention (case, %)

Compliance	Before intervention	After intervention	χ^2	P
Good compliance	8 (21.1)	24 (63.2)	14.182	<0.001
Moderate compliance	14 (36.8)	8 (21.1)		
Poor compliance	16 (42.1)	6 (15.8)		

Table 3 Comparison of the average daily oxygen therapy duration and SaO_2 and PaO_2 before and after the outpatient oxygen therapy intervention [$M(Q_{25}, Q_{75})$]

Items	Before intervention	After intervention	Z value	P
Duration of oxygen therapy (hours)	6 (4, 8.5)	13.5 [10, 15]	–4.985	<0.001
SaO_2 (%)	88 [86, 90]	90 (88, 91.3)	–2.822	0.004
PaO_2 (mmHg)	55 [54, 62]	61.5 (59, 64.3)	–5.173	<0.001

SaO_2, arterial oxygen saturation; PaO_2, partial pressure of arterial oxygen.

Table 4 Comparison of ADL and mMRC scores, the number of hospital visits for acute exacerbation, and medical expenses before and after the outpatient oxygen therapy intervention [(mean ± SD) or $M(Q_{25}, Q_{75})$]

Items	Before intervention	After intervention	*t*/Z value	P
ADL score	63.68±27.13	64.74±27.18	–1.954	0.058
mMRC score	2.95±0.70	2.37±0.82	5.556	<0.001
Number of visits (times/half a year)	2.5±0.98	1.7±0.78	7.646	<0.001
Medical expenses (RMB/half a year)	11,000 [6,475, 21,150]	8,650 [4,950, 13,375]	–2.408	0.016

ADL, activities of daily living; mMRC, modified Medical Research Council Dyspnea Scale.

Changes in patient compliance with oxygen therapy after outpatient oxygen therapy intervention

After the outpatient oxygen therapy intervention, the patients' compliance with home oxygen therapy was significantly improved, while the proportion of patients with poor compliance was significantly reduced (P<0.05, *Table 2*).

Comparison of the average daily duration of oxygen therapy and the effect of oxygen therapy before and after the outpatient oxygen therapy intervention

After the outpatient oxygen therapy intervention, the average daily oxygen therapy duration in the 6th month of home oxygen therapy was significantly longer than that before the oxygen therapy intervention (P<0.05). The results showed that at rest and without oxygen, SaO_2 and PaO_2 were significantly higher than before the oxygen therapy outpatient intervention (*Table 3*).

Comparison of ADL and mMRC scores, number of hospital visits and medical expenses of patients before and after outpatient oxygen therapy intervention

There was no significant difference in the ADL scores of patients before and after the outpatient oxygen therapy intervention (P>0.05). However, the mMRC score was significantly reduced after the intervention (P<0.05). In addition, the number of hospital visits and medical expenses due to acute exacerbation of chronic respiratory insufficiency in the 6 months after the intervention were also significantly reduced compared with the previous 6 months (P<0.05, *Table 4*).

Discussion

The value of home oxygen therapy for the treatment of

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stable chronic respiratory insufficiency has been supported by several randomized controlled studies (10,11), which confirmed that oxygen therapy for more than 15 hours a day can significantly alleviate the condition by improving symptoms, reducing the frequency of acute onset exacerbations and the number of hospitalizations, and prolonging the survival time of patients. Therefore, home long-term oxygen therapy is a category A recommendation in many European and American guidelines (12). In China, in-hospital oxygen therapy is gradually becoming standardized. For example, an expert consensus on emergency oxygen therapy has been developed (13), but the development of home oxygen therapy has been slow. The purpose of this research group is to refer to the experience of foreign countries to explore the establishment of a family oxygen therapy system that is in line with China's national conditions. Our initial idea was to use community health service centers as the main platform for implementing home oxygen therapy. However, through an epidemiological survey of the conditions under which home oxygen therapy took place and patients with chronic respiratory insufficiency in the pilot community, we found that this approach could not achieve the expected goal of the project. The main reasons for the inability of this proposal to meet patient needs were as follows: (I) the medical hardware conditions of the community health service centers for providing home oxygen therapy and the diagnosis and treatment abilities of the medical personnel are limited. (II) The number of the patients is limited, and patients with chronic respiratory failure seek treatment at secondary or tertiary hospitals; in addition, some patients live in nursing homes or rehabilitation institutions for a long time. The Department of Emergency and Critical Care Medicine of the Second Affiliated Hospital of Soochow University diagnoses and treats a large number of patients with acute exacerbations of chronic respiratory insufficiency every year. To meet the demand for continued respiratory support therapy for these patients after discharge and the need for follow-up rehabilitation treatment for patients discharged directly from the ICU, the Department of Emergency and Critical Care Medicine where our research group is located has established an Oxygen Therapy and Post-ICU Outpatient Service. The outpatient oxygen therapy service is the newest specialized home oxygen therapy clinic in China and one of few departments that treat chronic respiratory failure. This clinic ensures the standardization and effectiveness of home oxygen therapy prescriptions through comprehensive and systematic disease assessment for home oxygen therapy patients and diversified oxygen therapy experiences. Additionally, the individualized selection of oxygen therapy equipment addresses patients' lack of awareness and singularity in choosing oxygen therapy equipment, which has been an issue in the past. In short, the standardized diagnosis and treatment process maintains good continuity and homogeneity of diagnosis and treatment, follow-up, and efficacy evaluation.

The results of this study showed that only 21% of patients had good compliance with oxygen therapy in the past, and the average daily oxygen therapy duration was relatively short. The main reasons may be related to inadequate education, lack of professional follow-up, and lack of oxygen therapy knowledge in patients and their families. After 6 months of standardized diagnosis and follow-up in the outpatient oxygen therapy service, compliance with oxygen therapy was significantly improved, and the duration of oxygen therapy was significantly prolonged, indicating that most of the patients developed improved awareness of and attention to their disease and to home oxygen therapy. In addition, with the improvement of the patients' resting oxygenation (SaO_2, PaO_2), their mMRC scores significantly decreased, indicating that standardized oxygen therapy can improve patients' oxygenation and reduce the severity of their dyspnea. Observations of treatment economics indicators showed that after outpatient oxygen therapy intervention, with the improvement of patients' compliance with home oxygen therapy and their oxygenation status, the number of hospital visits and related patient costs due to acute exacerbation of chronic respiratory insufficiency also decreased significantly. This is consistent with the results of Pépin *et al.* (14). In addition, the results of this study found that after 6 months of outpatient oxygen therapy intervention, 36% of patients still had poor compliance with oxygen therapy, and their overall daily oxygen therapy duration still did not reach 15 hours. This may be mainly related to the low education level of the enrolled patients and to the patients' concerns about oxygen dependence. Therefore, it is necessary to continue to strengthen health education related to oxygen therapy in the future.

This study has the following limitations: (I) the sample size of this study was small, and the observation duration was short. These factors mainly affected the accuracy of seasonal correlation indicators (such as the frequency of acute onset exacerbations) and causes bias, which to some extent affects the reliability of the results. (II) The indicators that reflected the effect of oxygen therapy were

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not comprehensive: pulmonary function and the 6-minute walk test make certain requirements of patients, and few patients complete these examinations, therefore, these two indicators were not included in the effect evaluation. (III) Disease types were not classified: Due to the limited number of cases, the disease types were not classified, and the difference in the treatment effect of home oxygen therapy on patients with hypoxia caused by different primary diseases could not be verified. In subsequent studies, we will increase the sample size and follow-up time, improve the observation indicators. In view of the controversy of family oxygen therapy, the effectiveness of family oxygen therapy for patients with low oxygen caused by different diseases and different degrees of low oxygen is discussed (15,16).

In summary, as a relatively new outpatient service in China, outpatient oxygen therapy can improve the efficacy of home oxygen therapy for patients with chronic respiratory insufficiency through patient assessment, individualized selection of oxygen therapy equipment, standardized implementation of home oxygen therapy, and economic value. In addition, long-term family oxygen therapy for patients with chronic respiratory insufficiency prevents patients without serious hypoxia during rest, sleep and activity, and can eliminate the adverse effects of chronic hypoxia to prolong their survival time and improve their quality of life, which is more effective than drug treatment alone. The ultimate goal of long-term home oxygen therapy is to slow down the progression of the disease course and prolong patient survival, not just to improve symptoms. Oxygen therapy is of great significance in reducing the social burden and reducing medical expenses in addition to playing its unique role in relieving the individual pain of patients.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://apm.amegroups.com/article/view/10.21037/apm-21-3745/rc

Data Sharing Statement: Available at https://apm.amegroups.com/article/view/10.21037/apm-21-3745/dss

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://apm.amegroups.com/article/view/10.21037/apm-21-3745/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee of the Second Affiliated Hospital of Soochow University (approval number: JD-HG-2021-43). Individual consent for this retrospective analysis was waived.

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References

1. Zhou M, Wang H, Zeng X, et al. Mortality, morbidity, and risk factors in China and its provinces, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2019;394:1145-58.
2. Muir JF, Voisin C, Ludot A. Organization of home respiratory care: the experience in France with ANTADIR. Monaldi Arch Chest Dis 1993;48:462-7.
3. Melloni B, Mounier L, Laaban JP, et al. Home-Based Care Evolution in Chronic Respiratory Failure between 2001 and 2015 (Antadir Federation Observatory). Respiration 2018;96:446-54.
4. Hardinge M, Annandale J, Bourne S, et al. British Thoracic Society guidelines for home oxygen use in adults. Thorax 2015;70 Suppl 1:i1-43.
5. Jacobs SS, Krishnan JA, Lederer DJ, et al. Home Oxygen Therapy for Adults with Chronic Lung Disease. An Official American Thoracic Society Clinical Practice Guideline. Am J Respir Crit Care Med 2020;202:e121-41.

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6. Fritsch S, Bickenbach J. Respiratorisches versagen: State of the art – diagnose und therapie. Anästhesiol Intensivmed Notfallmed Schmerzther 2018;53:90-101.
7. Zheng LJ, Jia WR, Chen Q. Nursing intervention based on domiciliary oxygen therapy tracking tables quantitative classification for elderly patients with stable chronic obstructive pulmonary disease. Chinese Journal of Nursing 2017;52:1241-6.
8. Wu Y, Xu Y. Investigation on the daily living ability of the elderly in Suzhou city . Chinese Journal of Gerontology 2014;34:745-6.
9. Bestall JC, Paul EA, Garrod R, et al. Usefulness of the Medical Research Council (MRC) dyspnoea scale as a measure of disability in patients with chronic obstructive pulmonary disease. Thorax 1999;54:581-6.
10. Continuous or nocturnal oxygen therapy in hypoxemic chronic obstructive lung disease: a clinical trial. Nocturnal Oxygen Therapy Trial Group. Ann Intern Med 1980;93:391-8.
11. Long term domiciliary oxygen therapy in chronic hypoxic cor pulmonale complicating chronic bronchitis and emphysema. Report of the Medical Research Council Working Party. Lancet 1981;1:681-6.
12. Chang C, He B. Introduction to the 2011 updated version of the diagnosis and treatment of stable COPD. Chinese Journal of Tuberculosis and Respiratory Diseases 2012;35:256-8.
13. Emergency oxygen treatment expert consensus group. Emergency oxygen treatment expert consensus. Chinese Journal of Emergency Medicine 2018;27:355-60.
14. Pépin JL, Barjhoux CE, Deschaux C, et al. Long-term oxygen therapy at home. Compliance with medical prescription and effective use of therapy. ANTADIR Working Group on Oxygen Therapy. Association Nationale de Traitement à Domicile des Insuffisants Respiratories. Chest 1996;109:1144-50.
15. Albert RK, Au DH, Blackford AL, Casaburi R, et al. A Randomized Trial of Long-Term Oxygen for COPD with Moderate Desaturation. N Engl J Med 2016;375:1617-27.
16. Díaz Lobato S, García González JL, Mayoralas Alises S. The debate on continuous home oxygen therapy. Arch Bronconeumol 2015;51:31-7.

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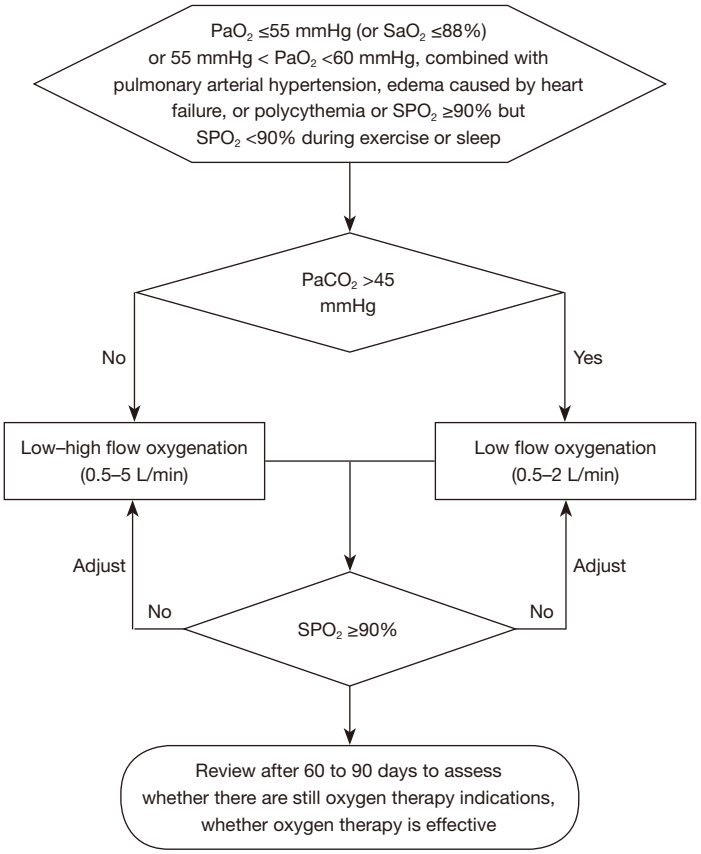

Figure S1 Home oxygen therapy program. PaO_2, partial pressure of arterial oxygen; $PaCO_2$, partial pressure of carbon dioxide in arterial blood; SaO_2, arterial oxygen saturation; SPO_2, transcutaneous oxygen saturation.

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Table S1 Home oxygen therapy compliance

Item	Always (4 points)	Often (3 points)	Occasionally (2 points)	Never (1 point)	Score
1. Do you use oxygen every day?					
2. Do you use oxygen for more than 15 h a day?					
3. Is your oxygen flow selection based on the oxygen therapy prescription issued by your doctor?					
4. Do you remember to use oxygen every day?					
5. Do you think that following your doctor's prescription can improve your condition?					
6. Are you satisfied with the outcomes of oxygen therapy?					
7. Do you increase your oxygen flow when your condition worsens?					
Item	Never (4 points)	Occasionally (3 points)	Often (2 points)	Always (1 point)	
8. Do you stop taking oxygen when you feel your symptoms improve?					
9. Do you stop treatment because of the long cycle?					
10. Do you find it difficult to use oxygen as prescribed by the doctor?					
11. Do you stop oxygen therapy due to a severe condition?					
12. Do you stop using oxygen when your condition worsens?					
13 Do you change the duration and dosage of oxygen therapy for certain reasons?					
14. Are you worried about the side effects of oxygen therapy?					
Total score					

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