

VHA PROSTHETIC CLINICAL MANAGEMENT PROGRAM (PCMP)

CLINICAL PRACTICE RECOMMENDATIONS

HOME USE OF SUPPLEMENTAL OXYGEN

I. PURPOSE

The purpose of this Clinical Practice Recommendation (CPR) document is to provide Veterans Health Administration (VHA) clinicians and administrative personnel with criteria and guidance for home use of supplemental oxygen.

II. BACKGROUND

The Under Secretary for Health directed VHA's Prosthetic and Sensory Aids Service (PSAS) to establish a Prosthetic Clinical Management Program (PCMP). The objectives of the PCMP are: (1) coordinate the development of CPRs for prosthetic prescription practices and contracting opportunities and (2) ensure technology uniformity and ease of access to prosthetic prescriptions and patient care that will lead to valid outcome measures and analysis for research purposes.

Each Veteran is entitled to an individualized evaluation. The prescribing clinician will take into account the Veteran's medical diagnoses, prognosis, functional abilities, limitations, goals, and ambitions.

This CPR is intended to assist practitioners in clinical decision-making, to standardize and improve the quality of patient care, and to promote cost-effective prescription of supplemental oxygen for ambulatory and home use. The goal is to effectively treat clinically significant hypoxemia which is typically achieved by supporting a patient continuously at or above a PaO₂ of 60 mmHg or an arterial oxygen saturation of 90 to 92 percent.

It is recommended that management of the home oxygen program be led by a qualified individual who is usually a VA-credentialed and/or licensed respiratory therapist. The Home Respiratory Care Team (HRCT) program is detailed in VHA Handbook 1173.13.

III. DEFINITIONS AND ABBREVIATIONS

Term	Description	Reference Value
ABG	Arterial blood gas	
RA	Room Air - reference to breathing ambient air O ₂	21% O ₂
FiO ₂	Fraction of inspired O ₂ – level depends on level of oxygen being breathed by patient	21% - 100%
PaO ₂	Partial pressure of O ₂ measured as part of ABG	85- 95 mmHg
SaO ₂	Oxygen saturation of arterial hemoglobin measured by co-oximetry as part of ABG	95 - 97%
ScO ₂	Oxygen saturation of arterial hemoglobin calculated from ABG PaO ₂	95 - 97%
SpO ₂	Oxygen saturation of arterial hemoglobin measured by pulse oximetry	95 - 97%
Hypoxemia	An abnormally low level of oxygen in arterial blood which in this document is defined as a level that is consistent with the need for supplemental oxygen	See Section IV

IV. INDICATIONS AND CONTRAINDICATIONS

A. Indications for the Prescription of Home Oxygen

One or more of the following criteria must be met:

1. Resting PaO₂ ≤ 55 mmHg or SpO₂ ≤ 88 percent in the absence of hypocapnea.

OR

2. Resting PaO₂ ≥ 56 mmHg and ≤ 59 mmHg or a SpO₂ ≤ 89 percent as measured by oximetry with evidence of a condition that suggests tissue hypoxia as determined by clinical or laboratory findings such as:

- Pulmonary hypertension.
- Cor pulmonale.
- Erythrocytosis/erythrocythemia/polycythemia (e.g. a hematocrit ≥ 55 percent).

- Impairment of cognitive processes should lead to further testing before oxygen is prescribed (e.g. mini-mental status examination).

AND/OR

3. Exercise SpO₂ ≤ 88 percent during or following exercise.

AND/OR

4. Nocturnal O₂ Deficits Identified

a. SpO₂ ≤ 88 percent, which among other conditions, may be suggested by and should be accompanied by one or more of the following or other complication, symptom or condition considered to be the result of nocturnal hypoxemia:

- Nocturnal restlessness.
- Morning headaches.
- Erythrocytosis/erythrocythemia/polycythemia.
- Cor pulmonale.
- Pulmonary hypertension.
- Unexplained daytime somnolence (1).
- Patients with obstructive sleep apnea whose nocturnal SpO₂ is not maintained despite successful treatment of the nocturnal respiratory events.
- Pulmonary Hypertension and other underlying pulmonary vascular diseases.

b. In the absence of complications or symptoms of hypoxemia at least 5 minutes of a SpO₂ <89 percent plus at least one measurement of SpO₂ ≤ 85 percent should be demonstrated during sleep. Alternatively, if the patient does not meet this criteria but spends more than 30 percent of sleep at a SpO₂ < 89 percent, this would also qualify for nocturnal oxygen (VII. 2).

Note: The measurement of arterial oxygen concentration for the above indications should be made or extrapolated to the altitude at which the patient typically lives. A nomogram to calculate the expected PaO₂ is available (VII.3).

AND/OR

5. Cluster headaches regardless of the arterial oxygen level with a diagnosis by an appropriate specialist such as a neurologist.

B. Contraindications for Prescription of Home Oxygen

1. None of the above indications are met.
2. Patients with normal arterial blood gases at rest and with exertion who are very dyspneic may not qualify for supplemental oxygen. There is a very poor correlation between dyspnea and hypoxemia. This may require a careful explanation to the patient as to why they do not qualify despite dyspnea.
3. Caregivers of terminally ill patients often request oxygen without evidence of hypoxemia, as it has been widely used with the belief that it helps relieve the "breathlessness" associated with the end of life. The use of home oxygen should be gently discouraged for these patients. Other measures to relieve the anxiety that these patients experience may be more beneficial and less costly than the use of oxygen. For example, movement of cool air with a fan can reduce dyspnea/stimulation of the trigeminal nerve via air pressure on the skin. In addition, skin cooling may reduce the sensation of dyspnea (VII. 4) and compressed air can be as effective as oxygen (VII. 5).

Note: exceptions or deviations should only be enacted under the purview of a pulmonologist or physician (subject matter expert).

V. PRESCRIPTION PROCESS

A. The prescription for home oxygen must be signed by a physician with the following included in the medical consult:

1. Prescription for oxygen including:
 - a. Desired flow rate
 - b. Method of delivery (e.g., nasal cannula, tracheotomy mask, etc.).
2. Extent to which oxygen support is required:
 - a. Continuous
 - b. Intermittent (e.g., cluster headaches)
 - c. Activity specific
3. If activity specific oxygen support is indicated, specifications for the number of hours of oxygen support needed must be included for any and all that apply:
 - a. Sleep
 - b. Ambulation

- c. Vehicle.
- d. Exercise.
- e. Exertion/activity.
- f. Other (must specify).

4. Type of equipment required:

- a. Concentrator.
- b. H tank or other needed for backup.
- c. Portable oxygen for outside the home (see Section VI. D.4).
- d. Liquid oxygen. *

Note: Liquid oxygen is appropriate for use primarily for circumstances when tanks: a) cannot provide the necessary flow rate; b) cannot meet the ambulatory needs; c) are not cost effective; or d) are impractical. There must be a specific reason (other than general impracticability or inconvenience) for prescribing liquid oxygen such as an inability to turn on a cylinder due to arthritis.

B. The following must be documented in the medical record:

1. The patient's diagnosis that indicates the requirement for home oxygen including the appropriate International Statistical Classification of Diseases-9 code.
2. Arterial oxygen levels or oxygen saturation levels for supplemental oxygen at rest, during exercise and during sleep, as appropriate.
3. Reason home oxygen is being ordered (Section V).
4. Criteria that are met to justify home oxygen (from Section IV).
5. Timeline for patient reassessment to determine ongoing need for oxygen support.

C. The duration of prescribed home oxygen use must be identified and follow up evaluation coordinated.

1. New VA patients should be assessed within a 1 to 3-month period, but no longer than 6 months after the institution of home oxygen therapy and a minimum of yearly thereafter (can be performed more frequently when clinically indicated to determine oxygen requirements). Annual evaluations will be performed by appropriate VA personnel and meet or exceed criteria listed in Section IV. A). Patients may no longer qualify at follow up and consideration should be given to discontinuing oxygen at that time. There may be a need to repeat the evaluation if the results are borderline or viewed as atypical for a given patient. If oxygen is prescribed after an acute respiratory illness such as a Chronic Obstructive

Pulmonary Disease (COPD) exacerbation, the reassessment and decision for continued long-term oxygen therapy should be done after the acute illness has fully resolved.

Note: All Veterans must be evaluated for their oxygen requirements annually with a corresponding renewal prescription. However, there may be exceptions in certain cases where the Veteran may not be able to be physically seen and administratively renewing the prescription (e.g. 90 day extension) for the Veteran may be necessary. For example, a Veteran with end stage lung cancer may not tolerate transport to the medical center. Exceptions for Veterans utilizing nocturnal or entrained supplemental oxygen into a Positive Airway Pressure (PAP) device are listed later in this document. An administrative renewal by a VA physician or licensed independent provider (LIP) will require contact with the Veteran in order to assess their compliance and/or condition along with a corresponding note in the Veterans electronic medical record. Such exceptions should be less than 10 percent of the total number of evaluations for the facility.

VI. ADDITIONAL INFORMATION

A. Assessment for Home Oxygen

1. Any patient who has a condition indicative of hypoxemia will be considered as a candidate for a home oxygen assessment. Typical conditions that may lead to resting, nocturnal and/or exercise hypoxemia include, but are not limited to, the following:

- Severe to very severe ($FEV_1 < 50$ percent) COPD.
- Idiopathic pulmonary fibrosis, sarcoidosis, or another interstitial lung disease.
- Bronchiectasis, including cystic fibrosis.
- Terminal lung cancer.
- Kyphoscoliosis.
- Neuromuscular disease such as amyotrophic lateral sclerosis, spinal cord injury, etc. For these patients, an arterial blood gas should be performed to determine the degree of hypoventilation (e.g., hypercapnia) which may be contributing to the hypoxemia.

2. Initial screening with oximetry may be carried out in any clinical setting by any health care provider. While a greater severity of disease may be associated with a greater likelihood of hypoxemia, all severities of disease may be associated with hypoxemia. For this reason, resting pulse oximetry screening is strongly recommended for all patients with a condition, regardless of severity, that may be associated with hypoxemia. Patients found to have a positive screening will be referred for further assessment.

3. Any assessment beyond initial screening should be carried out in a setting with appropriate resources by trained individuals experienced in home oxygen evaluation and treatment including appropriate patient education.

4. Assessment Steps Following Initial Screening

- SpO₂ via pulse oximetry at rest and exercise (e.g., 6 minute walk) on room air. An ABG should be performed if the qualifying SpO₂ is questionable. All qualifying results must be documented on the home oxygen prescription template. Situations, among others, where this may occur include poor peripheral circulation, borderline results and hyperventilating patients.
- Titrate oxygen liter flow at rest and exercise (preferably utilizing oxygen systems that reflect what the patient would be using) to an SpO₂ of 90 to 92 percent as a goal recognizing that this may not be attainable in all patients.

Notes:

- When oximetry and blood gases conflict, the ABG result should be used for determination of oxygenation status. Ensure that the oximeter being used is accurate when discrepancies occur.
- Exercise for the purpose of assessing a patient for supplemental oxygen is defined here as an activity that renders the patient dyspneic. This may occur with no or minimal exercise or with heavy exercise depending on the patient's perception of dyspnea. The prescription of oxygen should be tailored to the SpO₂ at rest (if necessary) and with exercise.
- There are many approaches to exercise from walking the patient at their normal pace until tired to a more formal 6 minute walk (VII. 6-7). Exercise should be performed whenever possible with the oxygen delivery device the patient will require for ambulation. This recommendation is made since it is the experience of respiratory care practitioners that devices differ in the amount of oxygen actually delivered for the same setting and this may lead to inadequate or inappropriate oxygenation of the patient.
- Nocturnal testing, as previously indicated, is usually based on clinical suspicion because of a sleep disturbance or unexplained cor pulmonale. This is performed at an overnight study focused on measurement of SpO₂.

- The initial order for nocturnal oxygen should be based on objective testing (i.e., polysomnogram or overnight oximetry) in order to determine the presence of nocturnal hypoxemia and possible additional testing to determine the liter flow required to treat the hypoxemia. Prescriptions for nocturnal oxygen must be renewed annually, but the decision for re-testing of this population should be made for the patient based on the VA physician or LIP's clinical judgment.

B. Equipment Specific Considerations for Home Oxygen

1. Portable System Selection

- a. There are many types of portable systems which include, but are not limited to A, B, C, D and E compressed oxygen cylinders (tanks), liquid oxygen portable units, and battery-operated portable concentrators. These tanks and devices are almost always used with a conserver device in order to extend the time that a full tank can provide oxygen without being replaced or refilled. The prescription needs to also specify the number of each kind of tank (i.e., 8 E tanks; 4 D tanks) and the kind of conserver device to be used (when applicable).
- b. Some patients have unique requirements. For example, a patient might need a very light portable (e.g., B cylinder) when walking, but could use an E-cylinder while driving. Calculating the ambulatory and non-ambulatory hours away from home will help provide the number of each type of cylinder required by the patient.
- c. Considerations should be given to patients with additional physical impairments. For example, a patient who has severely disabling arthritis may need a liquid system because of the inability to turn a cylinder on and off. Many patients request liquid oxygen without justification to provide this system. The ability of the patient to utilize oxygen in a safe manner should also be considered.
- d. Based upon the most recent patient safety literature, it is suggested patients be limited to no more than 15 tanks (at one time) in the home and no more than 3 tanks in an automobile. Any variance needs to have the concurrence of the assigned contracting officer's technical representative (COTR).

Note: Only one primary delivery system will be authorized by VA for continuous use (i.e., Concentrator vs. Liquid Stationary Unit). The most efficient and medically appropriate system will be determined by the prescribing VA physician.

2. Oxygen Conserving Devices

The purpose of oxygen conserving devices is to increase the ambulatory time (time out of home) while optimizing costs associated with the use of supplemental oxygen. Patients should be considered for oxygen conserving devices whenever they can maintain an SpO₂ from 90 to 92 percent. The type to be used in an individual patient will depend on a careful clinical evaluation. Patients should be instructed to utilize these types of conserving systems only when awake and able to trigger the device. There are three basic types of conserving systems:

- a. Reservoir conserver (mustache or pendant) as part of the nasal cannula system, oxygen conserving regulators, and Transtracheal oxygen (TO).
- b. The Reservoir conserver has a small bag or pouches that are part of the nasal cannula system that allow oxygen to accumulate during exhalation and be inspired during inhalation to increase the FIO₂ at relatively low flow rates. This increases the time that a portable oxygen delivery system can be used.
- c. Oxygen conserving regulators (demand-type) provide oxygen only during inspiration and may do so during less than every breath (e.g., every third breath).

Note: TO is delivered through a cannula placed surgically through a small hole in the trachea. Oxygen liter flow should be adjusted accordingly since the FIO₂ needs may decrease with this type of device.

C. Additional Clinical Considerations

1. Medical management should be optimized prior to committing to long-term supplemental oxygen. Temporary use of oxygen may be necessary until response to treatment is maximized and the patient is no longer hypoxemic.
2. The least amount of supplemental oxygen that is necessary to treat hypoxemia should be prescribed.
3. Patient smoking history and status will be assessed in detail and smoking cessation should be strongly encouraged. A fire risk assessment is conducted on all new oxygen therapy patients and a reassessment is conducted when renewing an oxygen prescription or anytime there is a significant change in the patient's oxygen therapy set-up. The clinical home oxygen coordinator, respiratory practitioner, or designee must alert the home oxygen vendor (e.g., via CPRs home oxygen consult), that the patient is at high risk for smoking while

oxygen treatment is in use. High risk patients are patients who exhibit unsafe clinical or behavioral traits involving oxygen and smoking, such as:

- Attempting to hide their smoking materials or activities from staff and or caregiver;
- Having a history of non-compliance with smoking rules; or
- Smoking while in bed; or
- Smoking in community areas designated as non-smoking.

4. Pulmonary rehabilitation and exercise programs should be encouraged for patients since these programs improve quality of life and reduce hospitalizations (VII. 8).

D. Self-Management Education – Patient and Caregiver

1. Safety of home oxygen

a. Patients need to be instructed in the proper use of their oxygen devices and associated equipment in order to reinforce that oxygen supports combustion and can cause a fire under certain conditions.

b. Intensify smoking cessation efforts, since smoking poses a safety hazard for patients on oxygen. The benefits of home oxygen may not be realized in patients who continue to smoke and have high levels of carboxyhemoglobin. The withdrawal of oxygen therapy in a patient who continues to smoke should only be undertaken after a careful assessment of the risks to the patient and others compared to the continued benefit of the oxygen.

c. Consideration should be given to providing written instructions, perhaps in the form of a written contract or an agreement explaining the hazards and what all members of the family must do to make it a safe environment.

2. Length of time for portable oxygen

a. Each conserving device has a table of liter per minute (lpm), times provided and explained to the patient. There are also tables for times of E and D cylinders needed to determine amount of time for driving a car or ambulating.

b. An outpatient visit at a VA medical center may be lengthy. The patient's oxygen supply may not be sufficient for the patient visit. PSAS,

in conjunction with the appropriate Services such as Pulmonary, should have an alternative system for the patient to have a supply of oxygen while they visit.

3. Assessment of patient and/or caregiver knowledge (represented in table on the following page):

Assessment of Patient and/or Caregiver Knowledge

Question	Information by provider	Expected knowledge
Do you know how oxygen works?	Supplemental O ₂ assures a near normal level of O ₂ in your blood only while in use. It keeps all organs and muscles functioning adequately.	Verbalizes: the goal is 90% O ₂ saturation at all times. Verbalizes: O ₂ is vital to all body cells functioning correctly.
Do you understand this prescription?	Your prescription is determined by the blood gas or oximeter reading at rest and walking. Using more (for instance, when you are upset or have more difficulty breathing), may trigger your brain to not breath as much as it should. Using less may hurt vital cells in your body.	Verbalizes: O ₂ , in the right doses (liter flow), keeps the body functioning correctly. Verbalizes: Too much or too little O ₂ can hurt the body just as too much or too little of any substance can hurt the body.
Do you know how oxygen decreases your difficulty breathing?	Muscles need oxygen to work. Muscles work better if they are conditioned (strengthened) as they hold more oxygen. When muscles hold more O ₂ , the lungs do not have to work so hard and the feelings of difficulty breathing are decreased.	Verbalizes: Need for exercise particularly strength training.
Do you always use it when active?	Your body needs more O ₂ when you are active than at rest, that is why the dose (prescription in liter flow) is less or not needed at all when at rest than when walking.	Verbalizes: Need to always use O ₂ as prescribed.
Do you have sore ears or a dry nose?	If your ears are sore, ear pillows, clips or a head tie may protect the ears. For dry noses, try a non-oil based gel specially designed for the nose.	Verbalizes: When to ask for and where to find ear pieces and approved nasal gel.

4. Traveling with Oxygen

- PSAS will work with the Veteran to arrange supplemental oxygen for travel (see attachment IV *Determination of Oxygen Prescription for Airline Travel* for further information).
- Patients who travel and require extended oxygen supplies and patients who are planning a move, should be informed that it is their responsibility to notify the VA facility that administers their oxygen. Once notified, there are shared and separate responsibilities for VA and the patient.

Temporary Travel

1. The patient informs VA of the mode of travel, the time to reach the destination and the length of time to be spent away. This must be done in a timely manner to allow for proper arrangements to be made. Generally, a minimum of 2 weeks notice, in writing, should be given unless there is an emergency.
2. If the travel is by air, the patient is responsible for contacting the airline to arrange for oxygen while on the airplane, unless the travel is mandated by the resident facility¹ (i.e., patient being transferred to another facility for surgery or other recommended procedure).
3. If the travel is by other public transportation, the patient is responsible for contacting and determining the policies of the transportation provider and conveying this information to PSAS. The provision of oxygen by VA will be determined dependent upon the transportation provider's policy. It is possible that some forms of public transportation may not be available for patients traveling with oxygen.
4. If the travel is by personal vehicle (i.e., car, sports utility vehicle, etc.), the patient is responsible for working with VA to determine the best approach to providing oxygen while traveling, taking into consideration time on the road and overnight stays. In these cases, the temporary issuance of a concentrator may be indicated. However, the Veteran is still responsible to ensure he/she adheres to hotel/motel policies pertaining to usage and/or storage of respiratory-related equipment.
5. Once the travel arrangements are made to reach the destination, arrangements are needed to provide oxygen.
 - a. A home oxygen vendor (contracted source preferable) at the destination must be identified. This may be accomplished by the current vendor on contract by the resident facility¹, if that vendor

¹ Resident facility is defined as the medical center that maintains the Veteran's consolidated health record/file.

has a subsidiary office. If not, the resident VA should contact the vendor on contract with the VAMC nearest the Veteran's destination to make these arrangements. The resident facility will be responsible for any charges incurred while on temporary travel.

b. Parallel to the destination arrangements being made, a prescription and a treatment plan are needed while on travel. This should be accomplished by the treating physician/clinic at the Veteran's resident VAMC. A copy should be provided to the patient for the patient.

c. The number of paid travels for vacation not related to a temporary relocation (e.g., for a season) per year is not defined, but should be limited. A total of 30 days of travel with a maximum of two set-up charges is recommended. Any third set-up charge within this timeframe may be the responsibility of the Veteran. Prior to any possible costs incurred, the Veteran will be notified in writing of any out-of-pocket costs by PSAS.

d. The resident VA will keep their contracted vendor aware of travel arrangements, as appropriate.

Special considerations for Travel with Oxygen

1. If travel is by air, the patient will need someone to accompany them to the airport to take back the oxygen supply (e.g., E-tank). Airlines generally do not allow passengers to bring oxygen on the airplane. Some airlines do supply oxygen for the passengers, if prescribed. However, others require the patient be provided/use a portable concentrator (which could require PSAS to make arrangements for). The patient should be aware that there may be areas of the airport (e.g. boarding area) that do not allow oxygen tanks and should determine what arrangements need to be made for oxygen during those periods of time.

2. If the travel is extensive (e.g. such as a winter vacation), the travel may need to be handled as a temporary relocation. Responsibility for coordination and payment of the oxygen care falls to the resident VA for up to 3 months and to the receiving VA for a temporary relocation of more than 3 months (in which case the Veteran should enroll in the receiving VA's appropriate clinic, generally the Pulmonary Clinic). The resident VA should notify the receiving VA of such extensive or temporary relocations if the relocation is greater than 1 month.

3. Some modes of travel may not be available to the patient and trips with many destinations may be impractical.

4. Prescriptions and care plans may need to be faxed ahead of time to the provider at the destination.

5. Some patients travel extensively by recreational vehicle (RV) with frequent stops at RV parks. This may be considered to be the patient's residence for at least that part of the year. Consideration should be given to designing a program that takes into account this type of travel. Alternative oxygen supply systems such as a transfill or portable concentrator may be appropriate. The Veteran should be informed that in some cases, not all contingencies can be addressed.

5. Permanent Moves with Home Oxygen (a MOVE is different than travel)

1. The resident VA will notify the destination VA of the patient's plans to move. Every effort should be made in providing this notification as soon as it becomes known so the destination VA can begin to make arrival arrangements.

2. A contact name, phone number and address for the destination VA should be given to the patient.

3. The resident VA and destination VA should make all attempts possible to ensure a contracted vendor is ready to receive the patient at his/her destination.

4. A multi-month prescription and care plan should be given to the patient, from the resident VA, while the patient checks in and arranges for oxygen therapy at the destination VA.

5. The resident VA should fax or otherwise transmit all of the particulars for the patient's oxygen therapy to the destination VA.

6. The resident VA will be responsible for payment of oxygen until such time the destination VA enrolls the patient into the Pulmonary/Home Oxygen Clinic and the contract vendor provides their equipment, unless other arrangements/agreements are made between the two VA facilities. The destination VA must enroll the Veteran as soon as reasonably possible (e.g. < 30 days in accordance with VA Clinics "Waits and Delays" measure).

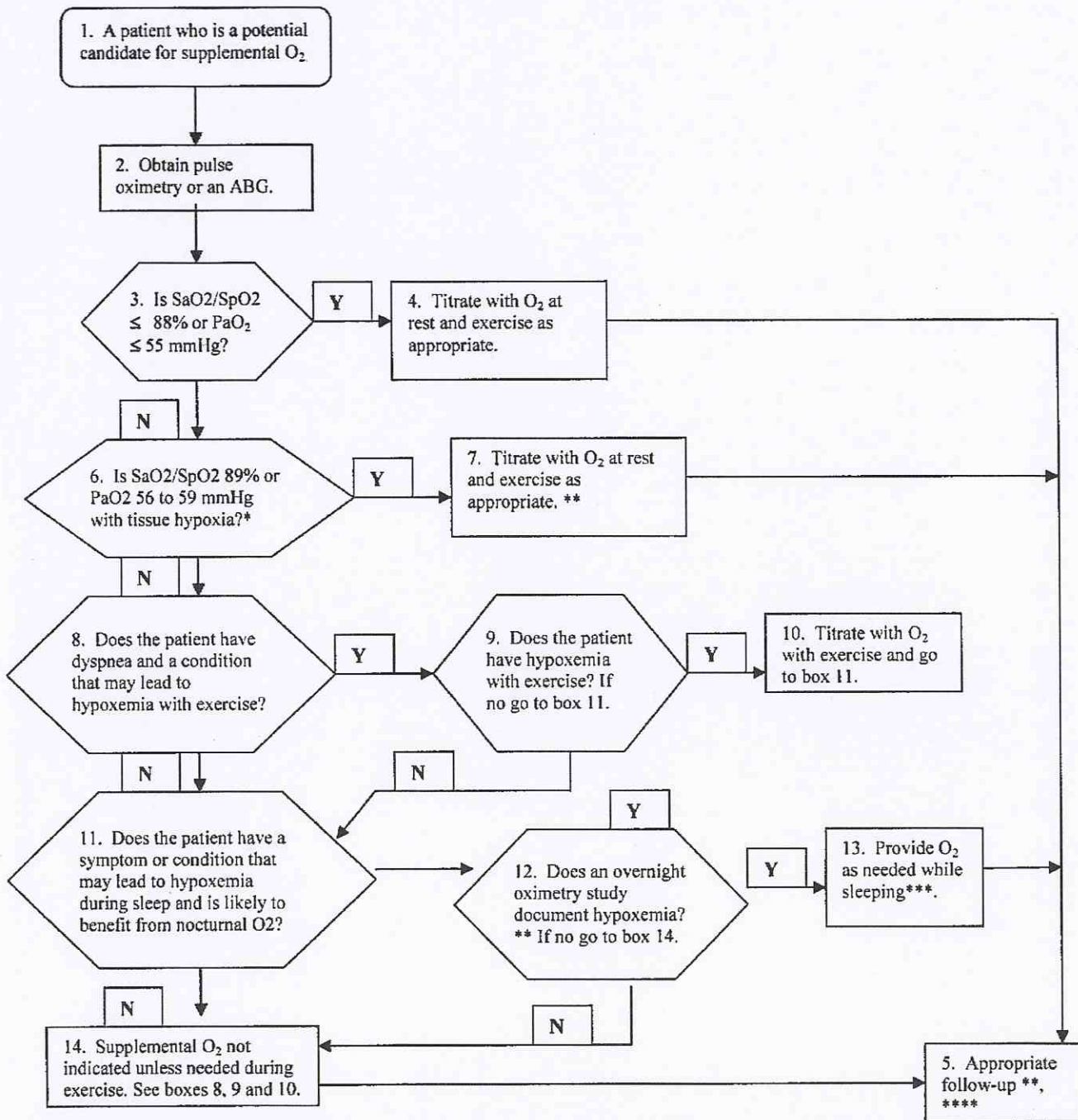
7. Upon arrival at the destination facility, any equipment that came with the patient and that is owned by the resident facility or contract vendor should be returned. Any cost incurred in the shipping/handling is the responsibility of the resident facility.

Note: Every effort will be made to prevent interruption in the patient's oxygen services during the move.

E. Quality Management/Performance

The Joint Commission (JC) has specific requirements for home oxygen programs including patient safety goals such as fire safety. These are beyond the scope of this document. It is the responsibility of the individual home oxygen program at the local site to ensure that JC requirements, which are frequently updated, are met.

F. Flow Chart of Usual Evaluation of a Patient for Supplemental Oxygen Therapy:



* - Tissue hypoxia (region of the body) is deprived of adequate delivery of oxygen to tissues which is associated with physiological effects such as anaerobic metabolism (cellular level).

** - Appropriate referrals (e.g., Pulmonary, Prosthetics) to conduct titration, write prescription and supply oxygen according to VA regulations and local requirements. The goal of oxygen therapy is a PaO₂ > 60 mmHg or an SaO₂ > 90% during rest, exercise and sleep.

*** - 2 liters/minute is recommended if the degree of hypoxemia is mild (e.g. ≥ 85% SaO₂) and there has not been a nocturnal oxygen titration study. If the hypoxemia is consistently more severe or if symptoms persist, consider nocturnal oxygen titration.

**** - The patient's medical care should be reviewed to ensure that the patient is on optimal medical management. If not, the patient should be reevaluated after being stable on such management and the oxygen prescription altered or discontinued, as necessary. The reevaluation should begin at a relevant point in the algorithm.

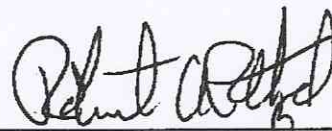
VII. REFERENCES

1. Cormick W, Olson LG, Hensley MJ, Saunders NA. Nocturnal hypoxemia and quality of sleep in patients with chronic obstructive lung disease. *Thorax*. 1986;41:846-54.
2. Fletcher EC, Donner CF, Midgren B, Zielinski J, Levi-Valensi P, Braghiroli A, Rida Z, Miller CC. Survival in COPD patients with a daytime PaO₂ > 60 mm Hg with and without nocturnal oxyhemoglobin desaturation. *Chest* 101:649-655, 1992.
3. Gong H Jr, Tashkin DP, Lee EY, Simmons MS. Hypoxia-altitude simulation test. Evaluation of patients with chronic airway obstruction. *Am Rev Respir Dis* 1984 Dec;130(6):980-6.
4. Ward SA et al. Effects of peripheral and central chemoreflex activation on the isopneic rating of breathing in exercise in humans. *J Physiol* 1989;411:27-43.
5. Booth S, Kelly MJ, Cox NP, Adams L, Guz A. Does oxygen help dyspnea in patients with cancer? *Am J Respir Crit Care Med* 1996;153:1515-8.
6. Hagarty EM, et al. Use of Pulse Oximetry to Determine Oxygen Prescription for Hypoxemic Patients with COPD, *Respiratory Care*; 1996; 41:30 -36.
7. ATS Statement: Guidelines for the Six-Minute Walk Test, *Am J Respir Crit Care Med* Vol. 166. pp 111-117, 2002.
8. Lacasse Y, Wong E, Guyatt GH, King D, Cook DJ, Goldstein RS. Meta-analysis of respiratory rehabilitation in chronic obstructive pulmonary disease. *Lancet* 348:1115-1119, 1996.
9. Management of Chronic Obstructive Pulmonary Disease Working Group. VA DOD Clinical Practice Guideline for Management of Chronic Obstructive Pulmonary Disease. Accessed 12/09/2009. Version 2.0, 2007. http://www.healthquality.va.gov/copd/copd_20.pdf

VIII. CPR RECERTIFICATION

This CPR will be reviewed for recertification in 5 years or as emerging technology and/or practice indicates need for review.

APPROVED DISAPPROVED:



Robert A. Petzel, M.D.
Under Secretary for Health

Date: 4/27/10

ATTACHMENTS:

- I. Prosthetic & Sensory Aids Service Quality Assurance Phone Survey
- II. Questionnaire for VA to Evaluate Contractor or Equipment and Service Provider(s)
- III. Questionnaire for VA to Evaluate Itself (i.e., Prosthetics and Pulmonary)
- IV. Determination of Oxygen Prescription for Airline Travel

ATTACHMENT I (SAMPLE)

**PROSTHETIC & SENSORY AIDS SERVICE
QUALITY ASSURANCE PHONE SURVEY**

PATIENT NAME: _____

SSN (last 4): _____

PHONE: _____

DATE: _____

- | | |
|---|--------|
| 1. Were you called 24 hours in advance of the delivery of your equipment? | YES/NO |
| 2. Did the contractor arrive at the scheduled time? | YES/NO |
| 3. Did the contractor give you your rights and responsibilities? | YES/NO |
| 4. Did the contractor instruct you in the use of the equipment? | YES/NO |
| 5. Was the contractor courteous and responsive to your needs? | YES/NO |
| 6. Do you know who to contact at VA if you are having a problem? | YES/NO |
| 7. Were you satisfied with the services provided? | YES/NO |

Any comments or suggestions to provide better service:

INTERVIEWER: _____

TITLE: _____

ATTACHMENT II (SAMPLE)

Questionnaire for VA to Evaluate Contractor or Equipment and Service Provider(s)

- 1. Name and Contact Number and Address of Contractor or Equivalent
- 2. Expectations of Contractor (i.e., supply equipment, set-up equipment, etc.)

3. Have these expectations been met with respect to:

- | | | |
|---|-----|----|
| a. quality of service | YES | NO |
| b. response to requests | YES | NO |
| c. providing the services ordered | YES | NO |
| d. documentation | YES | NO |
| e. turn around time | YES | NO |
| f. honoring of warranties (if applicable) | YES | NO |

Comments:

Person filling out questionnaire: _____

Title: _____

Date: _____

Note: If VA rather than a contractor is providing some or all of the services, the relevant VA personnel should fill answer this questionnaire regarding VA provided services. This would normally be answered by the personnel that order the services and by those personnel that depend upon some other service to deliver the services. For example, if Prosthetics is responsible for responding to orders or providing some or all of the services, then the personnel ordering the services should evaluate Prosthetics. If Pulmonary is responsible for providing some or all of the services, then Prosthetics should evaluate Pulmonary, as appropriate (i.e., documentation, expectation of delivery).

ATTACHMENT III (SAMPLE)

Questionnaire for VA to Evaluate Itself (i.e., Prosthetics and Pulmonary)

1. Is there appropriate communication between your department and the other departments involved in the providing of respiratory services? YES NO
2. Do you have regular meetings of your staff with minutes? YES NO
3. Do you have regular meeting of your staff with the staff of other involved departments with minutes? YES NO
4. Do you know who to contact with a request? YES NO
5. If a patient comes to you with a question that you do not know the answer, do you know whom to contact? YES NO
6. Are all health care provider orders carried out as requested? YES NO

Comments:

Person filling out questionnaire: _____

Title: _____

Department or equivalent: _____

Date: _____

ATTACHMENT IV. Determination of Oxygen Prescription for Airline Travel (COPD, Cor Pulmonale)

The expected in-flight PO₂ values may be calculated using the following steps outlined in Table 10 or may be looked up in the Table 11.

Table 10. How to Calculate Expected In-flight PO₂

<p>Step 1: Calculate expected in-flight PO₂ (Alt) based on sea level PO₂ (SL) and FEV1 according to the formula:</p> $PaO_2 (Alt) = 0.453 [PaO_2 SL] + 0.386 [FEV1 \% \text{ predicted}] + 2.44$ <p>Pre-calculated values of predicted in-flight PaO₂ can be looked up in Table 11.</p> <p>Step 2: A flow rate of 1L/minute increases inspired PO₂ by about 20 mgHg (2 liter/minute increases inspired PO₂ by about 40 mm Hg)</p> <p>Step 3: Adjust the O₂ flow for any comorbid conditions such as hypercapnia (aim for in-flight SaO₂ > 90%), cardiac or cerebrovascular disease (aim for in-flight SaO₂ > 95%)</p>

The values of PaO₂(Alt), calculated from the above formula, for given values of PaO₂(SL) in the range of 60 to 80 mm Hg and FEV1 from 30 to 100 percent predicted can be found in Table 11 (Dillard et al., 1989). If the PaO₂(SL) is above 80 mm Hg, the patient probably does not need oxygen for travel.

Table 11. Predicted In-flight PaO₂ Based on PaO₂ at Sea Level and FEV1

FEV1 % Predicted		100	90	80	70	60	50	40	30
PaO ₂ at sea level	80	56.2	54.9	52.7	50.9	49.2	47.4	45.7	44.9
	70	51.6	49.9	48.1	46.4	44.6	42.9	41.1	39.4
	60	47.1	45.4	43.6	41.9	40.1	38.4	36.6	34.9

Dillard et al., 1989

EVIDENCE TABLE

	Evidence	Source	QE	Overall Quality	R
1	Patients with COPD during flight may develop severe hypoxemia or symptoms and right heart failure resulting in urgent requests for oxygen and can affect morbidity and mortality.	Christensen et al., 2000 Dillard et al., 1991 Speizer et al., 1989	II-b	Fair	C
2	Predicting PaO ₂ at altitude from PaO ₂ at ground level.	Dillard et al., 1989; 1993: 1995	II-b	Fair	C
3	LTOT patients should increase flow by one to 2 liter/minute during flight.	Gong, 1992	II-b	Fair	C

QE = Quality of Evidence; R = Strength of Recommendation (See Appendix A)