Long Term Oxygen Therapy: Issues and Answers

Robert McCoy BS RRT FAARC
What is Oxygen Therapy?

Oxygen therapy is the administration of oxygen at concentrations greater than that in ambient air (20.9%) with the intent of treating or preventing the symptoms and manifestations of hypoxia.\(^1\)
Oxygen: Drug or Device?

• Oxygen is a medical gas and should only be dispensed in accordance with all federal, state, and local laws and regulations.
Why Give Oxygen?

Long-term oxygen therapy (LTOT) in the home or alternate site health care facility is normally indicated for the treatment of hypoxemia.²,³
Benefits of Long Term Oxygen Therapy (LTOT)

LTOT has been shown to significantly improve survival in hypoxemic patients with chronic obstructive pulmonary disease (COPD).\textsuperscript{4,5}

- LTOT has been shown to reduce hospitalizations and lengths of stay.\textsuperscript{6,7}
Indications for the use of LTOT

PaO2 ≤ 55 mm Hg or SaO2 ≤ 88% in subjects breathing room air or PaO2 of 56-59 mm Hg or SaO2 or SpO2 ≤ 89% in association with specific clinical conditions (e.g., cor pulmonale, congestive heart failure, erythrocythemia with hematocrit >56).\textsuperscript{8,9}
Ideal Prescription

- Assess the patients needs at all activity levels (rest, exercise, sleep)
- Titrate the oxygen delivery to a saturation above 90% at all activity levels
- Monitor for consistent oxygenation
The Current Business of LTOT

• Home oxygen therapy is process driven
• Reimbursement is focused on the delivery and availability of oxygen in the home
• There is no reimbursement focused on effective patient oxygenation with improved outcome

......................... until now
MedPac Recommendations Fully Endorsed in Health Care Reform

Healthcare Reform Proposals include:

- Hospital Value Based Purchasing: holdback of a portion of admission charges if rehospitalized for *any diagnosis*
- Bonus payments for inpatient improvement
- Bundled payment for Hospital & Primary Practice ACOs
- Disease management focus with payers drives quality bonuses (HEDIS/PQRS) & enrollment incentives.
- Pilot programs & Demos funded by CMS

Jencks: “Such proposals will radically change the accountability of hospitals for patients’ outcomes after discharge.”
Private Payer COPD Analysis: 
$23M Spent on COPD, 14,000 Patients

Klingensmith data for Western PA

• Hospital inpatient spending is 52% of total COPD spend, driven by 9% of the patients.
  – 70% of Readmits occur in first 90 days.
  – 33% of rehospitalized patients were readmitted 3-11 times.

• Outpatient services concentrated on physician procedures, yet few quality measures implemented.
  – 14% of patients are staged using spirometry as recommended by ATS/ERS GOLD guidelines.

• Hospital discharges fail to identify risk, and most do not have a transition plan.
  – 24% of discharges to HHA/SNF, account for 38% of readmits.
Home Oxygen Therapy

- Poorly assessed
- Poorly prescribed
- Poorly administered
- Poorly monitored

Yet still the most effective drug in improving survival for chronically hypoxic patients
Overview

• Patients requiring long term oxygen therapy (LTOT) must have access to clinically effective home oxygen equipment that is adaptable to their needs outside the hospital

• Oxygen is a drug that requires an appropriate prescription, an effective delivery system, therapeutic dosing and monitoring for effective therapy. Economics and patient demands are a secondary consideration to providing effective oxygen therapy

• Oxygen equipment does not accomplish effective oxygen therapy, it is only a tool used by a knowledgeable individual to accomplish oxygenation objectives
February issue of the Journal Health Affairs

- Researchers analyzed data from about 33,000 patients in Minnesota and found that the average health care costs of those with the highest levels of motivation, knowledge, skills and confidence to manage their own health care were 8 percent to 21 percent lower than those with the lowest levels.

- "The study highlights the important role that patients play in determining outcomes," study leader Judith Hibbard, a professor emerita in the planning, public policy and management department at the University of Oregon, said in a university news release.

- "We found that patients who were more knowledgeable, skilled and confident about managing their day-to-day health and health care -- also called patient activation -- had health care costs that were substantially lower than patients who lacked this type of confidence and skill," she explained.
Evolution of Home Oxygen Equipment
Home Oxygen Equipment Evolution

- Continuous flow (CF), 99% pure oxygen
- CF 90% pure oxygen
- Intermittent flow (IF), 99% pure oxygen
- IF, 90% pure oxygen
- Limited minute volume production, IF, Portable oxygen concentrator (POC), 85% pure oxygen
- Acclimation to limitations?

Less than 90%, IF, limited gas production

Slow acceptance of limitations allow for acclimation
Two different Therapy Environments
Equipment Capabilities

Hospital - Basic

Home - Complex
Metering Oxygen to the Patient

Continuous Flow (CF)  Intermittent flow (IF)
Oxygen Delivery Fundamentals

McCoy R. Oxygen Conserving Techniques and Devices. Respir Care 2000;45(1): 95-103
Oxygen Delivered in 1 Breath

2 lpm O₂ = 33 mL/sec
10 lpm O₂ = 167 mL/sec
0.2 x 167 = 33 mL

0.2 sec

Oxygen Conserving Device have Changed the Understanding of Oxygen Delivery

Bliss PL, McCoy RW, Adams AB Characteristics of Demand Oxygen Delivery Systems: Maximum Output and Setting Recommendations Respir Care 2004;49(2) 160-165
Oxygen Equipment Labeling

- Standardized, clear, concise information readily available for oxygen equipment
- For Intermittent Flow (IF) devices – 2 on the dial does not equate to 2 liter per minute
Hypoxic Drive

• Myth or reality?
• What is the evidence?
• What is the reality?
• Who does it effect?
• What you should do if the subject comes up
Home Equipment Options

Gas, LOX, Concentrator and Hybrids
Compressed Oxygen Gas
Liquid Oxygen (LOX)
Oxygen Concentrator Gas – Liquefied to Fill LOX Portable
Stationary Oxygen Concentrators
Oxygen Concentrator Trans-fill to Compressed Gas Cylinder
Continuous Flow Capable (3L/min) Portable Oxygen Concentrators (POC)
Intermittent Flow Only Portable Oxygen Concentrators (POC)

Dr. Petty suggested that “Practical portable concentrators should weigh no more than 10 pounds, produce 90% or more oxygen and provide a least 2 L of oxygen for a minimum of 4 hours”. This suggestion came at an AARC Journal conference in 2000.

Petty TL. Historical Highlights of Long Term Oxygen Therapy. Respir Care 2000;45(1):29-36
Maximum Oxygen Dose Delivered per Breath at Various Rates

- Central Air
- Eclipse 3
- EverGo
- FreeStyle
- iGo
- Inogen One
- LifeChoice
- LifeStyle
- Solo2
- XPO2

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FIO2% at Maximum Pulse Setting for POCs

- Central Air
- Eclipse 3
- EverGo
- FreeStyle
- iGo
- Inogen One
- LifeChoice
- LifeStyle
- Solo2
- XPO2

BPM:
- 15 BPM
- 20 BPM
- 25 BPM
- 30 BPM

FIO2%
Device Related Saturation Shortfalls Uncovered During Rehab Visits

Gaps Between Titration Settings at Discharge vs. Titration on Home Device

- 40% No Change
- 60% Oxygen Saturation <90%
- 60% of Patients required change
  - 20% Adjusted Setting
  - 40% Need New Device

Premier pulmonary rehab reviewed 65 patients post discharge:
- Treadmill test to evaluate ability of home device to meet 90% saturation goal.
- 60% did not meet target: 20% needed setting adjusted upward; 40% could not be titrated at any setting (replaced device).

Why are patients sent home on sub-standard device?

Source: Changes in Supplemental Oxygen Prescription in Pulmonary Rehabilitation, Limberg et al, Resp Care Nov 06; Vol 51 (11), pg 1302.
Therapeutically Effective Oxygen Therapy at all Activity Levels

Availability, feasibility and economics of home oxygen equipment

Physicians, clinicians, payers, patients and providers all lost in the home oxygen equipment Bermuda triangle of conflicting objectives for LTOT

Patients physical, emotional and societal capabilities to use oxygen equipment with normal activities of daily living
Oxygen Equipment Needs to Allow Patients to do Activities of Daily Living (ADL)
Thank You

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6. Petty TL, Bliss PL. Ambulatory oxygen therapy, exercise and survival with advanced COPD (the nocturnal oxygen therapy trial revisited). Respir Care 2000;45(2):204-213.