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Respiratory Drug Delivery Philips Home Healthcare Solutions

Choosing a Home Oxygen System

Many considerations arise when selecting a long-term oxygen therapy (LTOT) system for a patient. The focus of this article is to increase clinicians' knowledge of the clinical and opera-

tional differences of LTOT systems so they are able to match those systems to the needs of the patient appropriately. While choices for stationary systems are limited, a multitude of choices exist for portability. Each LTOT patient has his or her own unique needs; therefore, not all of these systems are right for each patient.

Prior insurance approval is generally required for coverage, with most private plans following Medicare guidelines. Medicaid oxygen guidelines vary from state to state. Medicare requires that certain clinical and laboratory criteria be met to qualify a patient for oxygen. In general, laboratory criteria must provide documentation of hypoxemia (ie, $PaO_2 \le 55 \text{ mm Hg or } SaO_2 \le 88\%$ in subjects breathing room air). If the laboratory criteria for hypoxemia are not met, then additional clinical qualifiers (eg, cor pulmonale, congestive heart failure, pulmonary hypertension, or erythrocythemia) are required.

As part of the qualification, the prescribing physician must complete a certificate of medical necessity (CMN). The CMN requires the documentation of an oxygen prescription, but it does not require the physician to specify the type or brand of oxygen equipment. In most cases, the home medical equipment (HME) provider will match the capabilities of the stationary and portable devices to the patients' needs and abilities. Oxygen requirements may change over time. Patients should be re-evaluated periodically while using their home portable system.

Stationary Systems

Liquid Oxygen (LOX) Reservoirs – Oxygen, which is normally a gas, becomes a liquid when stored at a very low temperature. Liquid oxygen is stored in a large insulated liquid reservoir system and it converts to a gas through a controlled evaporation system.

Oxygen Concentrator – Concentrators are electrically powered devices that separate oxygen from the other gases in room air. They deliver oxygen concentrations of \geq 90%, which is considered clinically equivalent to 100% oxygen.

Table	1.	LTOT	Stationary	Systems	Comparisons
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	Oxygen Concentrator	LOX Reservoirs
Cost	Low <i>Cost to Consumer–</i> Monthly electricity costs increase	High – Requires storage transportation, and other special handling by the HME provider <i>Cost to Consumer</i> – Operation does not require electricity
Reliability	Good A backup battery- operated system or compressed gas cylin- der required for power failure	Good
Liter Flow	Up to 10 LPM	Up to 15 LPM
Maintenance or Service	No filling required Minimal maintenance and service	Filling required every 7-10 days New <i>low loss systems</i> are subject to less evaporation and require less frequent filling
Operation	Noisy	Virtually quiet

Portable Systems

A portable system is defined as an oxygen system that weighs less than 10 pounds and can provide a minimum of 4 hours of oxygen therapy.

Compressed Gas Cylinders (CGC) – Small CGC coupled with an oxygen conserver are the most prevalent form of ambulatory oxygen. They are also used as a backup system for individuals who use electrically powered concentrators. Oxygen concentrators with external pressure boosters may be used to transfill (or refill) certain portable oxygen cylinders with pressurized concentrated oxygen.

Common CGC – Capacities and Weights

	M2	M4(A)	M6(B)	M9(C)	D	Е
Capacity (liters)	34	113	164	255	425	680
Weight (pounds)	0.7	1.6	2.2	3.7	5.3	7.9

Oxygen Conserving Devices (OCD) – Oxygen conserving device systems deliver oxygen to the patient during inhalation only, thus conserving the oxygen that would otherwise be wasted during exhalation. Continuous flow devices deliver oxygen throughout the entire breathing cycle. This consumes oxygen at a more rapid rate, which reduces the amount of time a patient

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Table 2 – LTOT Portable Systems Comparisons

	CGC	POC	Portable LOX
Liter Flow Requirements	High flow oxygen possible but requires a larger cylinder	Continuous flow oxygen (up to 3 LPM) on larger concentrator	Best choice for high flow oxygen
			Some of the larger portable units offer up to 15 LPM
Mode of Delivery (continuous or oxygen conserver)	Continuous and oxygen conserver mode	Integrated oxygen conserver on all models	Continuous and integrated oxygen conserver on all models
	Conserver is separate system added to CGC	Continuous mode not available on all models	Settings – \leq 4 LPM with oxygen conserver, \geq 6 LPM continuous flow
Activity (inactive, moderately active, or highly active)	Device of choice for nonambulatory patient that requires backup unit	Moderately active patient – lightweight POC	Moderately active patient – lightweight LOX
	Various sizes available to meet needs of moderate– highly active patient	Highly active patient – POC that offers longer duration	Highly active patient – LOX that offers longer duration
Travel Considerations (mode of travel and frequency)	Not approved by FAA	FAA approval of some POCs for use while in flight	Not approved by FAA
		Best choice for frequent air travelers	
Ease of Use (consider patient and caregiver strength, dexterity, and cognitive ability)	Transfill system requires dexterity and time to fill	Easy to use Touch-screen operation minimizes dexterity issues	Filling requires strength and dexterity
			Risks – If the portable is overfilled it may temporarily freeze to the stationary system
			Burns to the skin if the patient touches the cold fill ports
Operation Consideration	Operation – Quiet, no electricity required	Operation – Noisy when running on AC	Operation – Quiet, no electricity required
	Transfill system will require electricity	Other options, DC and battery	

can spend away from his or her stationary unit. Oxygen conserving devices are coupled with portable devices to reduce the weight of portable systems and increase their duration. Many makes and models of OCDs are available, but there are 2 general classifications: Pulse Dose Oxygen Delivery Systems (PDOD) and Demand Oxygen Delivery Systems (DOD).

Oxygen conserving device settings are depicted by numbers, but they are not equivalent to the settings on continuous systems. Continuous flow systems deliver oxygen in L/min and OCD systems deliver oxygen as a bolus (volume of gas) in mL/breath. To add to the confusion, product performance standardization is lacking. A setting on one OCD is not equivalent to the same setting on another OCD. Oxygen conserving devices have other performance characteristics such as trigger sensitivity and response time, which may affect the response and delivery of oxygen to the patient. Due to these differences and because not all patients can be effectively oxygenated with an OCD, titrating the patient on the specific portable and conserver combination to determine the setting that provides adequate oxygenation is important. Patients should be evaluated during rest, ambulation, and other activities of daily living.

Portable LOX – Liquid oxygen is transferred from the stationary reservoir system to a small portable LOX system. If you compare a similar size portable LOX with a CGC, more LOX than gas can be stored in the portable.

Portable Oxygen Concentrator (POC) – Portable oxygen concentrators are the newest form of portable oxygen technology, and they have gained popularity in the home oxygen market. When considering a POC, one should investigate the unit's battery life, weight, number of pulse dose settings, and oxygen delivery capacity. These can vary greatly among different models.