Portable Oxygen Concentrators

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Oxygen Concentrators

- Home medical oxygen concentrators were invented in the early-1970s.
- Prior to that era, home medical oxygen therapy required the use of heavy high pressure oxygen cylinders or small cryogenic liquid oxygen systems. Both of these delivery systems required frequent home visits by suppliers to replenish oxygen supplies.
- In the United States Medicare switched from fee-for-service payment to a flat monthly rate for home oxygen therapy in the mid-1980s, causing the durable medical equipment (DME) industry to rapidly embrace concentrators as a way to control costs.

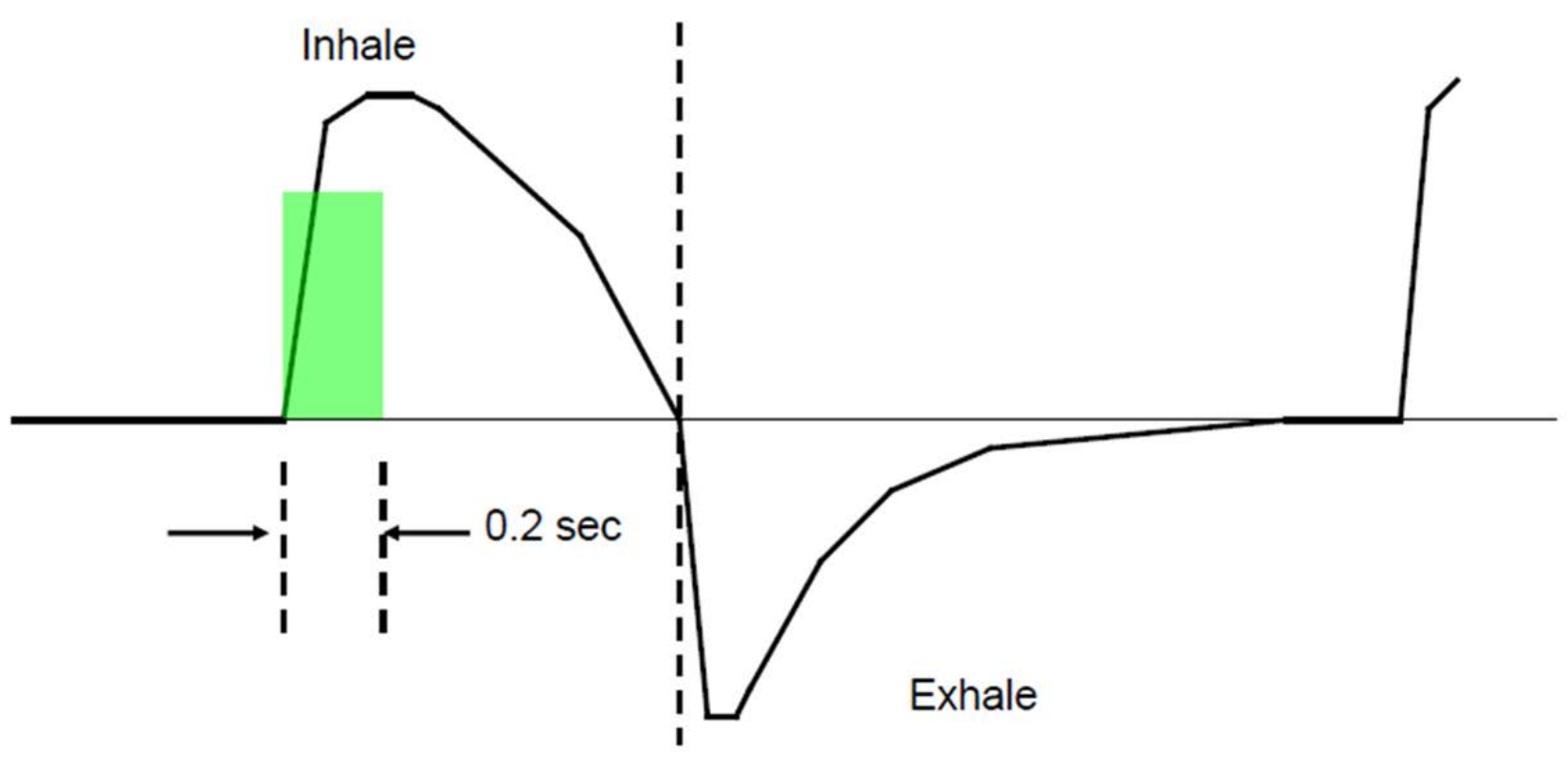
How does it work?

- The concentrator filters out nitrogen from room air while leaving the oxygen.
- Pressure Swing Adsorption
  - Air comes in through the inlet filter where a compressor compresses the air and puts it into the first of two cylinders called a zeolite tower which contains sieve beds. The sieve bed's job is to become saturated by the nitrogen. A valve then opens and then the oxygen is pushed into a second zeolite tower where additional nitrogen is removed while the nitrogen in the sieve bed is released out of the unit. The oxygen, now at around 95% purity, also leaves the unit and travels to the user.

Oxygen Concentrators

- In order to produce large volumes of oxygen, continuous flow models must have very large compressors and very large sieve beds to absorb enough nitrogen.
- How do they work?
  - https://www.youtube.com/watch?v=6h8hsZb-cZg

Oxygen delivery



What is a Portable Oxygen Concentrator (POC)?

- A portable oxygen concentrator (POC) is a portable device used to provide oxygen therapy to chronic patients at greater oxygen concentrations than the levels of ambient air. It is similar to a home oxygen concentrator, but is smaller in size and more mobile.

Differences

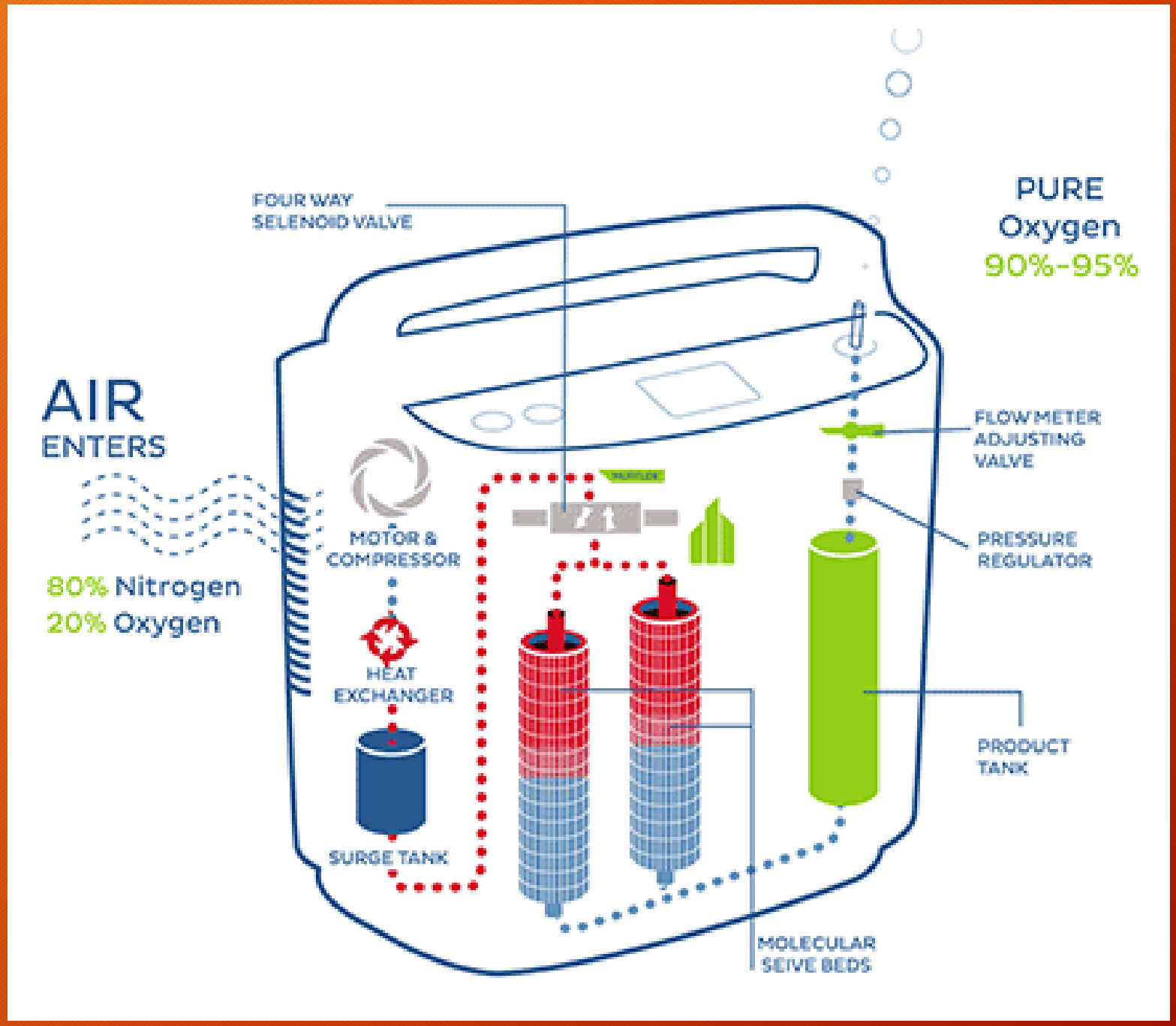
- Weight (1.75 to 20 pounds)
- Dimensions
- 24/7 day/night use
- Pulse versus continuous
- Battery run time
- Battery recharge time
- Power source (AC power, DC power or a rechargeable battery)
- Warranty

Differences

- Most are FAA approved for airline travel (22)
- Alarms (low oxygen purity, no breath, high breath rate, no flow, low battery, depleted battery alerts, general malfunction)
- Can be expensive or can rent ($3,000-$4,000)

Buy stock ☺

- The annual market for portable oxygen concentrators was at $242.5 million in 2012 and is expected to rise to $1.9 billion by year 2019. The growth is attributable to new competitors coming into the market, demand for the lighter technology by consumers, and the need of greater mobility support for the elderly. The competition is expected to drive innovation, resulting in lighter units and lower prices.


AIR
ENTERS
80% Nitrogen
20% Oxygen
FOUR WAY
SELENOID VALVE
MOTOR &
COMPRESSOR
HEAT
EXCHANGER
SURGE TANK
MOLECULAR
SEIVE BEDS
PRODUCT
TANK
PRESSURE
REGULATOR
FLOW METER
ADJUSTING
VALVE
PURE
Oxygen
90%-95%

Continuous flow

- Continuous flow units put out a specific adjustable dose measured in lpm
- Limit is 3 lpm
- Oxygen purity approximately 90%

Pulse flow

- The oxygen put out by pulse units cannot be measured the same since it does not produce constant oxygen for one minute.
- The output of a pulse unit is determined by the size of the individual pulse (fixed bolus volume), milliliters per minute (fixed minute volume) and the patient's respiratory rate.
- Maximum setting is 6 (NOT LPM)

Fixed minute volume

- This method of oxygen delivery establishes a predetermined volume of oxygen that will be produced for each POC setting over the course of a minute.
- The bolus amount delivered per breath is mathematically determined by the breathing rate (minute volume ÷ breathing rate).
- Since the amount of oxygen produced per minute remains steady as the breathing rate increases, the amount of oxygen delivered per breath becomes smaller. Conversely, as your breathing rate decreases, the bolus size gets larger.

Fixed bolus volume

- This method of oxygen delivery uses a predetermined bolus size that is calculated for each POC setting. Regardless of breathing rate, the POC delivers the same bolus volume per breath for the given setting.
- At very high breathing rates, some fixed bolus POCs may experience a drop in the oxygen purity because the total volume of oxygen being delivered in the course of each minute exceeds the production capacity for the specific setting.

Pulse flow

- Another difference between pulse units is the purity of the oxygen and when and how the bolus is released.
- In some cases the bolus is released immediately when it senses a breath, and in other cases it is spread out longer or occurs later in the breathing cycle.
- All of this affects how a patient is saturated with oxygen. If the bolus is released late and he/she are taking short breaths, some of the oxygen could be wasted.

FAA Approved Portable Oxygen Concentrators that offer a Continuous Flow

- SeQual Eclipse
- DeVilbiss Healthcare iGo
- O2 Concepts OxLife Independence
- Invacare Solo 2
- SeQual Saros
- Philips Respironics SimplyGo

FAA Approved Portable Oxygen Concentrators that DO NOT offer a Continuous Flow, Pulse Only Devices

AirSep FreeStyle

AirSep LifeStyle

Oxus Portable Oxygen Concentrator

Inogen One

Inogen One G2

Inova Labs Life Choice

Invacare XPO2

Philips Respironics EverGo

AirSep Focus

AirSep FreeStyle 5

Inogen One G3

Inova Labs Lifechoice ActiveOx

Precision Medical EasyPulse

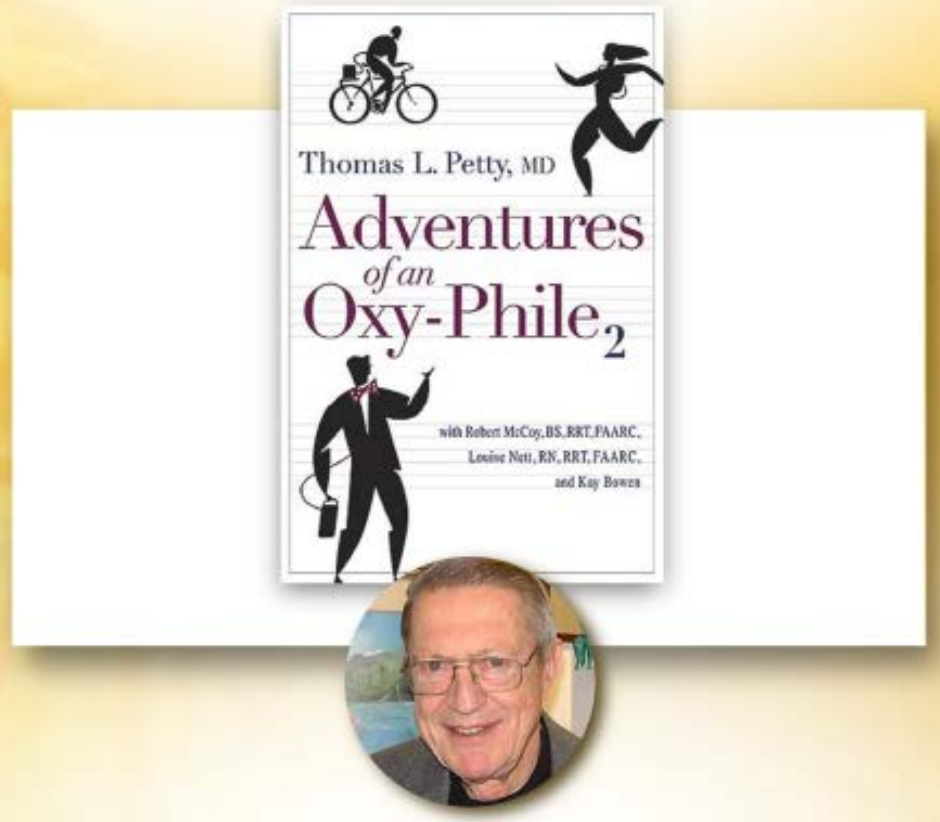
Free Audiobook

The American Association for Respiratory Care
as a long-time friend and colleague of the late

Dr. Thomas Petty

is both honored and privileged to provide his final book,

**"Adventures of an Oxy-Phile2,"
in audiobook format**



@ www.aarc.org/go/nd1

Additional Oxygen Resources

are available online via the AARC's journal, Respiratory Care.

Visit the AARC's journal, Respiratory Care @

http://rc.rcjournal.com/content/58/1.toc

Access The 50th Respiratory Care Journal Conference OXYGEN SPECIAL ISSUE.

Co-Chairs Richard D Branson MSc RRT FAARC and John E Heffner MD

QUESTIONS?

An Update on Medications used for COPD


ALBUTEROL NEB
CURES EVERYTHING EXCEPT STUPIDITY

FDA approved in 1999

- Proventil HFA Inhalation Aerosol (SABA); 3M Pharmaceuticals; Treatment or prevention of bronchospasm (SABA), Approved June 1999.

FDA approved in 2000

- Advair [fluticasone propionate (ICS) and salmeterol (LABA) taken BID]; GlaxoSmithKline; For the treatment of asthma and chronic obstructive pulmonary disease , Approved August 2000.

FDA approved in 2001

- DuoNeb (albuterol sulfate and ipratropium bromide); Dey Laboratories; For the treatment of bronchospasm associated with COPD, Approved March 2001.
- Foradil Aerolizer (formoterol fumarate inhalation powder – LABA taken BID); Novartis; Bronchodilator for COPD, asthma and bronchospasm, Approved February 2001 (asthma, bronchospasm); September 2001 (COPD)
- Ventolin HFA (albuterol sulfate inhalation aerosol - SABA); GlaxoSmithKline; For the treatment or prevention of bronchospasm, Approved April 2001.

FDA approved in 2003

- Zemaira (alpha1-proteinase inhibitor); Aventis Behring; For the treatment of alpha1-proteinase inhibitor deficiency (Alpha-1) and emphysema, Approved July 2003.

FDA approved in 2004

- Spiriva HandiHaler (tiotropium bromide - long-acting, 24-hour, anticholinergic bronchodilator); Boehringer Ingelheim; For the treatment of bronchospasm associated with chronic obstructive pulmonary disease, Approved February 2004.

FDA approved in 2006

- Brovana (arformoterol tartrate – twice daily LABA); Sepracor; For the treatment of Chronic Obstructive Pulmonary Disease, Approved in October 2006.

FDA approved in 2011

- Arcapta (indacaterol maleate inhalation powder – LABA taken once daily); Novartis; For the treatment of airflow obstruction resulting from chronic obstructive pulmonary disease, Approved July 2011.
- Daliresp (roflumilast); Forest Pharmaceuticals; For the treatment of chronic obstructive pulmonary disease to reduce the risk of exacerbations in patients with severe COPD associated with chronic bronchitis and a history of exacerbations, Approved February 2011.

FDA approved in 2012

- Rayos (prednisone) delayed-release tablets; Horizon Pharma; For the treatment of certain inflammatory diseases, including arthritis, COPD, asthma and psoriatic conditions, Approved July of 2012.
- Tudorza Pressair (aclidinium bromide inhalation powder – LAMA taken BID); Forest Laboratories; For the maintenance treatment of bronchospasm associated with chronic obstructive pulmonary disease, Approved July 2012.

FDA approved in 2013

- Anoro Ellipta [umeclidinium (LAMA) and vilanterol inhalation powder (LABA) taken once daily]; GlaxoSmithKline; For the maintenance treatment of chronic obstructive pulmonary disease, Approved December of 2013.
- Breo Ellipta [fluticasone furoate (ICS) and vilanterol inhalation powder (LABA) one inhalation daily]; GlaxoSmithKline; For the treatment of chronic obstructive pulmonary disease, Approved May 2013.

FDA approved in 2014

- Incruse Ellipta (umeclidinium inhalation powder – LAMA taken once daily); GlaxoSmithKline; For the treatment of chronic obstructive pulmonary disease, Approved May 2014.
- Striverdi Respimat (olodaterol – ultra LABA taken daily); Boehringer Ingelheim; For the treatment of chronic obstructive pulmonary disease , Approved July 2014.

FDA approved in 2015

- Stiolto Respimat [tiotropium bromide (LAMA) and olodaterol (LABA) two puffs daily]; Boehringer Ingelheim; For the maintenance of chronic obstructive pulmonary disease, Approved May 2015.
- Utibron Neohaler [indacaterol (LABA) and glycopyrrolate (LAMA) BID at the same time each day]; Novartis; For the long term, maintenance treatment of airflow obstruction in patients with COPD, Approved October 2015.

FDA approved in 2016

- Bevespi Aerosphere [glycopyrrolate (LAMA) and formoterol fumarate LABA) taken BID]; AstraZeneca; For the treatment of chronic obstructive pulmonary disease, Approved April 2016.
- Co-Suspension Technology uses porous, low-density phospholipid particles, which are designed to form a uniform suspension inside a pressurized metered-dose inhaler (pMDI) and distribution of drug crystals throughout the lungs for release at their sites of deposition.

Now in research

- A clinical research study of fluticasone furoate a synthetic corticosteroid (FF), vilanterol an ultra-LABA (VI) and umeclidinium bromide a LAMA (UMEC) for the treatment of COPD - administered once-daily in the morning via a dry powder inhaler in subjects with Chronic Obstructive Pulmonary Disease.
- The study evaluates the efficacy of (FF/UMEC/VI) to reduce the annual rate of moderate and severe exacerbations compared with dual therapy of FF/VI or UMEC/VI in subjects with COPD.


That's all Folks!