Health problem addressed

Oxygen concentrators provide supplementary oxygen for patients with chronic obstructive pulmonary disease (COPD) and, in higher concentrations, for severe chronic hypoxemia and pulmonary edema. They may be used as an adjunct treatment for severe sleep apnea (in conjunction with a continuous positive airway pressure unit). Oxygen concentrators are typically used as stationary sources to provide long-term oxygen therapy (LTOT) to patients at home.

Product description

Oxygen concentrators consist of a cabinet that houses the compressor and filters; tubing; a nasal cannula and/or face mask. Portable units will additionally include an AC and/or DC charger, and a battery.

Principles of operation

The concentrator draws in room air and passes it through a series of filters that remove dust, bacteria, and other particulates. In the first step of the concentration process, a compressor forces air into one of the two cylinders containing sieve material, where nitrogen is adsorbed, leaving concentrated oxygen and a small percentage of other gases found in room air. Simultaneously, in the other cylinder, nitrogen is desorbed and exhausted into the atmosphere. In the second step, the function of the cylinders is reversed in a timed cycle, providing a continuous flow of oxygen to the patient.

Operating steps

• The concentrator is properly set up by an expert.
• Unit is plugged in to a power source, turned on, and the oxygen flow is adjusted as prescribed by a doctor.
• A nasal cannula or mask is applied to the patient.
• The concentrator is used for the prescribed amount of time, typically continuously for days or weeks at a time.

Reported problems

Oxygen concentrators may fail to produce therapeutic levels of oxygen because of common problems involving the air-intake system, malfunctioning sieve-control valves, and contaminated sieve materials. Water vapor in room air can compromise the adsorption of nitrogen in the sieve beds by entering through small leaks in the internal tubing; if sufficient water vapor contaminates the sieve beds once again, the gas delivered will be room air. Patients may suffer irritation from nasal cannulae. Because excess oxygen enhances and accelerates combustion, extreme care must be taken to avoid using the concentrator near combustible materials and sources of ignition. A reserve compressed-oxygen tank and regulator should always be available in case of a power failure.

Use and maintenance

User(s): Patients; patient family members; clinicians (e.g., home care nurses or respiratory therapists)

Maintenance: Biomedical engineering staff and/or service contract with the manufacturer or third-party organization; OEM servicers

Training: Supervised training with experienced users and operator’s manuals

Environment of use

Settings of use: Home; hospital; nursing home

Requirements: Stable power source

Product specifications

Approx. dimensions (mm): 584 x 330 x 292 for stationary units; 216 x 152 x 305 for portable units
Approx. weight (kg): 19.5 for stationary units; 4.5 for portable units

Consumables: Filters; tubing; nasal cannulae; face masks

Price range (USD): 1,100-4,000 (2,300 typical) for stationary units; 3,995-5,700 (5,000 typical) for portable units

Typical product life time: 8 years

Shelf life (consumables): NA

Types and variations

• Stationary
• Portable