

# Oxygen concentrator-driven bubble CPAP

Country of origin | United Kingdom

## Health problem addressed

In 2011, 1.8 million children under five died from respiratory complications, most in developing countries. CPAP (Continuous Positive Airway Pressure), a form of oxygen therapy for respiratory distress, could save many infants and preterm babies. However, the cost of conventional CPAP is prohibitive in poor countries; as a result it is often unavailable, even in lifesaving situations.

## Product description

Treatment of serious breathing difficulties requires the continuous delivery of a mixture of oxygen and air to the lungs. This device generates and delivers a safe, easily controllable mixture of humidified oxygen and air for CPAP treatment. It is driven by an oxygen concentrator that generates oxygen from atmospheric air, eliminating the need for expensive cylinders of compressed gases. The device delivers flows of up to 8L/min of both oxygen and air. Pressure in the system is controlled by a bubble bottle that depends on the depth of tubing under water, and is set by a simple dial on the bottle top. An oxygen/air mixing chart provided means there is no need for an oxygen analyzer.

## Developer's claims of products benefits

Most CPAP devices available are designed for use in resource-rich countries and are inappropriate for low-resource settings. A few devices have been designed to make CPAP more widely available in low-resource settings, but these still require an external oxygen source, making them expensive to run. This device is unique in being driven by its own oxygen concentrator, a cost-efficient method of generating oxygen. This makes it possible to deliver low-cost reliable CPAP treatment in low-resource or remote areas where gas cylinders are not an affordable or practical option. The model of oxygen concentrator used in this CPAP device was selected for its durability and performance in tests. The device is robust, simple to operate and requires only minimal maintenance.



## Suitability for low-resource settings

The device is intended for use in low-income countries and remote areas where gas cylinders are expensive and difficult to transport. The device needs no compressed gases, It delivers both oxygen and air at 8 L/min and costs just 70 pence per day. Equivalent use of compressed gas costs £70 per day. It delivers safe, affordable, reliable CPAP.

## Operating steps

Plug in and run oxygen concentrator. Fill the bubble bottle with boiled, cooled water and connect the breathing circuit. Adjust the level of CPAP required using a simple dial control on the bottle. Flow of air and oxygen can be seen in the bottle as bubbles in the water. Connect nasal prongs or mask to the patient and continue to monitor signs of respiratory distress.

## Regulatory status

The oxygen concentrator and CPAP system incorporated in this device have CE mark and FDA approval. The device is provided by an ISO 13485 registered company.

## Future work and challenges

The device will be demonstrated at forthcoming exhibitions and conferences in Africa, Asia and the Middle East. Peer reviewed clinical trials are underway in Papua New Guinea. Intention is to co-author papers for publication in peer-reviewed journals.

## Use and maintenance

**User:** Physician, nurse

**Training:** Not required. Device comes with a manual with full instructions for operation and maintenance. It has successfully been used by medical staff, without any additional special training, in low-resource settings in rural hospitals in Kenya, Papua New Guinea, Sierra Leone, the Solomon Islands and Uganda.

**Maintenance:** Minimal maintenance by nurse/physician or technician

## Environment of use

**Settings:** Rural, urban settings, primary (health post, health center), secondary (general hospital), tertiary (specialized hospital)

**Requirements:** The device requires a stable electricity supply to run. Nasal prongs and tubes are reusable and autoclavable, thus they need to be sterilized between patients. Boiled water for the bubble bottle valve is required.

## Product specifications

**Dimensions (mm):** 390 x 440 x 840

**Weight (kg):** 26

**Consumables:** None

**Life time:** > 5 years

**Shelf life:** > 5 years

**Retail Price (USD):** 2400

**List price (USD):** 2400

**Other features:** Mobile, reusable

**Year of commercialization:** 2012

**Currently sold in:** Sold in the United Kingdom for use in Afghanistan, Congo, Kenya, Malawi, Papua New Guinea, Sierra Leone, Solomon Islands, Uganda.

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