

Portable Oxygen Concentrators

Clinical Evidence Summary



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Patient Use Patterns of Portable Oxygen Concentrators

Glezer et al. Patient use patterns of portable oxygen concentrators. Pulmonary Therapy 2024;10(1):123-132.



Study Design

A retrospective analysis was conducted to assess portable oxygen concentrator (POC) usage among patients who used an Inogen One G5 POC in the United States.

This study aimed to:

- describe the patterns of use of POCs,
- analyze their compatibility to the prescribed oxygen therapy settings, and
- demonstrate the contribution of POC usage to get a standardized long-term oxygen therapy (LTOT).

Data from Inogen One G5 POCs was analyzed; data was obtained directly from devices returned for service or at the end of rental period, from data streamed via the mobile application, and from customer support/reimbursement eligibility assessments.

POC USERS ARE MOBILE

42%

OF THE TIME WHEN USING BATTERY POWER.



Read the full study

<https://link.springer.com/article/10.1007/s41030-024-00252-4>

Results

The average POC daily usage was 4.29 hours.

- Slightly higher use on weekends.
- Over half of the patients used their POC at night.
- Most patients used their POC in multiple sessions during the day.

STUDY HIGHLIGHTS

- Data collected from this study showed that **patients frequently take advantage of POC portability**, being mobile almost 42% of the time when using battery power.
- Patients used their POCs when mobile and at rest.
- The battery and car charger may be indicative of patient mobility, displaying a higher BPM than while powered by a wall outlet.
- In addition to being ambulatory with their POCs, some patients adjusted their flow rate settings when switching between a mobile or non-mobile status.

Health and Economic Impact of Different Long-Term Oxygen Therapeutic Strategies in Patients with Chronic Respiratory Failure

A French Nationwide Health Claims Database 2 (SNDS) Study.
 Stanislav Glezer, Gregoire Mercler, Jean-Marc Coursler, Nicoleta Petrica, Marla Pini, Abhijith Pg
 Pulmonary Therapy, 2024. doi: 10.1007/s41030-024-00259-x

Objective

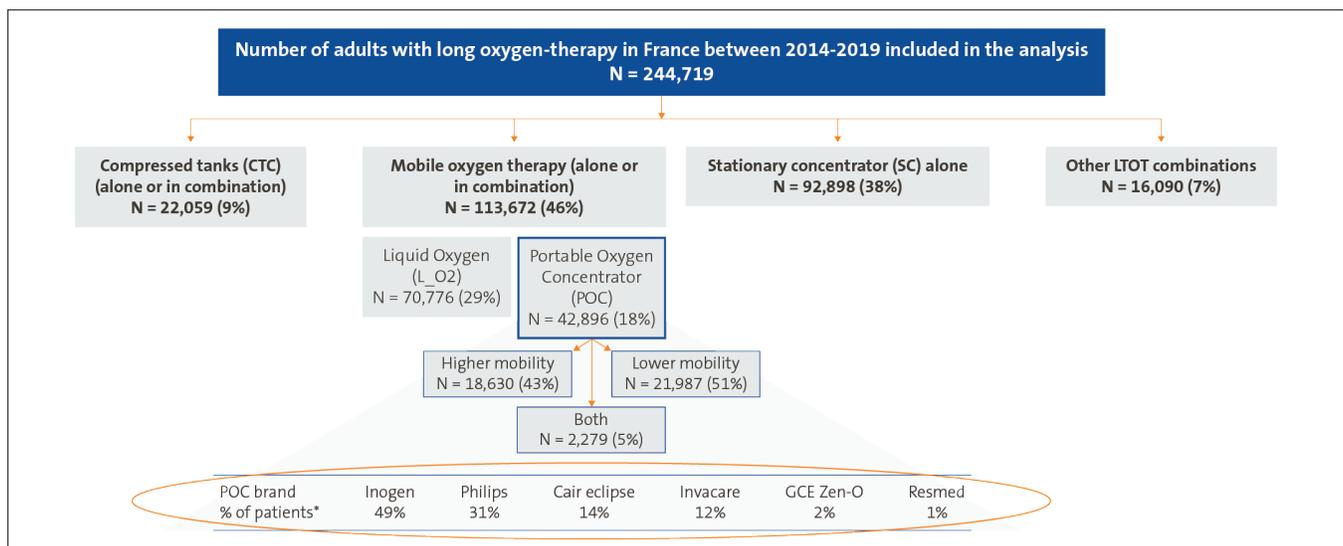
The primary objective of this study was to evaluate the health impact of Long-Term Oxygen Therapy (LTOT) according to the different oxygen-delivery strategies in patients treated for CRF due to COPD or other causes. The secondary objective was to estimate and compare cost-effectiveness of POCs based on the different level of autonomy.

Introduction

Long-term oxygen therapy (LTOT) is reported to improve survival in patients with chronic respiratory failure. We aimed to describe effectiveness, burden, and cost of illness of patients treated with portable oxygen concentrators (POC) compared to other LTOT options.

Methods

This retrospective comparative analysis included adult patients with chronic respiratory insufficiency and failure (CRF) upon a first delivery of LTOT between 2014 and 2019 and followed until December 2020, based on the French national healthcare database SNDS. Patients using POC, alone or in combination, were compared with patients using stationary concentrators alone (aSC), or compressed tanks (CTC) or liquid oxygen (LO2), matched based on age, gender, comorbidities, and stationary concentrator use.



Study Results

Among 244,719 LTOT patients (mean age 75 ± 12, 48% women) included, 38% used stationary concentrators, 46% mobile oxygen in the form of liquid oxygen (29%) and POC (18%), whereas 9% used compressed tanks. The risk of death over the 72-month follow-up was estimated 13%, 15%, 12% lower for patients in the POC group compared to stationary concentrators, compressed tanks, and liquid oxygen, respectively. In the POC group yearly mean total costs per patient were 5% higher and 4% lower compared to stationary concentrators and compressed tank groups, respectively, and comparable in the liquid oxygen group. The Incremental Cost-Effectiveness Ratio (ICER) of POC was €8,895, €6 288, and €13,152 per year of life gained compared to stationary concentrators, compressed tanks, and liquid oxygen, respectively.

STUDY HIGHLIGHTS

- First of its kind and largest study with an observed population of 244,719; possibly the first large study (n>150) evaluating the cost effectiveness of POC, used either alone or in combination, compared to other oxygen-delivery solutions.
- **Better survival and lower mortality were associated with the POC and HM groups.**
 - o POC (alone or in combination) was better than other modalities (stationary concentrator, tank, liquid).
 - o HM group (higher mobility/POC device battery run time greater than 5 hours, i.e., Inogen device) better than LM group (lower mobility/POC device battery run time less than 5 hours, i.e., non-Inogen device).
- **Healthcare costs were lower or comparable for the POC group compared to other modalities;** costs for the HM group were lower than the LM group; only applicable to Europe.
- **POCs, used alone or in combination, were cost-effective compared to stationary concentrator, tank, and liquid oxygen;** only applicable to Europe, based on the incremental cost-effectiveness ratio (ICER).

Considerations

- This was a retrospective observational study of the SNDS claims database, not a prospective clinical trial.
- This was an analysis of the French healthcare system; cost results do not apply to other countries.
- The analysis included a very large number of patients.
- The POC group was POC in combination with other modalities, not just POC alone.
- In the paper, “treated” = POC-equipped patients and “control group” = other modalities; groups are named by the index/first LTOT prescription and, with the exception of stationary concentrators, includes the modality alone and/or in combination with others (stationary concentrator is the only group that received only stationary concentrators).
- Propensity score matching was utilized to adjust for other factors (age, gender and comorbidities); this normalized baseline characteristics.
- Differentiation of the HM/Higher mobility and LM/Lower mobility groups was determined by POC device battery run time, i.e., HM = higher mobility/autonomy POC and LM = lower mobility/autonomy POC.
- **Of note, in the HM/Higher mobility group only Inogen devices were detected in the SNDS database,** as they were the ones approved for reimbursement within France during the study period.
- Cost data are only applicable to the French healthcare system and market.
- The effects seen were NOT a result of only POCs or only Inogen POCs.



Read the full study

<https://link.springer.com/article/10.1007/s41030-024-00259-x>

Contemporary Portable Oxygen Concentrators and Diverse Breathing Behaviors

A Bench Comparison by Martin

Pulm Med. 2019 Nov 19;19(1):217. doi: 10.1186/s12890-019-0980-x



Background

Decades of clinical research into pulsed oxygen delivery has shown variable efficacy between users, and across a user's behaviours (sleep, rest, activity). Modern portable oxygen concentrators (POCs) have been shown as effective as other oxygen delivery devices in many circumstances. However, there are concerns that they are not effective during sleep when the breathing is shallow, and at very high respiratory rates as during physical exertion. It can be challenging to examine the determinants of POC efficacy clinically due to the heterogeneity of lung function within oxygen users, the diversity of user behaviour, and measurement issues.

Results

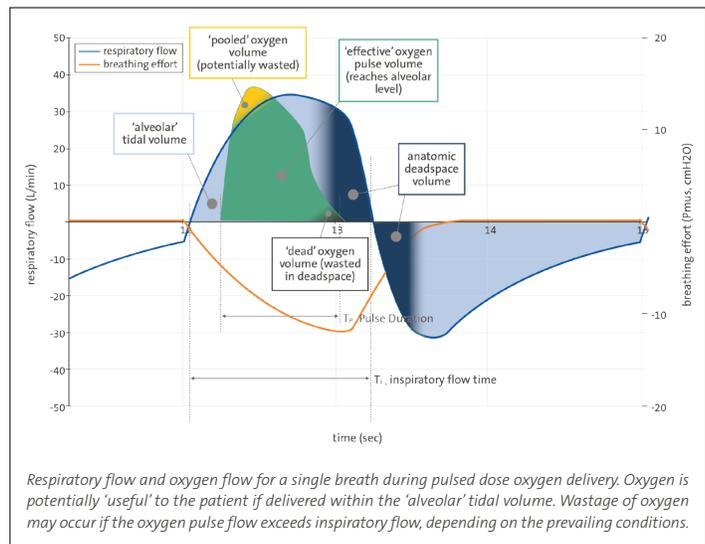
Three contemporary devices (Inogen One G3, ResMed Mobi, and Philips Respironics SimplyGo Mini) were bench-evaluated across three simulated breathing behaviors: activity, rest, & oronasal breathing during sleep. Emphasis was placed on breathing patterns representative of oxygen users.

The results are supportive of contemporary POC triggering abilities. **All three POCs performed well during simulated breathing during exertion and at rest.**



Read the full study

<https://pubmed.ncbi.nlm.nih.gov/31744499/>



STUDY HIGHLIGHTS

- Bench testing of these three contemporary POCs during vigorous breathing and at rest revealed all devices showed excellent pulse alignment at all POC settings.
- The exertion scenario confirms the devices successfully track dynamically changing breath rates up to the highest rate simulated.
- Success as a single device will depend on the confidence that pulsed oxygen delivery is efficacious across the breadth of patient breathing behaviors.

Long Term Domiciliary Oxygen Therapy in Chronic Hypoxic Cor Pulmonale Complicating Chronic Bronchitis and Emphysema

Report of the Medical Research Council Working Party
Lancet. 1981 Mar 28;1(8222):681-6. PMID: 6110912.

Study Design

This trial was planned to determine if oxygen, given for 15 hours in a day, over a three year period, could reduce mortality and improve exercise tolerance and working capacity.

The 87 patients, all under 70 years of age, who took part had chronic bronchitis or emphysema with irreversible airways obstruction, severe arterial hypoxaemia, carbon dioxide retention, and a history of congestive heart failure.

Patients in the treatment group received oxygen for at least 15 h a day, given by nasal prong, at a flow rate of 2 l/min, or at a higher flow rate if this was necessary to achieve a PaO₂ > 60 mm Hg.

Results

Supplemental oxygen use improved survival: compared with 40 of the 45 controls, over the three-year period of the trial, 19 of the 42 patients who received oxygen died. In the longer term survivors, it would appear that long term oxygen therapy prevented progression of the fall in PaO₂ and in the rate or rise of pulmonary vascular resistance, without provoking further rise in PaCO₂.

STUDY HIGHLIGHTS

- Indicators such as **general improvement in the sense of wellbeing, improved appetite, and general alertness** were frequently found in those patients treated with domiciliary oxygen.
- Patients were not bed bound and many showed **considerable gains in both social and physical mobility**, many insisting that oxygen had made all the difference to their lives.
- LTOT decreases mortality among patients who have COPD and severe resting hypoxemia.



Read the full study

<https://pubmed.ncbi.nlm.nih.gov/6110912/>



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