Reviewer's report

Title: Semi-closed circuit represents a cost-effective way of heliox administration in patients with severe airway obstruction: An economic study

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Reviewer: Stefano Baglioni

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The main aim of this interesting study was to demonstrate that a semi-closed circuit for heliox administration in spontaneously breathing patients reduces cost of heliox therapy significantly to 1/5 compared to the standard way of heliox administration using an open circuit. The economical advantage of semi-closed circuit increase with the number of patient treated, the authors conclude. A custom made semi-closed circuit is more cost-effective then circuits of standard anesthesia machine

Major compulsory revisions

In abstract and in methods the authors did not describe if the four methods of heliox administration are applied in the same patient (case control study) or always in different subjects. In this second case the authors have to explain the characteristics of patients (age, gender, disease, level of respiratory failure). Also the setting of the study is not explicated: ICU, ward (this not a "bench study", I think, because the authors do reference to a previous bench study); this extremely important to understand if the system are suitable in real life in different settings. Are there some differences in clinical effect or unwanted effect or applicability of heliox using the four different systems? The cost–effectiveness is critical if the systems works equally well.

Did the authors find better clinical results with heliox in comparison to other treatment of respiratory failure capable to avoid intubation of patient with airway obstruction, such as noninvasive ventilation and/or aggressive medical therapy.

In Methods, in equation 1 and 2 are not indicated the unit of measure

In table 1 the cost of service is indicated for ten years; is this the service sale for the home country of the authors or is valid also for the other European countries?

Table 2, the characteristics of cylinders on row 1 and 2 are identical but the price is different; is there a mistake? The table must be revised.

Figure 1, bottom, semi-closed circuit, authors refer to custom-made circuit or also to the anaesthesia circuits?

Minor issue

Background: author show a list of different pathologies with airway obstruction but some of that are not treatable with heliox (i.e. tumor or foreign body obstruction) and are not interesting and pertinent for this work.
Row two: asthma bronchiale (probably authors figure bronchial asthma)

In line 81 the authors state: “Heliox is relatively expensive compared to oxygen, but is certainly much less expensive than some other respiratory therapies such as mechanical ventilation and inhaled nitric oxide (NO)” but inhaled NO is used for arterial pulmonary hypertension and not for respiratory failure due to airway obstruction and so the comparation between heliox and NO is not logical, in my opinion. The reference number six is not appropriate in this case because in the work there is not a concern to NO therapy.

In the seven and eight references the authors did not indicate the journal.

Methods: paragraph 8, other paragraphs and table, gasses is incorrect, correct form is gases.

Discussion: this section is too long; a more concise style would be appreciable

**Level of interest:** An article of importance in its field

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests