Introduction:
Acute cardiogenic pulmonary edema is a sudden onset respiratory distress. Its management includes, drug therapy, oxygen and airway support by spontaneous ventilation in continuous positive airway pressure (CPAP). The Boussignac CPAP is powered by pure oxygen, its ´open´ character allows the patient to increase his inspiratory demand himself, which may influence the delivered FiO2, the patient also breathing ambient air with 21% O2. Previous studies assessed the FiO2 delivered by the device under conditions of respiratory distress but did not focus on inspiratory flow. The aim of this study was to measure the FiO2 actually delivered by the device under simulated conditions of respiratory distress.

Methods:
In this benchmark study, FiO2 was measured by varying the respiratory rate (FR, 10 up to 45 / min), tidal volume (Vt, between 150 and 750mL) and inspiratory flow (between 30 and 90L / min) at the target pressure of 8 cmH2 O. The assembly included a Boussignac CPAP fed with 100% O2 via a flowmeter up to 30 L / min, a double Vygon mask sealed, a Vygon manometer, a Michigan test lung driven by a Dräger Evita 4 ventilator, and a Citrex analyzer. Each measurement was done 3 times and the average of the 3 values was retained.

Results:
The O2 flow required to maintain the target pressure of 8cmH2O was ≤ 25L / min. Depending on FR and inspiratory flow, for a Vt ≤ 250mL, the delivered FiO2 ranged between 70 and 99%. For a 350mL ≤ Vt ≤ 500mL, the FiO2 was between 57 and 90%. For a given Vt, FiO2 decreased when FR and/or inspiratory flow were increased (figure).

Conclusion:
The Boussignac CPAP delivered high values of FiO2 at a flow rate of O2 ≤ 30L / min. However, FiO2 varied with FR, Vt and inspiratory flow. These changes in FiO2 observed during simulated severe respiratory distress conditions should be taken into account and compared to other CPAP devices.

References:
Effect of varying RR and inspiratory flow on FiO2 at a Vt of 0.250 L