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**Title:** Humidification of inspired oxygen is increased with a pre-nasal cannula compared to intranasal cannula

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**Body:** Background: Oxygen can be given pre- or intra-nasally  $\pm$  humidification. How this impacts intra-nasal humidity has not been investigated. Objective: To investigate nasal humidity during pre-nasal and intra-nasal oxygen administration with and without humidification. Method: We first developed and validated a sampling and analysis system.

By means of this system we measured nasal humidity in 12 individuals who received nasal oxygen with an intra-nasal and pre-nasal cannula at different flows  $\pm$  humidification. Results: In our subjects intranasal humidity dropped significantly from  $40.3 \pm 8.7$  % to  $35.3 \pm 5.8$  %,  $32 \pm 5.6$  % and  $29.0 \pm 6.8$  % at a flow of one, two and three litres respectively when oxygen was given intra-nasally without humidification ( $p=0.001$ ,  $p<0.001$  and  $p<0.001$  respectively).

We observed no significant change in airway humidity when oxygen was given pre-nasally without humidification. Conclusion: Pre-nasal administration of dry oxygen achieves similar levels of intranasal humidity as intranasal administration in combination with a bubble through humidifier. Pre-nasal oxygen simplifies application and may reduce therapy cost.