

Nasal Dryness Discomfort in Individuals Receiving Dry Oxygen Via Nasal Cannula

The majority of hospitals and home respiratory care companies do not use humidification when delivering oxygen at ≤ 4 L/min or ≤ 5 L/min via nasal cannula, based on the recommendations of 2 guidelines.^{1,2} The American Association for Respiratory Care clinical practice guidelines for oxygen therapy¹ indicate that oxygen supplied to adults via nasal cannula at flows ≤ 4 L/min does not require humidification. The American Thoracic Society statement on the diagnosis and care of patients with chronic obstructive pulmonary disease² mentions a lack of evidence on the need for humidification when oxygen is delivered via nasal cannula at flows ≤ 5 L/min. These guidelines are based on a letter³ that determined the expected excessive water loss from the airway during inhalation of dry oxygen, and also on clinical studies by Estey⁴ and Campbell et al.⁵ Neither study found significant differences in severity of subjective symptoms between dry oxygen inhalation and humidified oxygen inhalation in groups of randomly selected patients.

Since those studies were not crossover trials, the subjects were unable to compare nasal comfort between dry and humidified

oxygen. We therefore wondered whether subjects might notice any difference and thus prefer humidified or dry oxygen. We performed a single-blind crossover trial with 20 healthy volunteers (mean \pm SD age 24 ± 1 y), recruited from students at Hokkaido University, and 18 patients with pulmonary disease (mean \pm SD age 68 ± 3 y) recruited from out-patients at Hokkaido University Hospital, who had no experience with oxygen inhalation.

Subjects inhaled dry and humidified oxygen via nasal cannula for 1 min at flows of 1, 2, 3, 4, and 5 L/min, in random order. After 1 min at a given flow, the subject graded his or her feeling of nasal dryness by marking a 10-cm visual analog scale, which was marked in quarters from 0 to 4 (0 = none, 0.5 = very slight, 1 = slight, 2 = moderate, 3 = severe, 4 = very severe). There was a 1-min rest period between each 1-min trial. This procedure was repeated until the subject had inhaled all 5 oxygen flows both with and without humidification (ten 1-min trials). Each subject underwent 2 sets of this procedure, for a total of twenty 1-min trials. The score sheet had 20 horizontal visual analogue scales: one for each trial. Data from the second set of trials were used for analysis.

Two-way factorial analysis of variance for repeated measures was applied, followed

by a Scheffé post hoc test. For all tests, differences were considered statistically significant when $p < 0.05$.

The study protocol was approved by the university ethics committee of the Hokkaido University School of Medicine, and all subjects provided written informed consent to participate in the study.

The subjects were uninformed about the purpose of this study, to minimize the risk of bias. Throughout the experiments the subjects were blinded to whether the oxygen source had humidification (the device was concealed by a curtain), and listened to music via headphones to promote relaxation and mask sound from the bubble-type humidifier (TO-90-5L, Teijin, Tokyo, Japan). Temperature and humidity in the room were approximately 22–25°C and 43–45%, respectively.

Figures 1 and 2 summarize the subjective nasal dryness ratings. In the young healthy subjects, discomfort was significantly higher with dry oxygen than with humidified oxygen at all flow rates, and the discomfort difference between dry and humidified oxygen was larger at flows ≥ 3 L/min. In contrast, the patient group felt significant differences between the dry and humidified oxygen only at flows ≥ 3 L/min.

All the subjects reported a sensation of gas flow hitting the nasal mucosa during

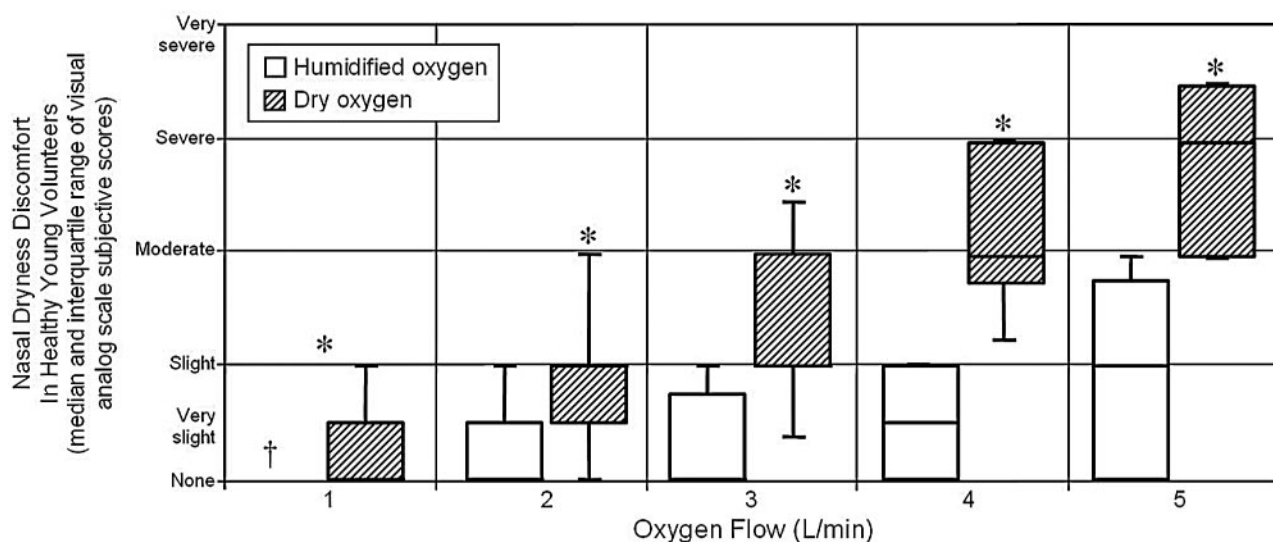


Fig. 1. Subjective (visual analog scale) ratings of nasal discomfort while receiving oxygen via nasal cannula, among young healthy volunteers. At all flow rates discomfort was significantly greater during dry oxygen than during humidified oxygen. * $p < 0.05$ for dry versus humidified oxygen. † With humidified oxygen at 1 L/min, none of the healthy young volunteers felt any nasal dryness discomfort.

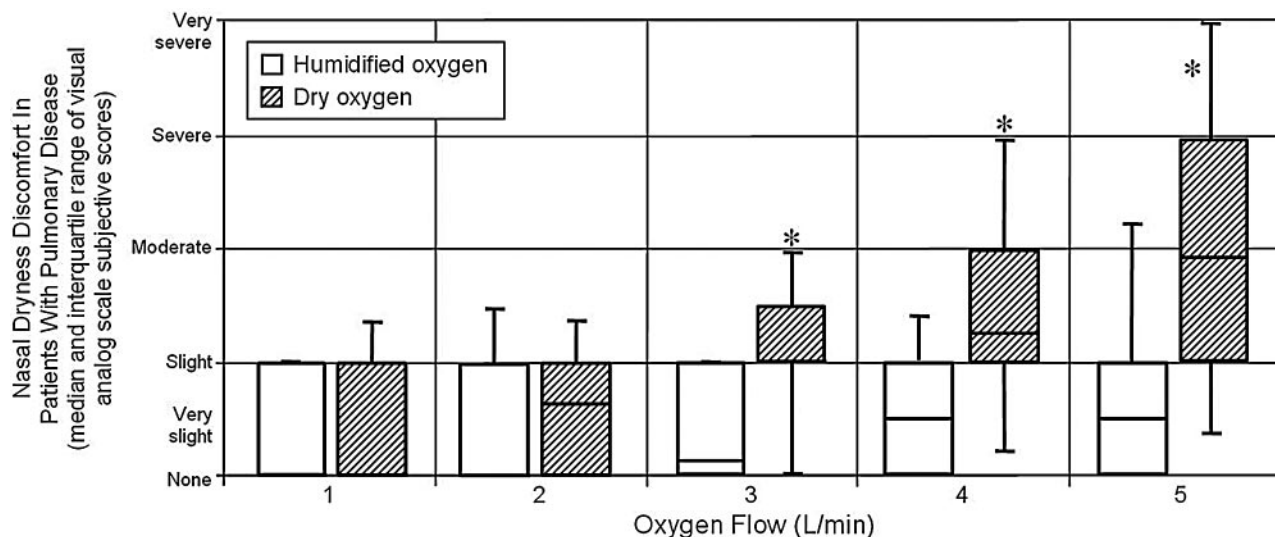


Fig. 2. Subjective (visual analog scale) ratings of nasal discomfort while receiving oxygen via nasal cannula, among patients with pulmonary disease. Only at flows ≥ 3 L/min was discomfort significantly greater during dry oxygen than during humidified oxygen. * $p < 0.05$ for dry versus humidified oxygen.

the second half or end phase of expiration. Only one healthy volunteer reported feeling no nasal discomfort while inhaling dry oxygen; all the other subjects reported some degree of discomfort and irritation. These data clearly demonstrate that humidification of oxygen reduces nasal discomfort that can occur in both young healthy volunteers and older patients with pulmonary disease, particularly at flows ≥ 3 L/min.

Two limitations of this study were that subjects reported their feelings after only 1 min at each oxygen flow, and that the healthy subjects were not in the same age range as the patient subjects. Thus, the differences in nasal dryness discomfort between the groups might be attributable to differences in nasal mucosa from aging or chronic respiratory disease, in addition to any potential differences in the dryness sensation itself.

In conclusion, humidification of oxygen may be worthwhile, based on patient request and/or symptoms when oxygen therapy via nasal cannula is prescribed, even for flows ≤ 4 L/min. Obviously further studies of longer duration are warranted.

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The authors report no conflict of interest related to the content of this letter.

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Vocalization During Huff

This letter is regarding the recent recommendation by James B Fink PhD RRT FAARC, in the September 2007 special issue of *RESPIRATORY CARE* on airway clearance, regarding huff technique.¹

Fink advocated whispering the word “huff” while performing the huff technique. I believe this is not correct and would be detrimental to performing the huff. I am not aware of any authoritative source that advocates the whispered “huff.”^{2,3}

The huff technique was so-named because the sound produced with a properly performed huff was similar to the spoken word “huff.”

Huff is an open-glottis technique, designed to assist mucus clearance in patients who are unable to produce an adequate expiratory expulsive force, and maintaining an unobstructed open glottis is crucial to the technique. Whispering implies vocalization, and vocalization necessitates at least some degree of vocal cord closure, depending on how the act of whispering is performed. Even partial upper-airway closure must be detrimental to huff performance.

In addition, the huff requires the patient to fully focus while doing the expulsive portion of the procedure, and whispering would necessitate some element of distraction, even in well trained patients. Also, the sound of the huff is a valuable signal to both patient and therapist as to the adequacy of the huff performance.

For these reasons the whispered “huff” should not be performed.

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Deane Hillsman MD owns and operates Sierra Biotechnology Company, which manufactures technologies used in respiratory therapy. He reports no other conflicts of interest.