

RESPIRATORY CARE

The Science Journal of the American Association for Respiratory Care

2007 OPEN FORUM Abstracts

PERCEPTIONS OF NON-REBREATHING MASK FIO2 VS. ESTIMATED FIO2 USING THE REVERSE ALVEOLAR AIR EQUATION

K. Moody¹, C. Trippe¹, D. Pursley¹, A. Light¹

Background: We surveyed 38 randomly selected RRTs and RNs and asked them the following question: “What FIO2 does a non-rebreathing mask (NRBM) deliver to a patient’s airway at 12-15 L/m?” The 20 RRTs had an average of 20 years of experience, while the 18 RNs had a mean of 12 years of experience. On average, the RNs said the NRBM gave 96% while the RRTs believed that it gave 84%, with 32 of the respondents answering “90-100%”. However, the reality is that “modern disposable non-rebreathers normally do not provide much more than approximately 70% oxygen” (Wilkins, et al., 2003, p. 840). Because the disposable NRBM is actually a low flow oxygen system, we agree that it delivers a more moderate FIO2 and thought it would be interesting to calculate the estimated FIO2 from the PaO2 of persons breathing oxygen from this device.

Method: We recruited ten healthy, non-smoking, normothermic volunteers between 21-29 years of age and had them breathe oxygen from a NRBM at either 12 L/m or 15 L/m. The subjects were told to relax and breathe normally for a period of fifteen minutes. At the end of the fifteen minute period, we performed a radial artery blood gas and measured PaCO2 and PaO2 using an IL GEM 3000 blood gas analyzer. Assuming our subjects had normal cardiopulmonary anatomy and physiology, we estimated PAO2 by dividing PaO2 by a normal a/A ratio of 0.9 to reflect a 10% higher partial pressure of oxygen in the alveolus than in the arterial blood (Wilkins, et al., 2003, p. 231). Knowing approximate alveolar partial pressure of oxygen, we then calculated FIO2 based on what we call the reverse alveolar air equation:

$$FIO_2 = [(PaO_2 \div 0.9) + (PaCO_2 \cdot 1.25)] \div (PB - 47).$$

Results: Our results indicate that the NRBM delivered an average FIO2 of 0.60 in young, healthy non-smokers. FIO2 varied from 0.53 to 0.71 in our ten subjects.

Conclusion: Contrary to the opinion of the healthcare professionals in our survey, the NBRM tended to deliver more moderate concentrations of oxygen in our young, healthy volunteers. Patients with high minute ventilation placed on a NRBM will theoretically receive an even

lower tracheal FIO2 due to additional dilution of room air with oxygen. In this situation, high flow devices which meet or exceed the patient's inspiratory flow demand may provide a more suitable method of delivery to give high concentrations of oxygen.

Wilkins, et al. (2003). Egan's Fundamentals of Respiratory Care, 8th Edition. Mosby.

Age/Gender	L/M	Height	V _E (L/m)	V _T (mL)	f	P _B (mmHg)	PaO ₂ (mmHg)	PaCO ₂ (mmHg)	Estimated FIO ₂
28/Female	12	5'8"	6.41	712	9	730	292	33	0.53
23/Female	12	5'7"	8.10	810	10	730	299	37	0.55
29/Male	12	6'2"	6.40	582	11	730	301	40	0.56
22/Male	12	5'7"	6.55	595	11	730	316	42	0.59
25/Male	12	5'9"	7.45	497	15	730	293	42	0.55
25/Female	15	5'6"	6.17	560	11	730	396	39	0.71
26/Female	15	5'1"	11.2	800	14	730	397	40	0.71
21/Male	15	6'1"	12.8	853	15	730	304	34	0.55
26/Female	15	5'9"	8.90	890	10	730	335	37	0.61
25/Male	15	6'2"	11.6	967	12	730	349	41	0.64

You are here: [RCJournal.com](#) » [Past OPEN FORUM Abstracts](#) » [2007 Abstracts](#) » [PERCEPTIONS OF NON-REBREATHING MASK FIO2 VS. ESTIMATED FIO2 USING THE REVERSE ALVEOLAR AIR EQUATION](#)

© The Journal RESPIRATORY CARE Company | ISSN: 0020-1324 e-ISSN: 1943-3654

9425 N. MacArthur Blvd., Suite 100, Irving TX 75063 | Tel: 1 972 243 2272 | Fax: 1 972 484 2720

[Contact Us](#) | [Advertise with Us](#)