The picture can't be displayed.

Dräger

This is Ventilation

Evita® V800 and Evita® V600

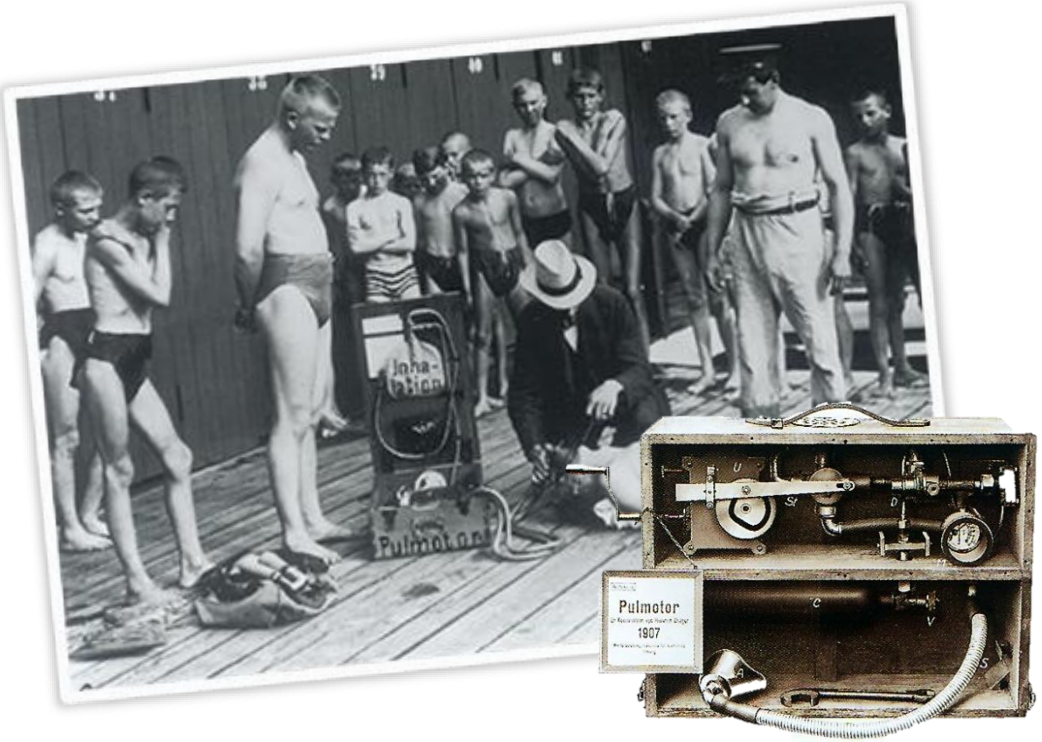
Improving outcomes in Intensive Care

We focus on reducing mortality rates in the ICU, supporting patient outcome and increasing staff satisfaction in the ICU via connected technologies and services that help achieve therapeutic goals faster and safer.

That‘s why we are

Your Specialist in Acute Care

Your Specialist in Acute Care since 1889



1907 |
Pulmotor

The first life-saving ventilator

Today |
Evita V600/V800

Experience the next level of ventilator operation. The Evita® V600/V800 combines high performance ventilation with an aesthetic design enabling quick and efficient operation.

We share …

Improving
clinical outcomes

Managing
cost of care

…

your goals

…

Ensuring
staff satisfaction

Enhancing patient
experience

Our mission – Improving outcomes in Intensive Care

As your specialist in acute care

we focus on reducing mortality rates in the ICU. Supporting patient outcome and increasing staff satisfaction in the ICU via connected technologies and services that help achieve therapeutic goals faster and safer is what drives us.

Only 41%

of patients who are artificially ventilated for at least 14 days, will survive the next year.[1]

Avoid ICU-acquired weakness

Start the weaning process as early as possible to help reduce ventilation time, improve sedation management and optimise patient interaction.
Encourage spontaneous breathing, which helps train of respiratory muscles and start early mobilisation activities.

Avoiding cognitive impairment

Provide a comfortable and supportive environment that helps your patient feel calm and at ease.
Turn the ICU into a healing environment and enable the patient to feel more comfortable in a family-friendly integrated surrounding.

Prevention of VALI / ARDS

Protect the lung with personalised ventilation strategies.
Support spontaneous breathing at any time to provide a seamless transition from controlled ventilation to patient contribution.
Improve clinical results with decision supporting insights from multiple sources.

01

Operation & Handling

Operation & Handling

Clear information on the user interface are key to follow a defined strategy in ventilating a patient.

We support an intuitive operation of our devices which lowers education times and helps to avoid human errors.

Operation & Handling

Quick and safe to operate

Quick and safe to operate even in the most stressful situations due to intuitive menu access to both settings and your clinical data.

Fully recorded

All patient data, alarms and trends are fully recorded. Conveniently exported via USB interface.

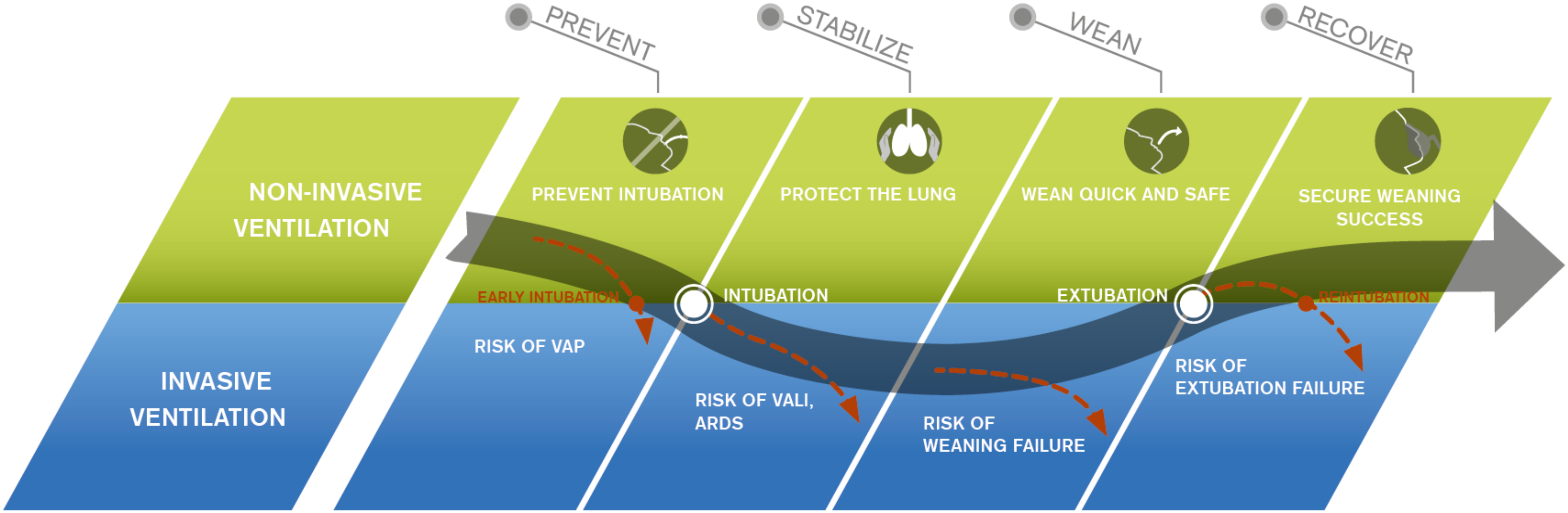
Step-by-step guidance

Step-by-step guidance leads you through every procedure.

Multiple view configurations

Switch between multiple view configurations with the touch of a finger.

Individual protective ventilation therapy along
The Respiration Pathway



As non-invasive as possible, as invasive as necessary: The variability and diversity of our treatment tools for use along the respiration pathway enable you to administer protective mechanical ventilation therapy in your ICU.

02

Safeguarding High-Flow O_2-Therapy

Evita Ventilators – Safeguarding O_2-Therapy

Safeguarding

Our O_2-Therapy function enables a Safeguarding High Flow Therapy as you have the possibility of a **Pmax setting**. A possible exceeding of the set maximum allowed airway pressure is detected early, and **the flow is reduced accordingly**.

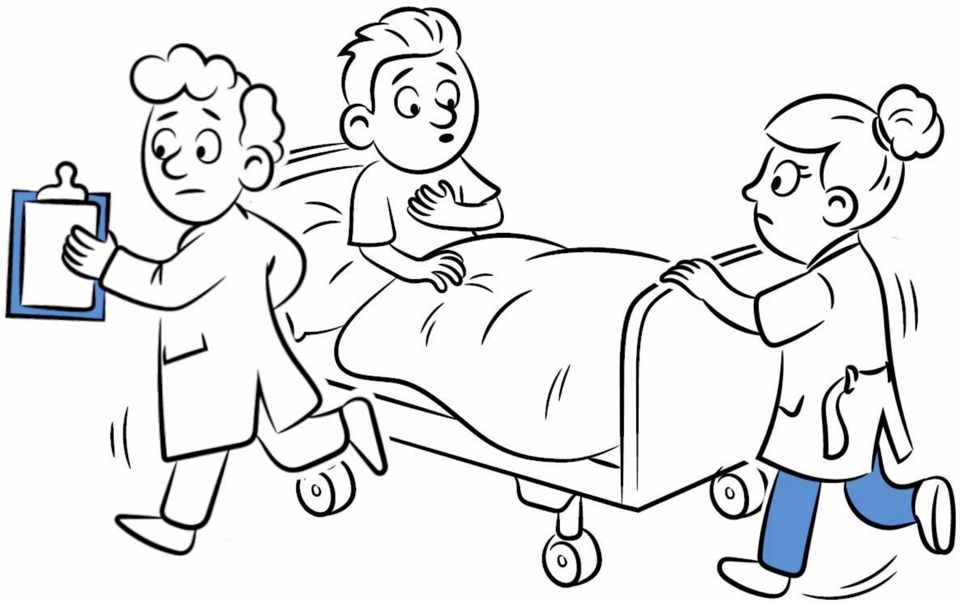
– For all patients

O_2-Therapy (high flow oxygen therapy) is suitable for use as respiratory support for adults, paediatric patients, and neonates who can inhale and exhale spontaneously.

– Seamless transition

By using Dräger ventilators you can conveniently switch your patient between traditional invasive ventilation, non-invasive ventilatory support or HFNC to meet changing needs while still using the same device.

Life-Saving Treatment...



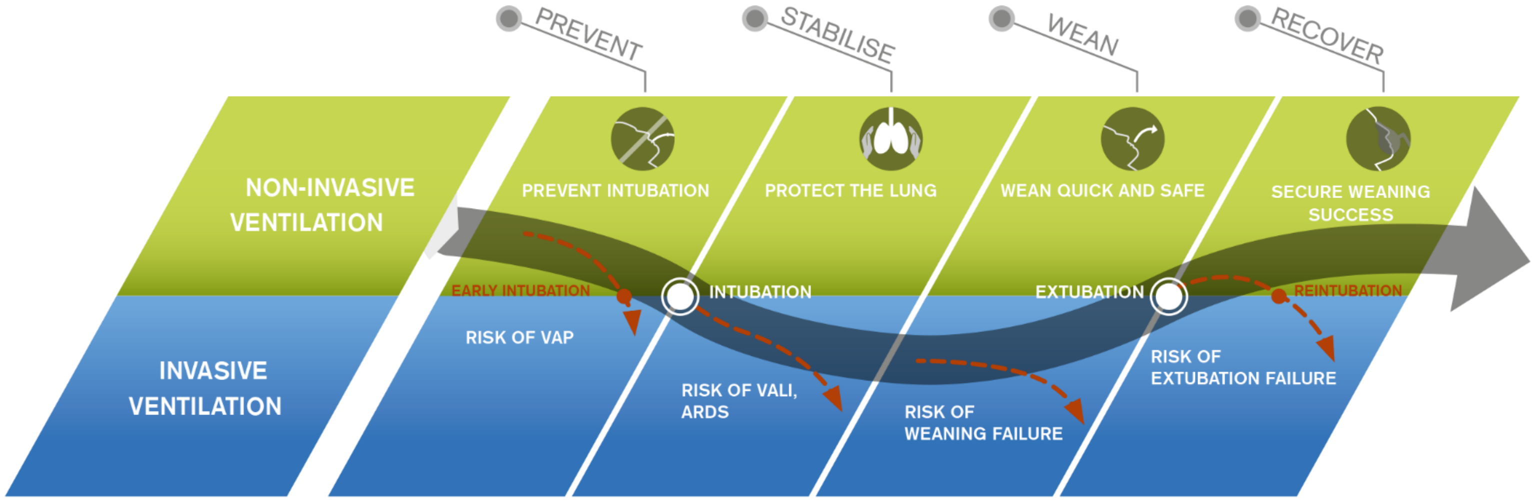
...with High-Flow Oxygen Therapy for All Patient Categories.

The Respiration Pathway

Hi-Flow Star Cannula

The Respiration Pathway

Support whenever you need it



Prevent

Avoiding intubation as long as possible helps to decrease the possibility of patients developing VAP.

Stabilise

Stabilising your patient is crucial to protecting their lungs from potential conditions such as VALI, which could result in ALI or ARDS.

Wean

Weaning your patient efficiently reduces incidences of ALI or ARDS.

Recover

Ensuring successful weaning and avoiding reintubation improves your patient's recovery.

Respiration Pathway

As non-invasive as possible, as invasive as necessary:
Discover the variability and diversity of our treatment tools for use along the respiration pathway. They enable you to administer protective mechanical ventilation therapy in your ICU.

Physiology and Physics of High Flow Oxygen Therapy

Physiology, HFOT provides a consistent and high concentration of warmed, humidified oxygen that meets or exceeds patients' inspiratory flow demands, reducing work of breathing, decreasing dead space, and improving oxygenation by increasing alveolar ventilation.

From a physics perspective, HFOT utilizes principles such as laminar flow to deliver a high and stable flow rate of gas through large-bore nasal cannulas, creating a slight positive airway pressure that helps keep alveoli open, reducing atelectasis and improving gas exchange.

The high flow also flushes carbon dioxide from the upper airway, decreasing rebreathing and dead space, which enhances overall ventilation efficiency.

Literature – FLORALI & Frat et al., 2015

The FLORALI trial (Fluid and Oxygen in Patients with Acute Lung Injury) primarily investigated the effectiveness of high-flow nasal cannula (HFNC) oxygen therapy compared to standard oxygen therapy and non-invasive ventilation in patients with acute hypoxemic respiratory failure.

It found that HFNC was associated with lower intubation rates and improved patient outcomes, especially in cases of moderate hypoxemia.

The study by Frat et al. published in the New England Journal of Medicine 2015. The trial demonstrated high-flow oxygen therapy's effectiveness in reducing intubation rates among patients with hypoxemic respiratory failure, specifically in the context of acute respiratory failure due to pneumonia, cardiogenic pulmonary oedema, or other causes.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 | JUNE 4, 2015 | VOL. 372 NO. 23

High-Flow Oxygen through Nasal Cannula in Acute Hypoxemic Respiratory Failure

Jean-Pierre Frat, M.D., Arnaud W. Thille, M.D., Ph.D., Alain Mercat, M.D., Ph.D., Christophe Girault, M.D., Ph.D., Stéphanie Ragot, Pharm.D., Ph.D., Sébastien Perbet, M.D., Gwénael Prat, M.D., Thierry Boulain, M.D., Elise Morawiec, M.D., Alice Cottereau, M.D., Jérôme Devaquet, M.D., Saad Nseir, M.D., Ph.D., Keyvan Razazi, M.D., Jean-Paul Mira, M.D., Ph.D., Laurent Argaud, M.D., Ph.D., Jean-Charles Chakarian, M.D., Jean-Damien Ricard, M.D., Ph.D., Xavier Wittebole, M.D., Stéphanie Chevalier, M.D., Alexandre Herbland, M.D., Muriel Fartoukh, M.D., Ph.D., Jean-Michel Constantin, M.D., Ph.D., Jean-Marie Tonnelier, M.D., Marc Pierrot, M.D., Armelle Mathonnet, M.D., Gaëtan Béduneau, M.D., Céline Delétage-Métreau, Ph.D., Jean-Christophe M. Richard, M.D., Ph.D., Laurent Brochard, M.D., and René Robert, M.D., Ph.D., for the FLORALI Study Group and the REVA Network*

ABSTRACT

BACKGROUND

Whether noninvasive ventilation should be administered in patients with acute hypoxemic respiratory failure is debated. Therapy with high-flow oxygen through a nasal cannula may offer an alternative in patients with hypoxemia.

METHODS

We performed a multicenter, open-label trial in which we randomly assigned patients without hypercapnia who had acute hypoxemic respiratory failure and a ratio of the partial pressure of arterial oxygen to the fraction of inspired oxygen of 300 mm Hg or less to high-flow oxygen therapy, standard oxygen therapy delivered through a face mask, or noninvasive positive-pressure ventilation. The primary outcome was the proportion of patients intubated at day 28; secondary outcomes included all-cause mortality in the intensive care unit and at 90 days and the number of ventilator-free days at day 28.

RESULTS

A total of 310 patients were included in the analyses. The intubation rate (primary outcome) was 38% (40 of 106 patients) in the high-flow–oxygen group, 47% (44 of 94) in the standard group, and 50% (55 of 110) in the noninvasive-ventilation group (P=0.18 for all comparisons). The number of ventilator-free days at day 28 was significantly higher in the high-flow–oxygen group (24±8 days, vs. 22±10 in the standard-oxygen group and 19±12 in the noninvasive-ventilation group; P=0.02 for all comparisons). The hazard ratio for death at 90 days was 2.01 (95% confidence interval [CI], 1.01 to 3.99) with standard oxygen versus high-flow oxygen (P=0.046) and 2.50 (95% CI, 1.31 to 4.78) with noninvasive ventilation versus high-flow oxygen (P=0.006).

The authors' affiliations are listed in the Appendix. Address reprint requests to Dr. Frat at Centre Hospitalier Universitaire de Poitiers, Service de Réanimation Médicale 2, rue de la Milétrie, CS 90577, 86021 CEDEX Poitiers, France, or at jean-pierre.frat@chu-poitiers.fr.

*A complete list of investigators in the Clinical Effect of the Association of Noninvasive Ventilation and High Flow Nasal Oxygen Therapy in Resuscitation of Patients with Acute Lung Injury (FLORALI) study and the Réseau Européen de Recherche en Ventilation Artificielle (REVA) Network is provided in the Supplementary Appendix, available at NEJM.org.

This article was published on May 17, 2015, at NEJM.org.

N Engl J Med 2015;372:2185-96.
DOI: 10.1056/NEJMoa1503326

Literature – ROX-Index & Christophe Girault et al,. 2024

Recent reviews from 2023–24 emphasize that flow rates in respiratory support devices, such as HFNC, significantly influence treatment effectiveness, with higher flows improving oxygenation and reducing work of breathing.

Christophe Girault et al. published their study on the performance of the ROX index in predicting high-flow nasal oxygen outcomes in COVID-19-related hypoxemic acute respiratory failure in the journal Respiratory Medicine.

> Ann Intensive Care. 2024 Jan 18;14(1):13. doi: 10.1186/s13613-023-01226-6.

ROX index performance to predict high-flow nasal oxygen outcome in Covid-19 related hypoxemic acute respiratory failure

Christophe Girault [1,2], Michael Bubenheim [3], Déborah Boyer [4], Pierre-Louis Declercq [5], Guillaume Schnell [6], Philippe Gouin [7], Jean-Baptiste Michot [8], Dorothée Carpentier [4], Steven Grangé [4], Gaëtan Béduneau [9], Fabienne Tamion [10]

Affiliations + expand

PMID: 38236356 PMCID: PMC10796865 DOI: 10.1186/s13613-023-01226-6

Abstract

Background: Given the pathophysiology of hypoxemia in patients with Covid-19 acute respiratory failure (ARF), it seemed necessary to evaluate whether ROX index (ratio SpO_2/FiO_2 to respiratory rate) could accurately predict intubation or death in these patients initially treated by high-flow nasal oxygenation (HFNO). We aimed, therefore, to assess the accuracy of ROX index to discriminate

Literature – S. Ozckowski, F. Vargas R. Parke

EUROPEAN RESPIRATORY JOURNAL
ERS OFFICIAL DOCUMENTS
S. OCZKOWSKI ET AL.

ERS clinical practice guidelines: high-flow nasal cannula in acute respiratory failure

Simon Oczkowski[1,2,26], Begüm Ergan[3,26], Lieuwe Bos[4,5], Michelle Chatwin[6], Miguel Ferrer[7], Cesare Gregoretti[8,9], Leo Heunks[10], Jean-Pierre Frat[11,12], Federico Longhini[13], Stefano Nava[14,15], Paolo Navalesi[16,17], Aylin Ozsancak Uğurlu[18], Lara Pisani[14,15], Teresa Renda[19], Arnaud W. Thille[11,12], ..., Wolfram Windisch[21], Thomy Tonia[22], Jeanette Boyd[23], Giovanni Sotgiu[2...]

...of Critical Care, McMaster University, Hamilton, ON, Canada. [2]Dept of Health Research Method... ...ersity, Hamilton, ON, Canada. [3]Dept of Pulmonary and Critical Care, Dokuz Eylul Universit... ...Dept of Intensive Care and Laboratory of Experimental Intensive Care and Anesthesiolo... ...Academic Medical Center, Amsterdam, The Netherlands. [5]Respiratory Medicine, Amsterdam U... ...Amsterdam, The Netherlands. [6]Academic and Clinical Department of Sleep and Breathing... ...earch Unit, Royal Brompton and Harefield NHS Foundation Trust, London, UK. [7]Dept of P... ...al Clinic, IDIBAPS, University of Barcelona and CIBERES, Barcelona, Spain. [8]Dept of Surgical, ... of Palermo, Palermo, Italy. [9]G. Giglio Institute, Cefalù, Italy. [10]Dept of Intensive Care Medicine, ...erdam, The Netherlands. [11]Centre Hospitalier Universitaire de Poitiers, Médecine Intensive R... Centre d'Investigation Clinique 1402 ALIVE, Université de Poitiers, Poitiers, France. [13]Ane... ...f Medical and Surgical Sciences, Magna Graecia University, Catanzaro, Italy. [14]Dept of Clinical... (DIMES), Alma Mater Studiorum University of Bologna, Bologna, Italy. [15]IRCCS Azienda ... ...spiratory and Critical Care Unit, Bologna, Italy. [16]Department of Medicine – DIMED, Universit... ...and Intensive Care, Padua University Hospital, Padua, Italy. [18]Dept of Pulmonary Medici... [19]Cardiothoracic and Vascular Department, Respiratory and Critical Care Unit, Careggi Univers... ...de Medicina da Universidade do Porto, Porto, Portugal. [21]Dept of Pneumology, Cologne Merhe... ...GmbH, Witten/Herdecke University, Faculty of Health/School of Medicine, Köln, Germany. ...cine, University of Bern, Bern, Switzerland. [23]European Lung Foundation (ELF), Sheffield, U... Statistics Unit, Dept of Medical, Surgical, Experimental Sciences, University of Sassari, Sa... ...tory Intensive Care Unit, Cardio-Thoraco-Neuro-Vascular Dept, Usl Toscana Sudest, S Dona... ...rs.

Corresponding author: Raffaele Scala (raffaele_scala@h...

Shareable abstract (@ERSpublications)
This guideline provides evidence-based recommendations for the use of high-flow na... alongside other noninvasive forms of respiratory support in adults with acute respira... https://bit.ly/3mgwO8h

Cite this article as: Oczkowski S, Ergan B, Bos L, *et al.* ERS clinical practice guidelines: hig... cannula in acute respiratory failure. *Eur Respir J* 2022; 59: 2101574 [DOI: 10.1183/13993003.0...

Physiologic Effects of High-Flow Nasal Cannula Oxygen in Critical Care Subjects

Frederic Vargas MD PhD, Mélanie Saint-Leger MD, Alexandre Boyer MD PhD, Nam H Bui MD, and Gilles Hilbert MD PhD

INTRODUCTION: High-flow nasal cannula (HFNC) can deliver heated and humidified gas (up to 100% oxygen) at a maximum flow of 60 L/min via nasal prongs or cannula. The aim of this study was to assess the short-term physiologic effects of HFNC. Inspiratory muscle effort, gas exchange, dyspnea score, and comfort were evaluated. METHODS: Twelve subjects admitted to the ICU for acute hypoxemic respiratory failure were prospectively included. Four study sessions were performed. The first session consisted of oxygen therapy given through a high-F_{IO_2}, non-rebreathing face mask. Recordings were then obtained during periods of HFNC and CPAP at 5 cm H_2O in random order, and final measurements were performed during oxygen therapy delivered via a face mask. Each of these 4 periods lasted ~20 min. RESULTS: Esophageal pressure signals, breathing pattern, gas exchange, comfort, and dyspnea were measured. Compared with the first session, HFNC reduced inspiratory effort (pressure-time product of 156.0 [119.2–194.4] cm H_2O × s/min vs 204.2 [149.6–324.7] cm H_2O × s/min, $P < .01$) and breathing frequency ($P < .01$). No significant differences were observed between HFNC and CPAP for inspiratory effort and breathing frequency. Compared with the first session, P_{aO_2}/F_{IO_2} increased significantly with HFNC (167 [157–184] mm Hg vs 156 [110–171] mm Hg, $P < .01$). CPAP produced significantly greater P_{aO_2}/F_{IO_2} improvement than did HFNC. Dyspnea improved with HFNC and CPAP, but this improvement was not significant. Subject comfort was not different across the 4 sessions. CONCLUSIONS: Compared with conventional oxygen therapy, HFNC improved inspiratory effort and oxygenation. In subjects with acute hypoxemic respiratory failure, HFNC is an alternative to conventional oxygen therapy. (ClinicalTrials.gov registration NCT01056952.) *Key words: high-flow nasal cannula; continuous positive airway pressure; oxygen therapy; acute hypoxemic respiratory failure; inspiratory effort.* [Respir Care 2015;60(10):1369–1376. © 2015 Daedalus Enterprises]

British Journal of Anaesthesia **103 (6):** 886–90 (2009)
doi:10.1093/bja/aep280 Advance Access publication October 20, 2009
BJA

Nasal high-flow therapy delivers low level positive airway pressure

R. Parke[1]*, S. McGuinness[1] and M. Eccleston[2]†

[1]Cardiothoracic and Vascular Intensive Care Unit, Level 4, Building 32, Auckland City Hospital, Private Bag 92024, Auckland 1010, New Zealand. [2]Fisher and Paykel Healthcare, 1 Maurice Paykel Place, East Tamaki, Auckland, New Zealand

**Corresponding author. E-mail: rparke@adhb.govt.nz*

Background. The aim of this prospective study was to determine whether a level of positive airway pressure was generated in participants receiving nasal high flow (NHF) delivered by the Optiflow™ system (Fisher and Paykel Healthcare Ltd, Auckland, New Zealand) in a cardiothoracic and vascular intensive care unit (ICU).

Methods. Nasopharyngeal airway pressure was measured in 15 postoperative cardiac surgery adult patients who received both NHF and standard facemask therapy at a flow rate of 35 litre min^{-1}. Measurements were repeated in the open mouth and closed mouth positions. Mean airway pressure was determined by averaging the pressures at the peak of inspiration of each breath within a 1 min period, allowing the entire pressure profile of each breath to be included within the calculation.

Results. Low level positive pressure was demonstrated with NHF at 35 litre min^{-1} with mouth closed when compared with a facemask. NHF generated a mean nasopharyngeal airway pressure of mean (SD) 2.7 (1.04) cm H_2O with the mouth closed. Airway pressure was significantly higher when breathing with mouth closed compared with mouth open ($P \leq 0.0001$).

Conclusions. This study demonstrated that a low level of positive pressure was generated with NHF at 35 litre min^{-1} of gas flow. This is consistent with results obtained in healthy volunteers.

Australian Clinical Trials Registry www.actr.org.au ACTRN012606000139572.

Br J Anaesth 2009; **103**: 886–90

Keywords: airway pressure; nasal high-flow therapy; Optiflow™; oxygen

Accepted for publication: August 18, 2009

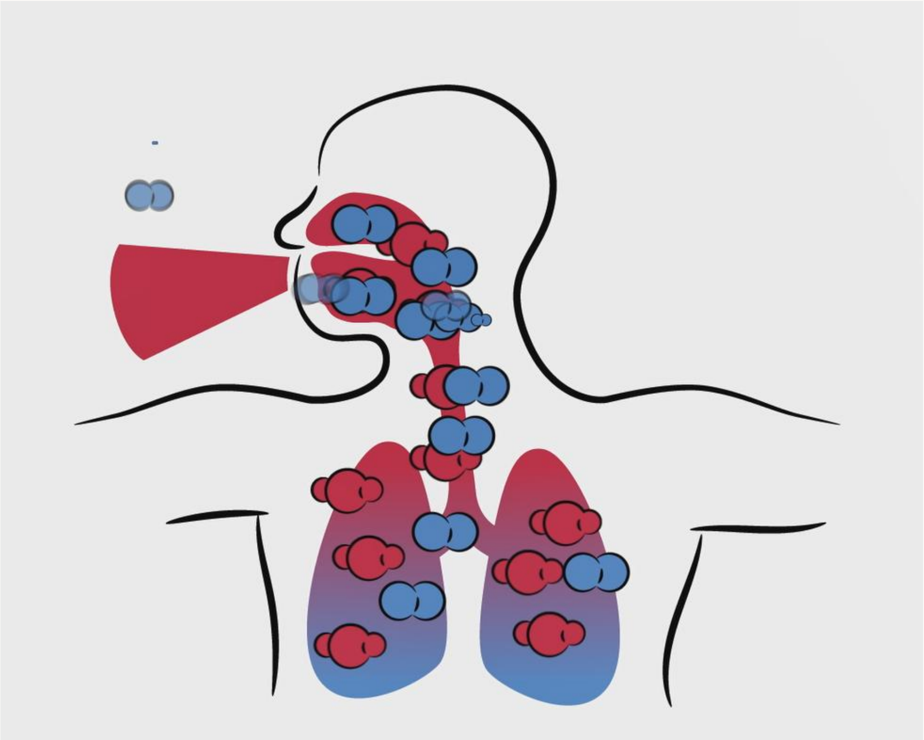
Patients with respiratory failure are typically treated with three main respiratory support strategies, depending on the severity of their illness. These are traditional oxygen therapy, non-invasive ventilation, and invasive mechanical ventilation.[1] A new respiratory support therapy has recently been introduced into the adult arena. NHF allows the delivery of up to 60 litre min^{-1} of heated and humidified gas via a wide bore nasal cannula. However, the been reports that NHF may be beneficial in the treatment of obstructive sleep apnoea, attributable to a flow-related pressure effect.[7] There has been a similar pressure effect reported in healthy adult volunteers[8–9] where a positive relationship between flow and airway pressure has also been described. However, to date there have been no

High-Flow Oxygen Therapy – Mechanisms of action

- Flushing of anatomical dead space
- Reduced work of breathing
- Enhanced humidification:

  Improved mechanisms
  Reduction in the metabolic cost
  Better mucociliary clearance

- Better control of the patient's FiO2
- Positive airway pressure improves alveolar recruitment



Annals of Biomedical Engineering, Vol. 44, No. 10, October 2016 (© 2016) pp. 3007–3019
DOI: 10.1007/s10439-016-1604-8

BMES
BIOMEDICAL ENGINEERING SOCIETY™
www.bmes.org

CrossMark

An Experimental and Numerical Investigation of CO_2 Distribution in the Upper Airways During Nasal High Flow Therapy

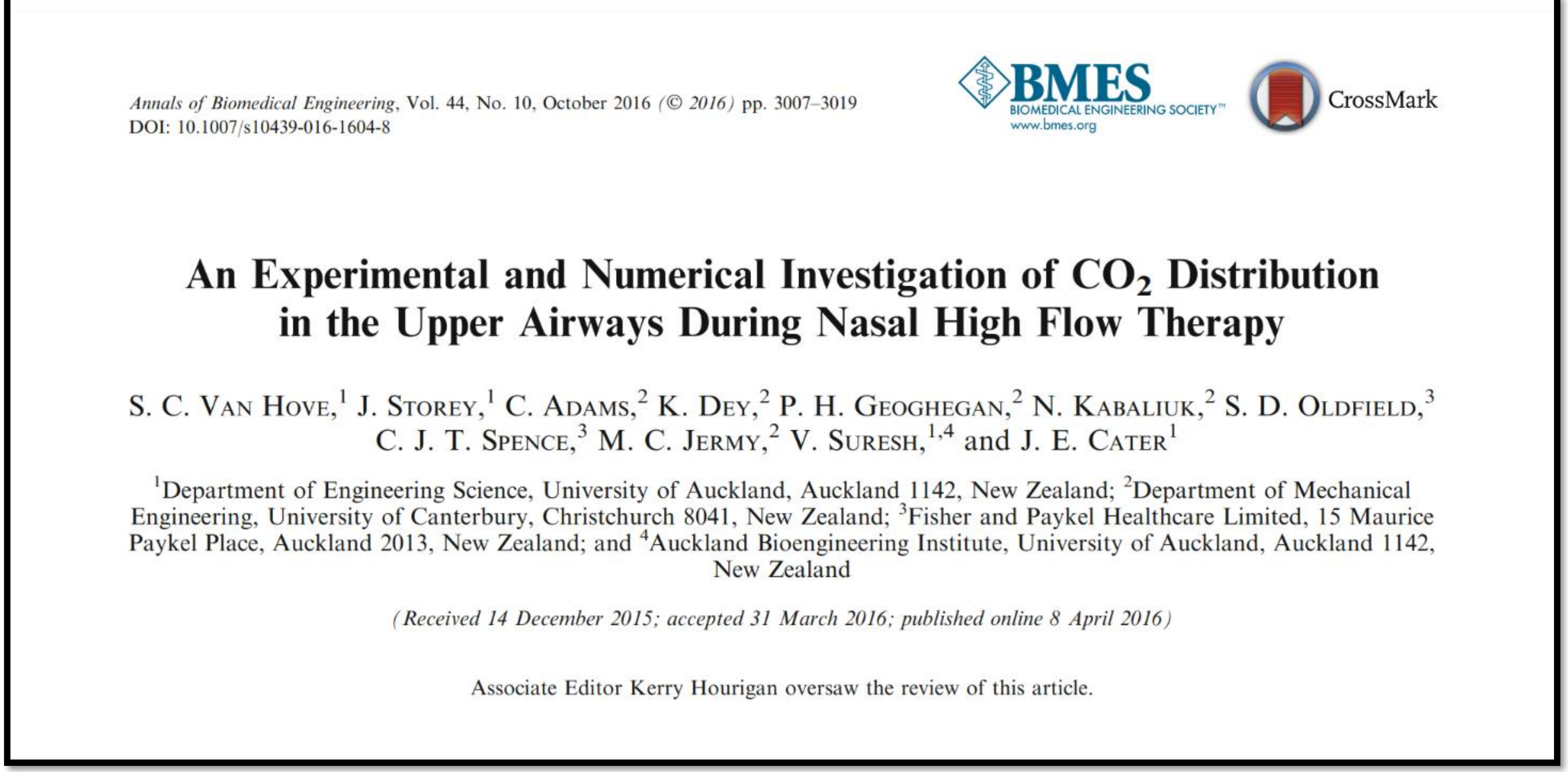
S. C. Van Hove,[1] J. Storey,[1] C. Adams,[2] K. Dey,[2] P. H. Geoghegan,[2] N. Kabaliuk,[2] S. D. Oldfield,[3] C. J. T. Spence,[3] M. C. Jermy,[2] V. Suresh,[1,4] and J. E. Cater[1]

[1]Department of Engineering Science, University of Auckland, Auckland 1142, New Zealand; [2]Department of Mechanical Engineering, University of Canterbury, Christchurch 8041, New Zealand; [3]Fisher and Paykel Healthcare Limited, 15 Maurice Paykel Place, Auckland 2013, New Zealand; and [4]Auckland Bioengineering Institute, University of Auckland, Auckland 1142, New Zealand

(*Received 14 December 2015; accepted 31 March 2016; published online 8 April 2016*)

Associate Editor Kerry Hourigan oversaw the review of this article.

Combines computational modelling and experimental measurements to analyse how nasal high-flow (NHF) therapy influences CO2 clearance in the upper respiratory tract.



Annals of Biomedical Engineering, Vol. 44, No. 10, October 2016 (© 2016) pp. 3007–3019
DOI: 10.1007/s10439-016-1604-8

BMES BIOMEDICAL ENGINEERING SOCIETY™ www.bmes.org

CrossMark

An Experimental and Numerical Investigation of CO_2 Distribution in the Upper Airways During Nasal High Flow Therapy

S. C. Van Hove,[1] J. Storey,[1] C. Adams,[2] K. Dey,[2] P. H. Geoghegan,[2] N. Kabaliuk,[2] S. D. Oldfield,[3] C. J. T. Spence,[3] M. C. Jermy,[2] V. Suresh,[1,4] and J. E. Cater[1]

[1]Department of Engineering Science, University of Auckland, Auckland 1142, New Zealand; [2]Department of Mechanical Engineering, University of Canterbury, Christchurch 8041, New Zealand; [3]Fisher and Paykel Healthcare Limited, 15 Maurice Paykel Place, Auckland 2013, New Zealand; and [4]Auckland Bioengineering Institute, University of Auckland, Auckland 1142, New Zealand

(*Received 14 December 2015; accepted 31 March 2016; published online 8 April 2016*)

Associate Editor Kerry Hourigan oversaw the review of this article.

The research demonstrates that NHF improves CO2 removal by flushing out exhaled gases from the upper airways, thereby reducing dead space and enhancing ventilation efficiency. This mechanistic insight supports the physiological benefits of NHF in promoting better gas exchange, highlighting its role in reducing hypercapnia and improving patient outcomes during respiratory support, as well as informing optimal flow settings for effective therapy.

Velocity Distribution Over Sagital Plane

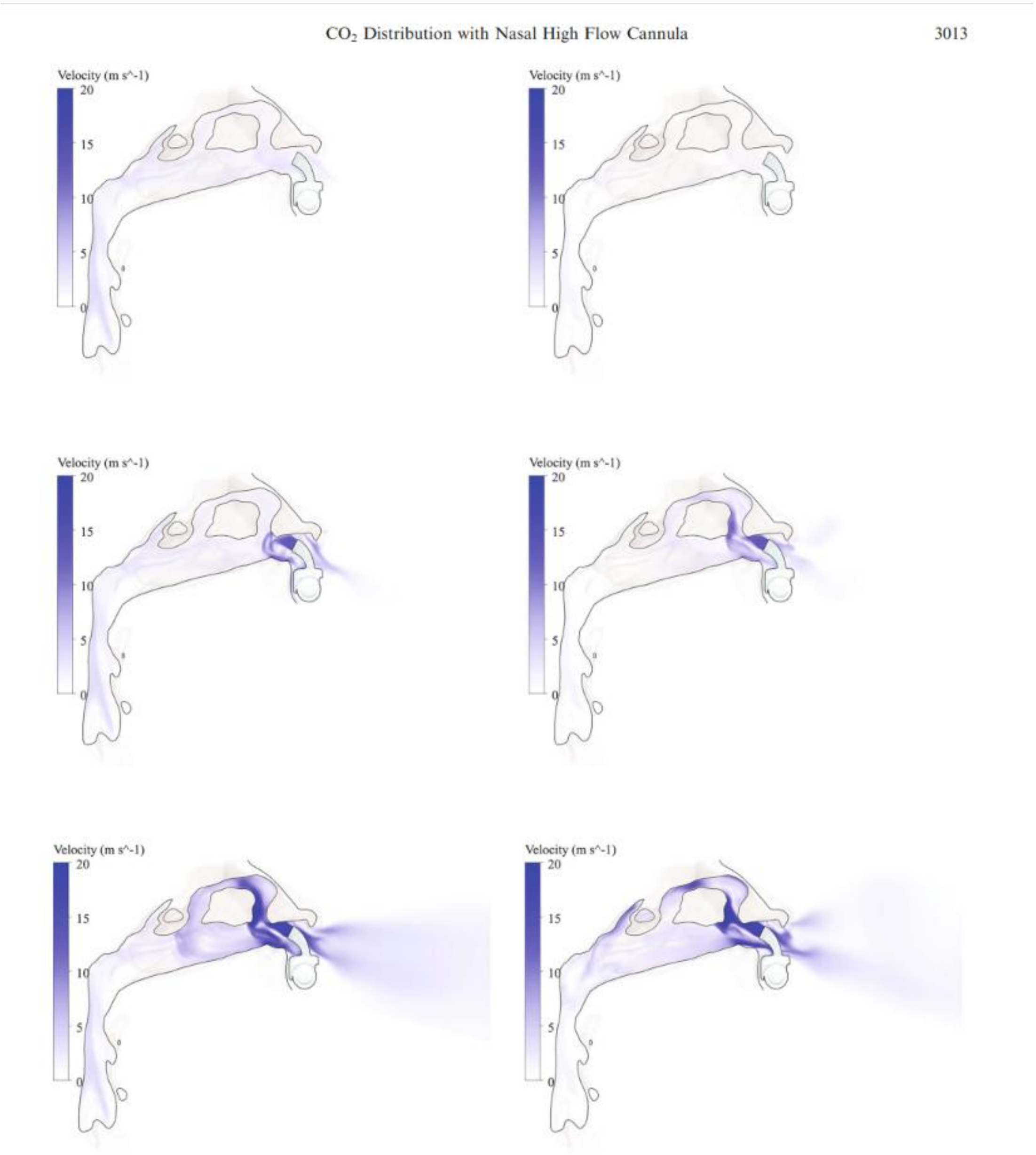
Top – 0 L/M

Middle – 30 L/M

Bottom – 60 L/M

Left - Midway through expiration

Right – Instant in time prior to the transition between expiration and inspiration



CO2 Volume Fraction Displayed Over Sagital Plane

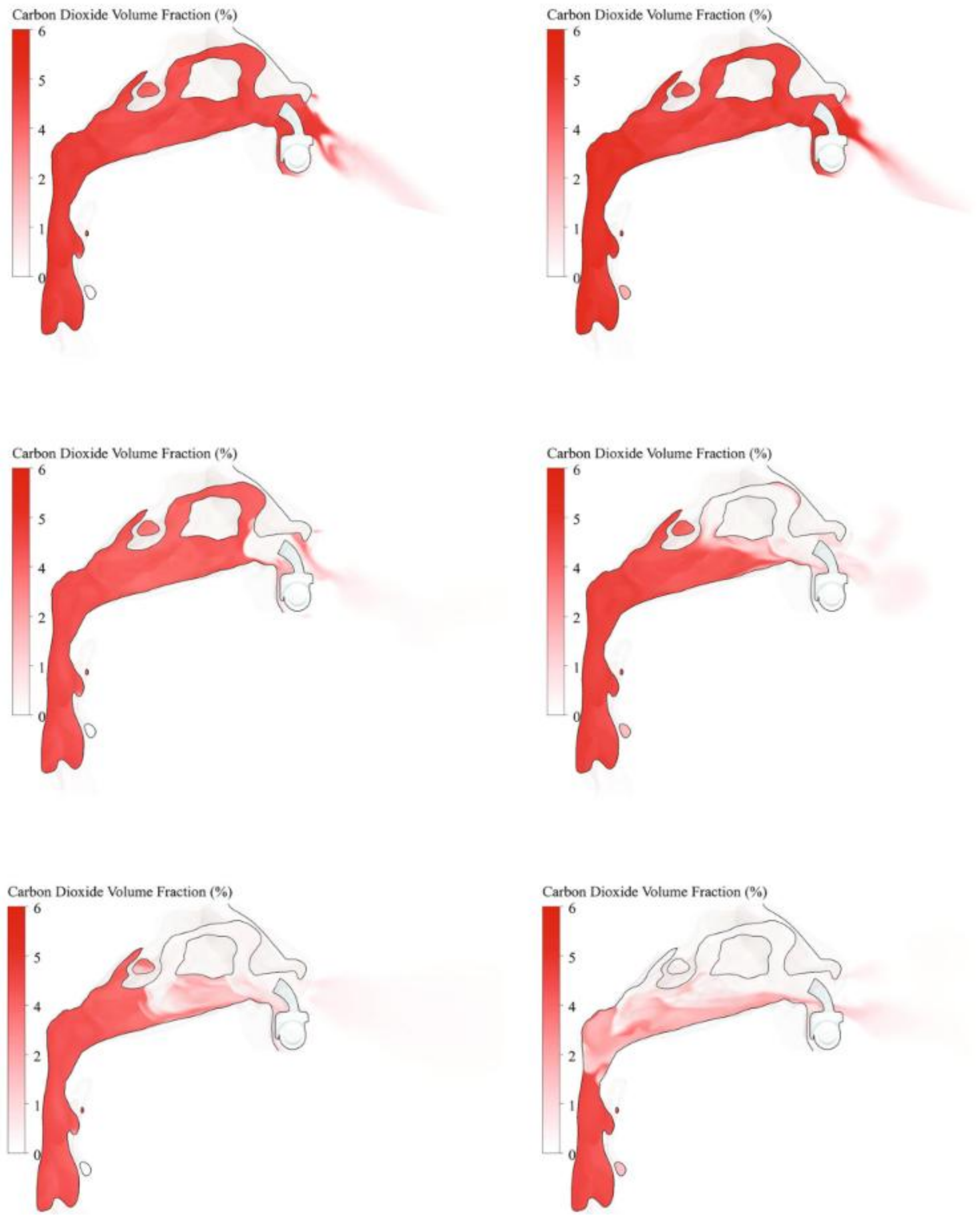
Top – 0 L/M

Middle – 30 L/M

Bottom – 60 L/M

Left - Midway through expiration

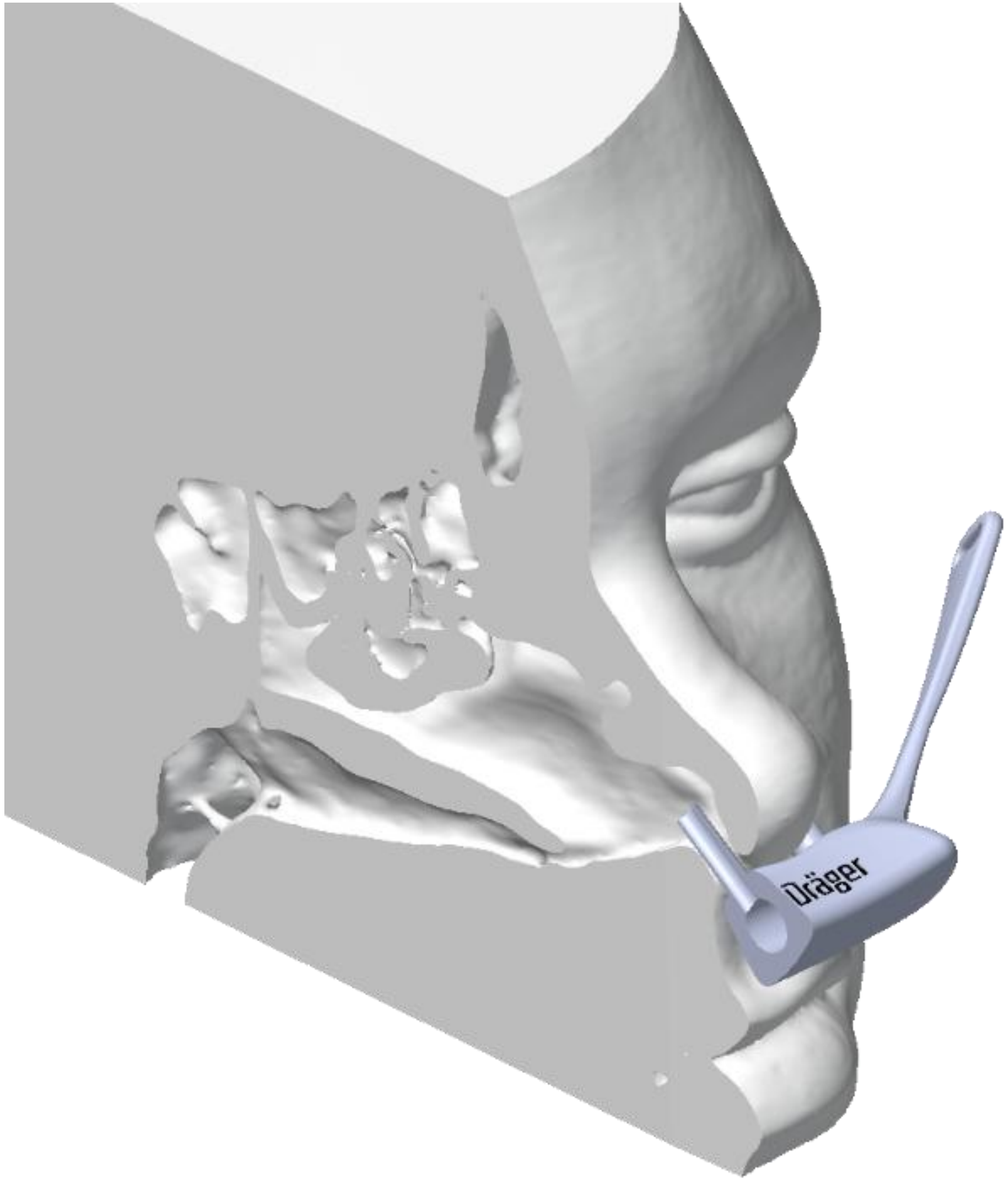
Right – Instant in time prior to the transition between expiration and inspiration



Conclusion

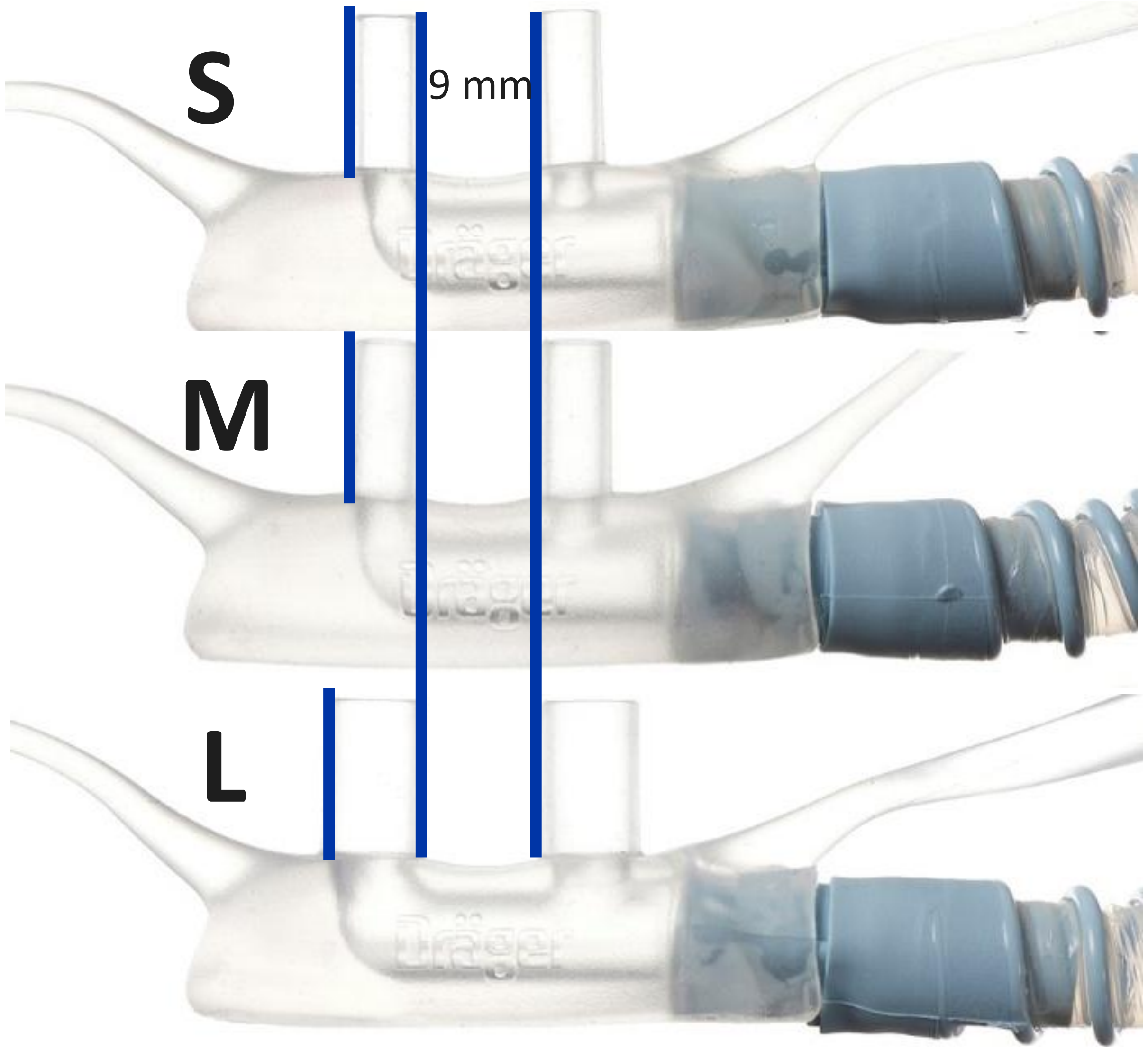
“Numerical simulation of the flow and CO2 concentration within the upper airway of a subject undergoing nasal high flow therapy have been performed. The numerical simulations were validated using an experimental model and the results are consistent with previously reported airway measurements.

A nasopharyngeal washout phenomenon was observed and the amount of CO2 cleared from the nasal cavity was found to increase in a flow dependant manner over the range of flows simulated.” (Van Hove et al., 2016.)



Hi-Flow Star Nasal Cannula: Straight Prong Design

Hi-Flow Star Sizes



Hi-Flow Star Nasal Cannula: Correct Size

Use the sizing gauge to find the appropriate size.

Make sure that the prongs only **cover max. 50%** of the nostrils.

Hi-Flow Star Easy Application

Many thanks

Stephen Abram | Clinical Application Specialist