Using Nasal High Flow across the pediatric & adult care continuum

Fisher&Paykel HEALTHCARE

Disclosures

Senior Product Manager (Nasal High Flow) for Fisher & Paykel Healthcare

Crazy about my sons, Alex (11) & Matthew (9), and the New Zealand All Blacks Rugby Team

Pittsburgh Steelers supporter

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Learning Objectives

Attendees will be familiar with the application of Nasal High Flow in the pediatric and adult population and the literature supporting its use.

- Identify the four mechanisms of action for Nasal High Flow
- Understand the physiological effects of Nasal High Flow
- Describe the clinical outcomes of implementing Nasal High Flow

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Outline

History & background

Mechanisms of action to physiological effects to clinical outcomes

Pediatric to adult BREAKING NEWS

Implementation to usage

History & background

1214 DECEMBER 7, 1968 PRELIMINARY COMMUNICATIONS THE LANCET

tests demonstrated severe delayed hypersensitivity reaction, maximal at 48–72 hours. This response was to the first application after transplant and approximately 3 months after previous tests. It is probable that small amounts of the chemicals remained in the tissues and when thymic function was established, sensitisation occurred. Biopsy of a lymph-node 8 months after implantation of thymic tissue was normal for an infant of this age (fig. 4b). This finding, coupled with normal numbers of circulating lymphocytes, indicated repopulation of peripheral lymphoid tissue with small lymphocytes. After operation

CONTINUOUS CONTROLLED HUMIDIFICATION OF INSPIRED AIR

Summary It has been observed that gases can be administered through the nose at high flow-rates provided that they are at body-temperature and fully saturated with water-vapour. A simple and easily portable system has been devised for delivering gases in this way, and has been shown to be effective in volunteers. It is now proving satisfactory in clinical use, both for continuous humidification and for administration of oxygen.

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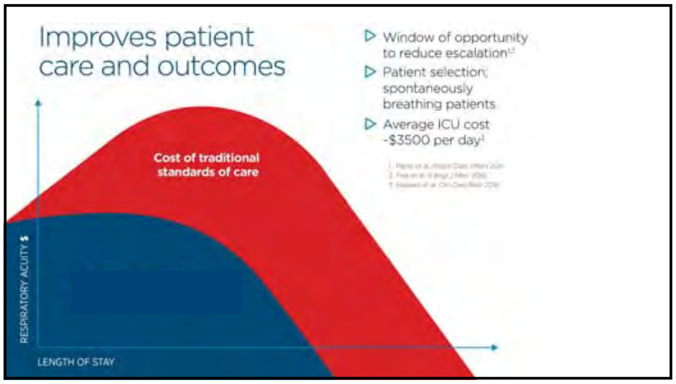
History & background

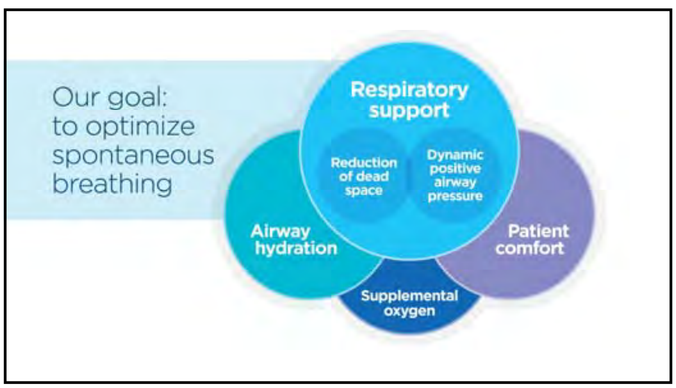
1214 DECEMBER 7, 1968 PRELIMINARY COMMUNICATIONS THE LANCET

Most of the problems of humidification could be solved by the use of water-vapour instead of aerosols. This would more nearly reproduce the physiological mechanism of humidification in the respiratory tract. Such a method became practicable when the author discovered that gases could be blown into one nostril at 20–30 litres per minute without discomfort, and even without perception, provided that the gas was at body-temperature and 100% saturated with water-vapour. (The highest tolerable flow of dry, cool gas is normally regarded as 6–8 litres per minute.)

History & background

HFO	High flow oxygen
HFOT	High flow oxygen therapy
HFNC	High flow nasal cannula
HFNP	High flow nasal prongs
$NHFO_2$	Nasal high flow oxygen
HHFO	Heated high flow oxygen
HHFNC	Humidified high flow nasal cannula
$HHHFO_2$	Heated & humidified high flow oxygen
HHHFNC	Heated & humidified high flow nasal cannula
NHF	**Nasal High Flow**

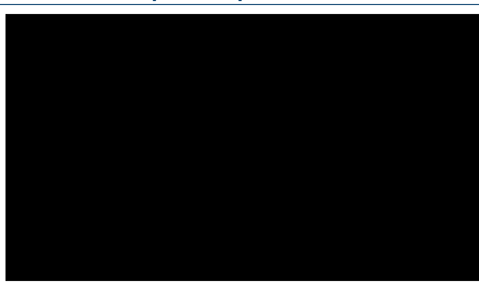




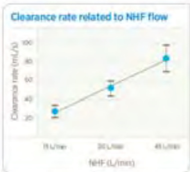
Reduction of dead space

Reduction of dead space

Reduction of dead space - Spence



Reduction of dead space - Moller



Adapted from Möller et al. J Appl Physiol. 2015

Reduction of dead space - Moller

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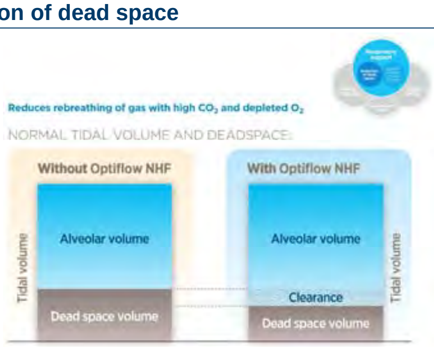

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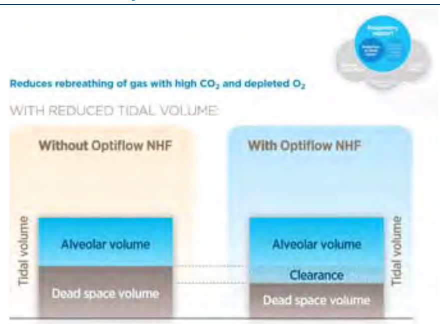

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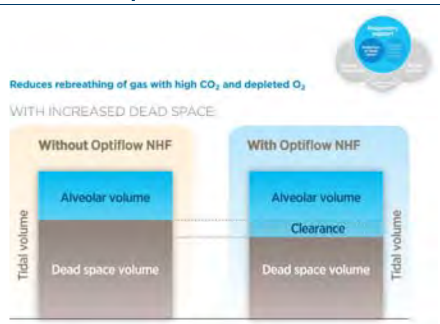
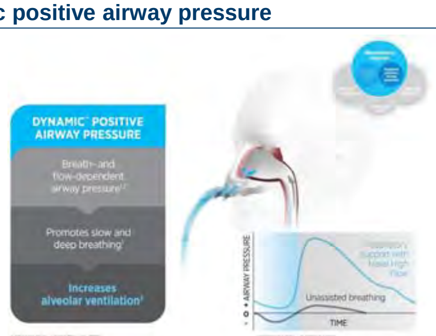


Dynamic positive airway pressure



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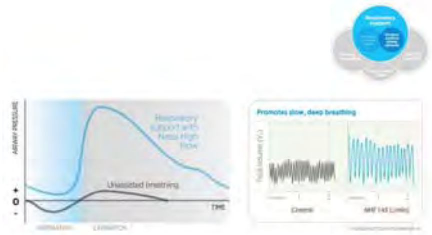
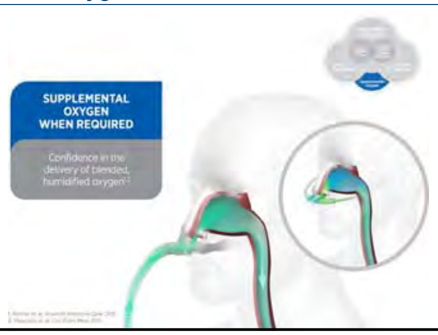


- Pressure dynamically changes depending on breath and flow
- Inspiratory resistance decreases, making inspiration easier
- Expiratory resistance increases, leading to prolonged expiration

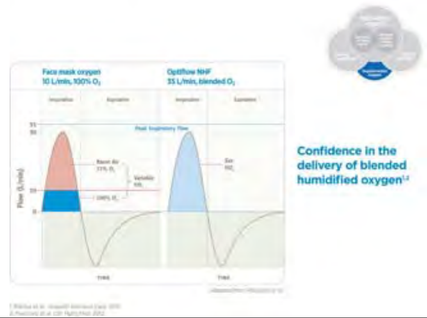
What changes are seen in patients using NHF?

NHF increases airway pressure, end-expiratory lung volume and tidal volume.[1]

Supplemental oxygen



Supplemental oxygen



Airway hydration

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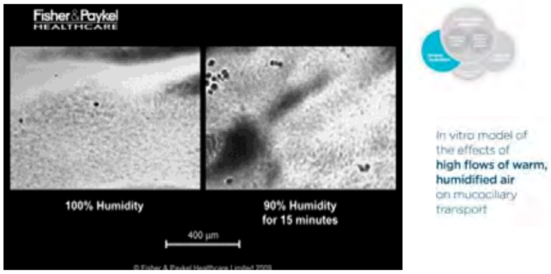
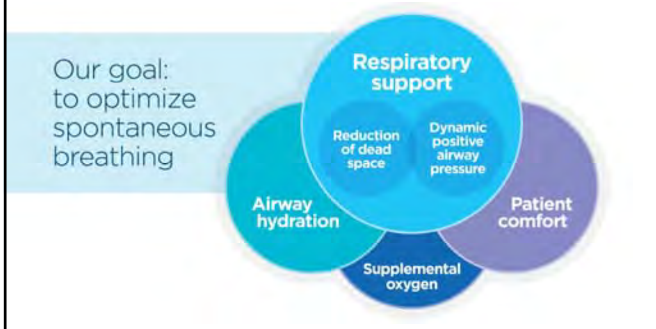


Patient comfort

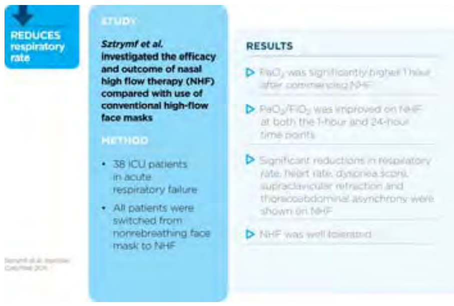
Patient comfort



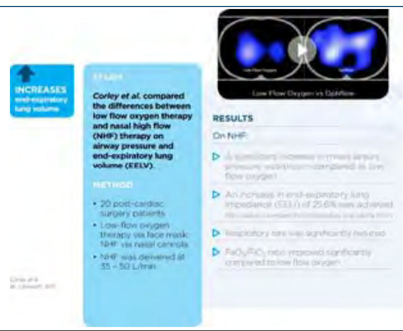
Physiological effects

Physiological effects

Sztrymf et al. 2011 Intensive Care Medicine



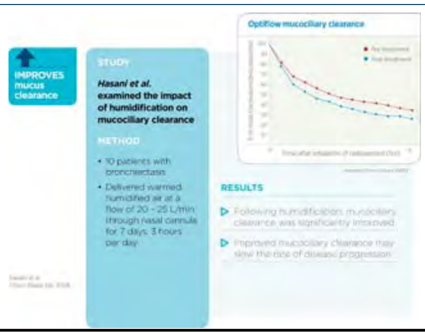
Corley et al. 2011 British Journal of Anaesthesia



Physiological effects

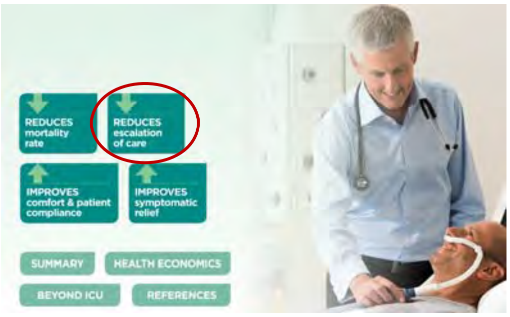
Physiological effects

Hasani et al. 2008 Chronic Respiratory Disease

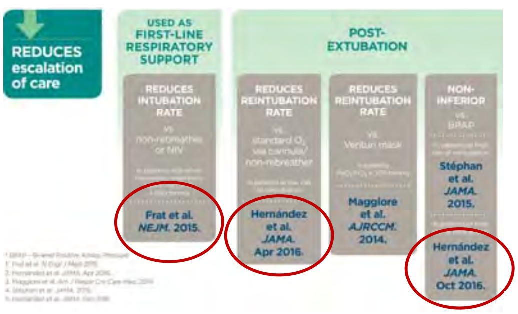


Physiological effects

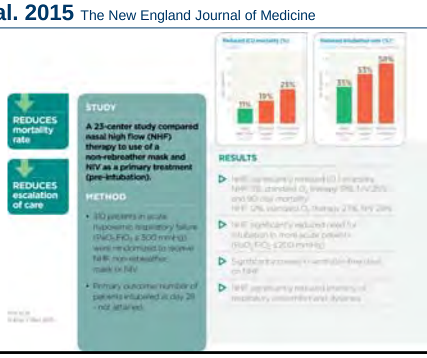
Clinical outcomes



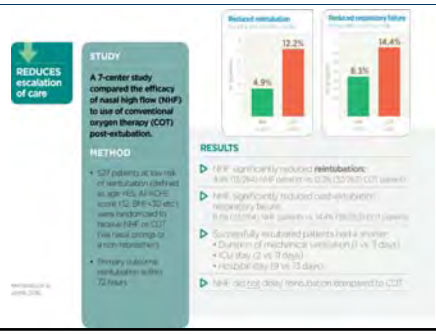
Clinical outcomes



Frat et al. 2015 The New England Journal of Medicine

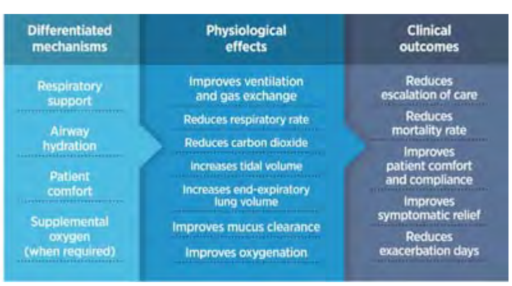


Hernández et al. 2016 Journal of the American Medical Association



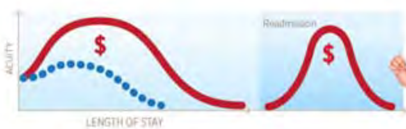
Hernández et al. 2016 Journal of the American Medical Association

Summary



Neonatal respiratory care continuum

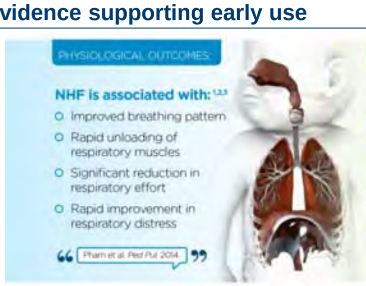
Optimizing the pediatric respiratory care continuum



EVIDENCE SUGGESTS:

- Early use of Nasal High Flow (NHF) in pediatrics may reduce escalation and length of stay.
- NHF is not only effective, but also gentle and easy.
- It is best used early and in an integrated manner.

Evidence supporting early use



Usage

"How do I know if my patient is responding to NHF?"

"What flows should I use with pediatric patients?"

"What is the evidence for NHF in pediatric populations?"

How do I know if my patient is responding to NHF?

Literature suggests therapy outcome may be predicted within 60 minutes, using clinical indicators:

	LIKELY INDICATORS FOR:	
WITHIN 60 MINUTES:	SUCCESS	CAUTION
Respiratory rate	Improvement	No improvement
Heart rate	Improvement	No improvement
Work of breathing	Improvement	Currently no data
O_2 Oxygen desaturation	Currently no data	No improvement

What flows should I use with pediatric patients?

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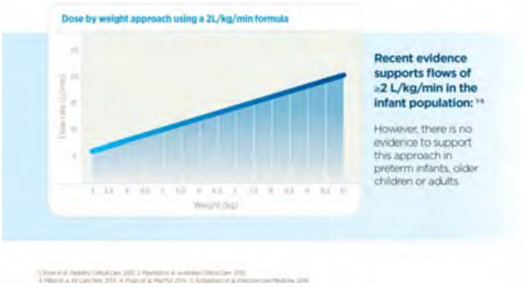

What is the evidence for NHF in pediatric populations?

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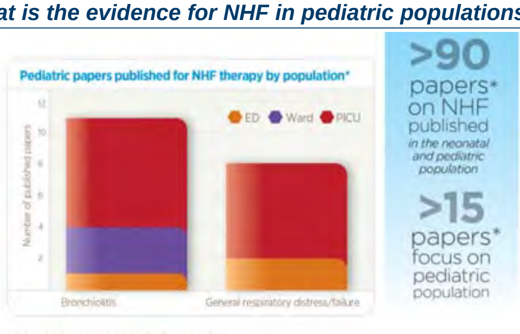

BREAKING NEWS Recent publication of PARIS II RCT

The much anticipated **P**ediatric **A**cute **R**espiratory **I**ntervention **S**tudy, the largest NHF RCT to date, just published in New England Journal of Medicine (NEJM).

Study Aim: Investigate if the early use of NHF to treat bronchiolitis in less intensive setting could prevent the need for treatment escalation

Study Details: Pop: 1,472 infants younger than 12 months with bronchiolitis
Setting: 17 ED's and Pediatric Floors across Australia & NZ
Interventions: NHF (delivered 2L/kg/min) vs std. oxy (max 2L/min)
Used: F&P Optiflow™ Junior 2 and F&P AIRVO™ 2 system

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Study Results: The early use of NHF was found to be effective strategy to reduce the level of care required in infants with bronchiolitis

12% of infants on NHF required escalation of care compared to 23% of infants on standard oxygen therapy ($p<0.001$)

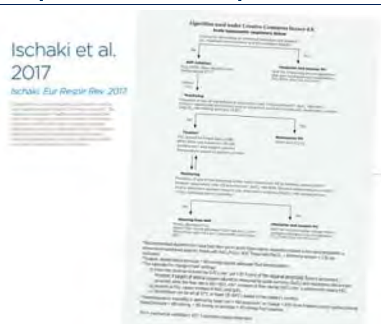
There was no increased risk of adverse events reported

Study Funding: PARIS funded by the National Health and Medical Research Council and others

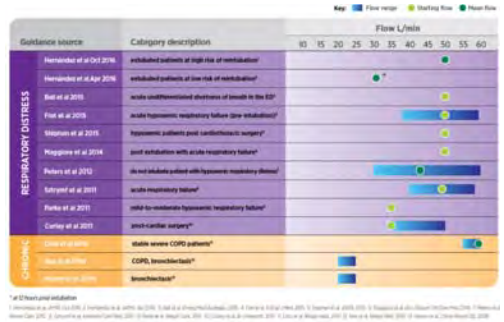
Adult respiratory care continuum

Usage

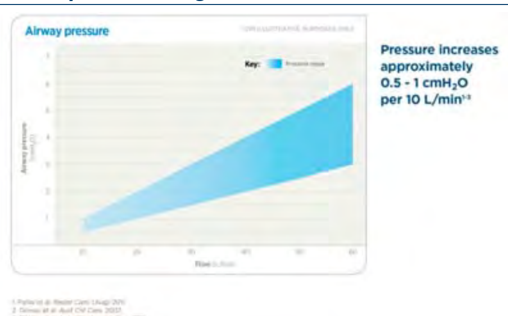
Is there a NHF protocol for AHRF patients?



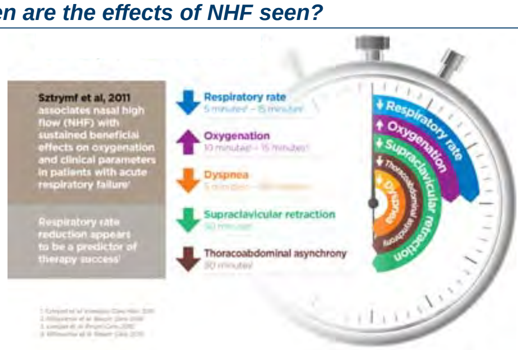
What flow rates and ranges are used?

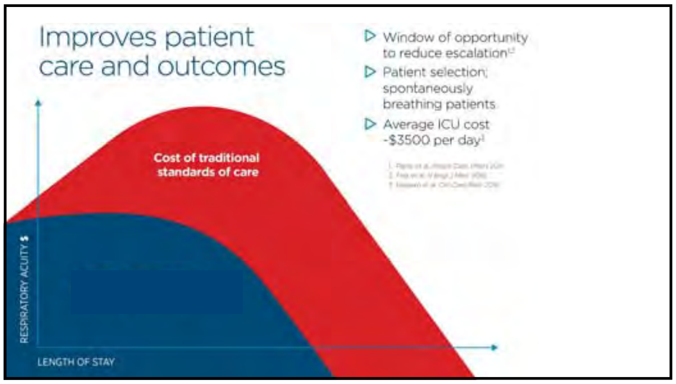


How much pressure is generated?



When are the effects of NHF seen?





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Mechanisms of action to physiological effects to clinical outcomes

Pediatric to Adult BREAKING NEWS

Implementation to usage

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Thank you from Fisher & Paykel Healthcare

Questions?