F&P Optiflow

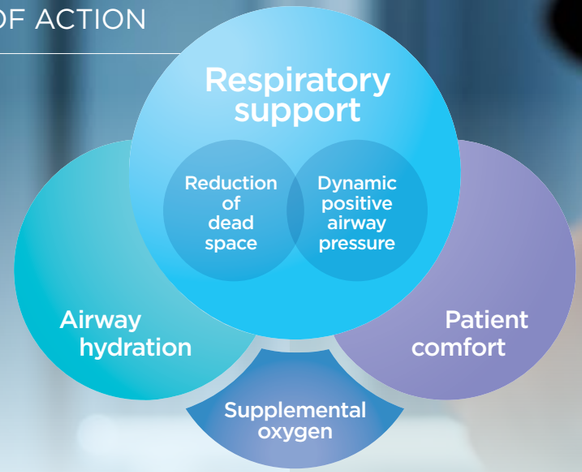
Nasal High Flow Therapy

Fisher & Paykel HEALTHCARE

Optiflow™ Nasal High Flow (NHF) therapy delivers respiratory support to your spontaneously breathing patients. It provides heated, humidified air and/or oxygen at flow rates up to 60 L/min through the unique Optiflow patient interfaces.

F&P Optiflow

MECHANISMS OF ACTION



With Optiflow NHF, you can independently titrate flow and oxygen concentration (FiO_2 21 – 100%) according to your patient's needs.

The mechanisms of action differ from those of conventional therapies, as do the resulting physiological effects and clinical outcomes.

PHYSIOLOGICAL EFFECTS

- ↑ **IMPROVES** ventilation and gas exchange
  - ↓ **REDUCES** respiratory rate[1-7]
  - ↓ **REDUCES** carbon dioxide[8-10]
  - ↑ **INCREASES** end-expiratory lung volume[1]
- ↑ **IMPROVES** mucus clearance[11]
- ↑ **IMPROVES** oxygenation[1,2,4,7,12-16]

CLINICAL OUTCOMES

- ↓ **REDUCES** escalation of care when used:
  - as a first-line respiratory support[14]
  - post-extubation[13,17-20]
- ↓ **REDUCES** mortality rate[14]
- ↑ **IMPROVES** symptomatic relief[2,3,14]
- ↑ **IMPROVES** comfort and patient compliance[2,3,13,17,20]

MECHANISMS OF ACTION

RESPIRATORY SUPPORT

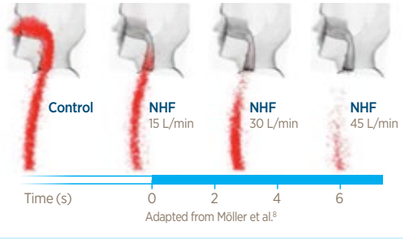
Reduction of dead space

Clearance of expired air in the upper airways[8]

Reduces rebreathing of gas with high CO_2 and depleted O_2[8]

Increases alveolar ventilation[8]

The effects of flow rate on clearance of rebreathing CO_2



Adapted from Möller et al.[8]

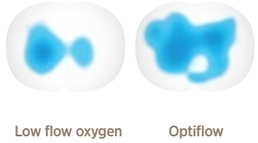
Dynamic positive airway pressure

Breath- and flow-dependent airway pressure[9,21]

Promotes slow and deep breathing[9]

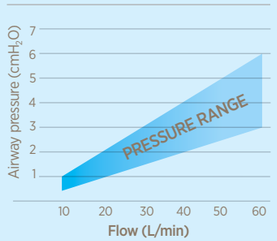
Increases alveolar ventilation[1,8]

The effects of NHF on airway pressure, end-expiratory lung volume and tidal volume



Adapted from Corley et al.[1]

Mean airway pressure
(For illustrative purposes only)



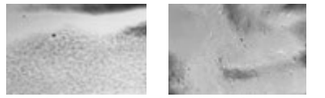
Airway hydration

Optimal Humidity

Prevents desiccation of the airway epithelium[22]

Improves mucus clearance[11,22]

The effects of high flows of warm, humidified air on mucociliary transport



Optimal humidity (100% Humidity)

Dry epithelium after exposure to room air for 1 hour

Patient comfort

Optimal Humidity

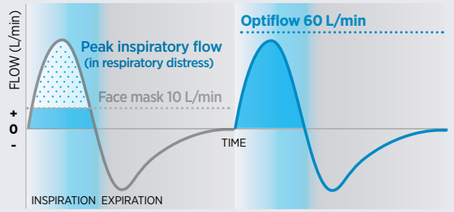
Open system
No seal required

Comfortable[2,13] and easy to use

Patient tolerance[2,14]

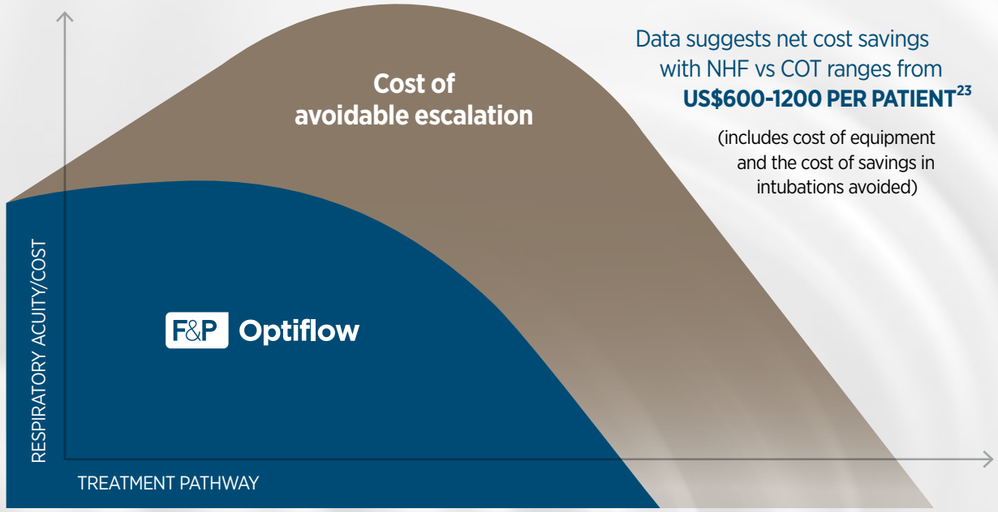
Supplemental oxygen when required

Confidence in the delivery of mixed, humidified oxygen[3,12], from 21% to 100%



Cost benefits

Use Optiflow NHF to reduce escalation[14,18] thereby avoiding associated costs.



Data suggests net cost savings with NHF vs COT ranges from **US$600-1200 PER PATIENT[23]**

(includes cost of equipment and the cost of savings in intubations avoided)

Using Optiflow NHF as a first-line therapy (both pre-intubation and post-extubation) may reduce a patient's escalation 'up the acuity curve', resulting in better patient outcomes and reduced costs of care.

Summary of applications for NHF therapy

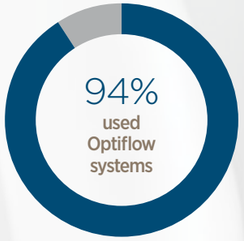
Medical society Clinical practice guideline publication	Primary support (Medical)	Primary support (Surgical)	Pre-escalation support	De-escalation support	Complementary support	Prophylactic support
ESICM. Rochwerg et al. 2020[23]	●	●	● A	●		
ERS. Oczkowski et al. 2021[24]	●	●		●	●	
SSC. Evans et al. 2021[25]	● B					
AARC. Piraino et al. 2021[26]	● C			● D		●
ACP. Qaseem et al. 2021[27]	●			● E		
TSANZ. Barnett et al. 2022[28]	●					●
WHO. WHO Guideline Development Group. 2022[29]	● F				●	
JSICM/JRS/JSRCM. Tasaka et al. 2022[30]	● G					

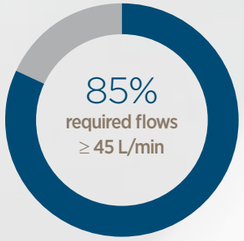
ESICM: European Society of Intensive Care Medicine. ERS: European Respiratory Society. SSC. Surviving Sepsis Campaign. AARC: American Association for Respiratory Care. ACP: American College of Physicians. WHO: World Health Organisation. TSANZ: Thoracic Society of Australia and New Zealand. JSICM: Japanese Society of Intensive Care Medicine. JRS: Japanese Respiratory Society. JSRCM: Japanese Society of Respiratory Care Medicine

A. Continue to use NHF if already receiving therapy during intubation. B. Sepsis-induced hypoxemic respiratory failure. C. Hypoxemia and immuno-compromised patients with ARF. D. Immediately post-extubation to avoid re-intubation. E. For post-extubation acute hypoxemic respiratory failure. F. Acute Hypoxemic patients with severe to critical COVID-19. G. Acute respiratory distress syndrome (ARDS) patients.

Usage

Guidelines for the use of NHF for acute respiratory support in adults are supported by peer-reviewed and published evidence.

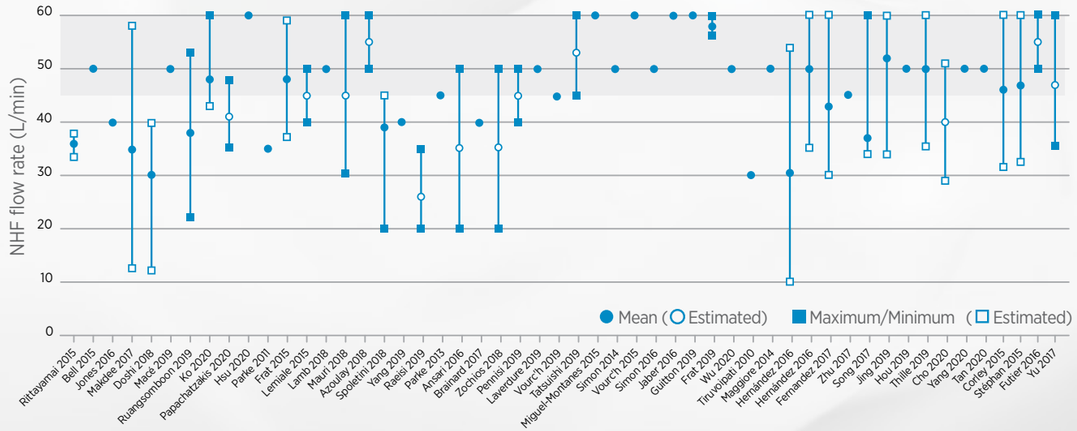




What flow rates and ranges are used?

Systematic search of PubMed database for acute Adult NHF controlled studies with subjects n > 39.

Flow rates used in the 52 controlled studies on acute adult NHF (with subjects n >39)*



*Systematic search of the PubMed database: Conducted on 17 September 2020 using pre-defined search terms. Filtered using an Excel database and checked by an internal clinical team.

Clinical practice guidelines

ESICM CLINICAL PRACTICE GUIDELINES

Rochwerg B, et al. Intensive Care Medicine. 2020.[23]

Primary support – Medical

NHF is preferred to COT for patients with hypoxemic respiratory failure.

STRONG RECOMMENDATION

Primary support – Surgical

NHF is preferred to COT in high risk and/or obese patients undergoing cardiac or thoracic surgery to prevent respiratory failure in the immediate postoperative period.

Prophylactic NHF to prevent respiratory failure in other postoperative patients is not recommended.

CONDITIONAL RECOMMENDATION

Pre-escalation support

No recommendation is made regarding use of NHF in the peri-intubation period.

NHF during intubation should be continued for patients who are already receiving NHF.

CONTINUE NHF

De-escalation support

NHF is preferred to COT following extubation in patients with any high-risk feature who were intubated for > 24 hours.

NIPPV is preferred to NHF in patients who would normally be extubated to NIPPV.

CONDITIONAL RECOMMENDATION

ERS CLINICAL PRACTICE GUIDELINES

Oczkowski S, et al. European Respiratory Journal. 2021. [24]

Primary support – Medical

NHF is preferred to COT or NIV in patients with acute hypoxemic respiratory failure.

CONDITIONAL RECOMMENDATION

Primary support – Medical

Trialling NIV prior to use of NHF in patients with COPD or acute hypercapnic respiratory failure.

CONDITIONAL RECOMMENDATION

De-escalation support

NHF is preferred to COT in low-risk non-surgical patients.

NIV is preferred to NHF in non-surgical patients at high risk of extubation failure, unless NIV is contraindicated.

CONDITIONAL RECOMMENDATION

Primary support – Surgical

Either NHF or COT can be used in post-operative patients at low risk of respiratory complications.

Either NHF or NIV can be used in post-operative patients at high risk of respiratory complications.

CONDITIONAL RECOMMENDATION

Complementary support

NHF is preferred to COT during breaks from NIV in patients with acute hypoxemic respiratory failure.

CONDITIONAL RECOMMENDATION

SSC INTERNATIONAL GUIDELINES

Evans L, et al. Critical Care Medicine. 2021. [25]

Primary support - Medical

NHF is preferred to NIV in patients with sepsis-induced hypoxemic respiratory failure.

WEAK RECOMMENDATION

ENDORSED BY:

- *Society of Critical Care Medicine*
- *American Association of Critical Care Nurses*
- *American College of Chest Physicians*
- *American College of Emergency Physicians*
- *American Thoracic Society*

AARC CLINICAL PRACTICE GUIDELINES

Piraino T, et al. Respiratory Care. 2021. [26]

Primary support – Medical

General recommendations for the delivery of supplemental oxygen for patients who require oxygen

Aim for SpO_2 range of 94–98% for most of hospitalized patients (included critically ill patients).

Aim for 88–92% for patients with COPD.

Aim for 88–95% for patients with ARDS.

Consider early initiation of NHF.

LEVEL C

De-escalation support

NHF is preferred to COT immediately post-extubation to avoid re-intubation in patients who require supplemental oxygen.

LEVEL B

Prophylactic support

NHF is preferred to COT as it may avoid escalation to NIV or invasive ventilation in patients who require supplemental oxygen.

LEVEL B

Immuno-compromised

Either NHF or COT may be used in patients who require supplemental oxygen.

LEVEL B

AARC grades of recommendation
A. Convincing scientific evidence based on randomized controlled trials of sufficient rigor;
B. Weaker scientific evidence based on lower levels of evidence such as cohort studies, retrospective studies, case-control studies, and cross-sectional studies;
C. Based on the collective experience of the committee.

Clinical practice guidelines

ACP CLINICAL GUIDELINES

Qaseem A, et al. Annals of Internal Medicine. 2021. [27]

Primary support – Medical
NHF is preferred to NIV for the initial management of patients with AHRF.

CONDITIONAL RECOMMENDATION

De-escalation support
NHF is preferred to COT in patients with post-extubation AHRF.

CONDITIONAL RECOMMENDATION

TSANZ POSITION STATEMENT

Barnett A, et al. Respirology. 2022. [28]

Primary support – Medical
NHF should be considered in selected patients with severe hypoxaemic respiratory failure (P/F < 300)

Recommended SpO_2 targets
88 – 92%
Chronic respiratory disease or potential for hypercapnia

92 – 96%
For other clinical situations

GRADE B

Primary support – Medical and Prophylactic support

Early Warning Score (EWS) should be used to detect deterioration and combine use of FiO_2 and SpO_2 as risk markers	$FiO_2 \geq 40\%$ or O_2 flow ≥ 6 L/min to maintain target SpO_2 should receive senior clinician review*	$FiO_2 \geq 50\%$ or O_2 flow ≥ 8 L/min to maintain target SpO_2 should receive ICU review**
GRADE C	**GRADE D**	**GRADE D**

* and may require transfer to a facility such as HDU
** and most will require a higher level of monitoring and supportive care which an ICU/HDU environment can provide.

WHO GUIDELINE DEVELOPMENT GROUP

Clinical management of COVID-19: living guideline. 2022. [29]

Primary support – Medical
In hospitalized patients with severe or critical COVID-19 and acute hypoxaemic respiratory failure (AHRF) not needing emergent intubation, we suggest NHF rather than COT.

CONDITIONAL RECOMMENDATION

Complementary support
We suggest awake prone positioning of severely ill patients hospitalized with COVID-19 requiring supplemental oxygen (includes NHF or NIV).

CONDITIONAL RECOMMENDATION

JSICM/JRS/JSRCM CLINICAL PRACTICE GUIDELINES

Tasaka S, et al. Journal of Intensive Care. 2022. [30]

Primary support – Medical
NHF is preferred to COT as an initial respiratory management for patients with acute respiratory failure suspected of having ARDS.*
NHF is preferred over tracheal intubation for patients with ARDS.

GRADE 2B

* if there are no contra-indications for noninvasive respiratory support or if organ failure other than respiratory failure is absent.

Rochwerg et al. 2019 [31]

Intensive Care Medicine

High flow nasal cannula compared with conventional oxygen therapy for acute hypoxemic respiratory failure: A SYSTEMATIC REVIEW AND META-ANALYSIS.

Study

Systematic review and meta-analysis to summarize the safety and efficacy of NHF in patients with AHRF.

Method

Systematic review conducted using the search terms 'high flow nasal cannul*' etc AND (adult OR mature OR grown) with filters of publication date from 1 Jan 2007 to 25 Oct 2018; Humans; English; Spanish.

This search identified 446 studies and the meta analysis was performed on 9 RCTs.

100% **100% of the analyzed studies used F&P Optiflow Systems**

Results

NHF vs COT

Patients with acute hypoxemic respiratory failure

Decreased risk of requiring intubation	Decreased escalation of oxygen therapy*	No difference in mortality
[RR] 0.85 [95% CI] 0.74-0.99	*[RR] 0.71 [95% CI] 0.51-0.98*	*[RR] 0.94 [95% CI] 0.67-1.31*

**Escalation to NHF if on COT or NIV*
RR = Relative risk; CI = Confidence interval

Frat et al. 2015 [14]

The New England Journal of Medicine

High-flow oxygen through nasal cannula in acute hypoxemic respiratory failure.

Design

23 center RCT

Patients

n = 310, pre-intubation patients in acute hypoxemic respiratory failure (PaO_2:FiO_2 < 300 mmHg)

Intervention

NHF

Control

COT or NIV

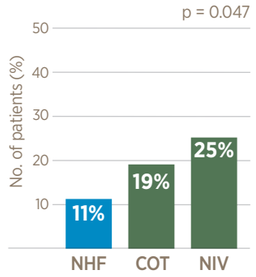
Outcome

Primary: number of patients intubated at day 28

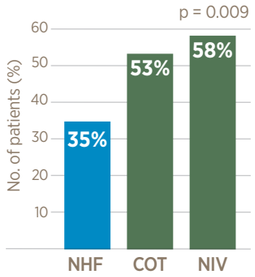
Results

- **NHF significantly reduced ICU** (p = 0.047) **and 90-day mortality** (p = 0.02)
- The primary outcome was not met for all patients (p = 0.18), however, **NHF significantly reduced the need for intubation in more acute patients (PaO_2:FiO_2 ≤ 200 mmHg)** (p = 0.009)
- Significant increase in ventilator-free days on NHF (p = 0.02)
- NHF significantly reduced intensity of respiratory discomfort (p < 0.01) and dyspnea (p < 0.001)

ICU mortality



Reduced intubation rate*



**Patients with PaO_2:FiO_2 ≤ 200 mmHg*

Ischaki et al. 2017 [32]

European Respiratory Review

Nasal high flow therapy: a novel treatment rather than a more expensive oxygen device.

Acute hypoxaemic respiratory failure*

Criteria for immediate or imminent intubation are present.

NO

NHF initiation
- FiO_2 100%
- Flow rate 60 L/min
- Temperature 37°C

Within 1-2 h

Monitoring
Presence of prognostic factors

NO

Titration
- FiO_2 based on target SpO_2 [>88- 90%]
- Flow rate based on < 25-30 breaths/min^{-1} and patient comfort
- Temperature based on patient comfort.

Monitoring
Presence of prognostic factors within hours [maximum 48 h]

NO

Weaning from NHF
Firstly decrease FiO_2. When FiO_2 <40% decrease flow rate by 5 L/min.

YES

Intubation and invasive MV
NHF for improving pre-oxygenation and peri-laryngoscopy oxygenation
- FiO_2 100%
- Flow rate 60 L/min

YES

Noninvasive MV
Short trial [1-2 h]

YES

Intubation and invasive MV
NHF for improving pre-oxygenation and peri-laryngoscopy oxygenation
- FiO_2 100%
- Flow rate 60 L/min

**Adapted from original paper[23]; used under Creative Commons licence 4.0.*

MV = mechanical ventilation; SOT = standard oxygen treatment.

Cortegiani et al. 2020 [33]

Critical Care

High flow nasal therapy versus noninvasive ventilation as initial ventilatory strategy in COPD exacerbation: a multicenter non-inferiority randomized trial.

Design

9 center RCT

Patients

n = 79, mild-to-moderate AECOPD
(pH 7.25–7.35, $PaCO_2$ ≥ 55 mmHg before ventilator support)

Intervention

NHF

Control

NIV

Outcome

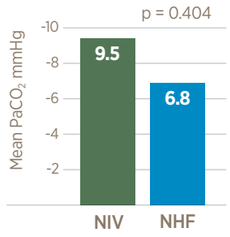
Primary: $PaCO_2$ from baseline to 2 h
(non-inferiority margin 10 mmHg)

Secondary: non-inferiority of NHF to NIV in reducing $PaCO_2$ at 6 h rate of treatment changes, dyspnea, discomfort, RR, ABG, hospital LoS, mortality

Results

- NHF was non-inferior to NIV in reduction of $PaCO_2$
- Both treatments had a significant effect on $PaCO_2$ reductions over time, and trends were similar between groups.

Mean $PaCO_2$ reduction from baseline at 2 hours



Pantazopoulos et al. 2020 [34]

COPD: Journal of Chronic Obstructive Pulmonary Disease

Nasal high flow use in COPD patients with hypercapnic respiratory failure: treatment algorithm & review of the literature.

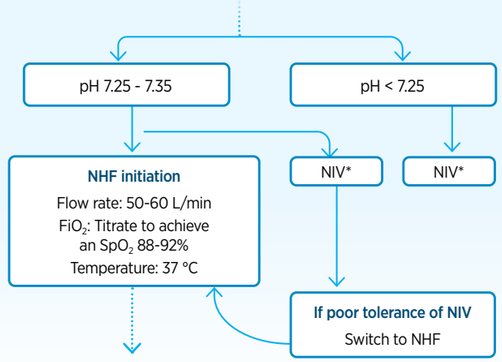
Study

Literature review of NHF use in COPD patients with hypercapnic respiratory failure and development of a treatment algorithm.

Results

NHF recommended for patients with:
- pH: 7.25 - 7.35
- escalate to NIV if pH < 7.25

Algorithm for NHF use in acute hypercapnic exacerbation of COPD



Conclusions

It may well also be used in place of NIV in the least tolerant and compliant patients, or in association with NIV to reduce mask-related side effects.

NHF seems to be effective in improving clinical and gas exchange parameters in patients with moderate hypercapnic respiratory failure, with an acceptable rate of non-responders who required additional ventilatory support.

Chaudhuri et al. 2020 [35]

Chest

High-flow nasal cannula in the immediate postoperative period: a systematic review and meta-analysis.

Study

Systematic review and meta analysis to assess if routine NHF use is superior to continuous oxygen therapy (COT) or noninvasive ventilation (NIV) in preventing intubation in post-operative patients.

Method

Systematic review conducted using the search terms 'high flow nasal cannul*' AND (adult OR mature OR grown) with filters of publication date from 1 Jan 2007 to 6 Nov 2019; Humans; English; Spanish.

This search identified 650 studies and the meta analysis was performed on 11 RCTs including a total of 2201 patients.

Results

NHF vs COT

Preventing intubation in post-operative patients

NHF is associated with a lower risk of requiring reintubation
[RR] 0.32 [95% CI] 0.12-0.88

NHF is associated with a decreased escalation of respiratory support
[RR] 0.54 [95% CI] 0.31-0.94

NHF vs NIV

No difference in:
Reintubation rate,
rate of respiratory therapy failure,
or ICU LoS

Skin breakdown:
More common with NIV
after 24 hours (p < 0.001)

Conclusion

Prophylactic NHF reduces reintubation and escalation of respiratory support compared with COT in the immediate postoperative period after cardiothoracic surgery.

- This effect is likely driven by patients who are at high risk and/or obese.
- These findings support postoperative prophylactic NHF use in the patients who are at high risk and/or obsess undergoing cardiothoracic surgery.

Stephan et al. 2015 [20]

Journal of the American Medical Association

High-flow nasal oxygen vs noninvasive positive airway pressure in hypoxemic patients after cardiothoracic surgery: a randomized clinical trial.

Study

6 center RCT

Patients

n = 830, patients who have undergone cardiothoracic surgery

Intervention

NHF

Control

NIV

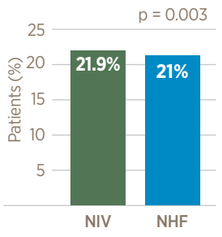
Outcome

Primary: Treatment failure defined as reintubation, switch to the other study treatment, or premature treatment discontinuation.

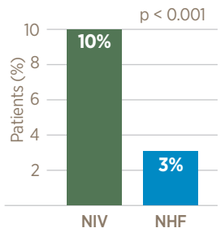
Secondary: Early changes in respiratory variables, comfort and respiratory and extrapulmonary complications

Results

Treatment failure (NHF not inferior to NIV)



Skin breakdown at 24 hours



Yu et al. 2017 [36]

Canadian Respiratory Journal

Effect of high-flow nasal cannula versus conventional oxygen therapy for patients with thoracoscopic lobectomy after extubation.

Study

3 center RCT

Patients

n = 110, patients who have undergone planned thoracoscopic lobectomy

Intervention

NHF

Control

COT

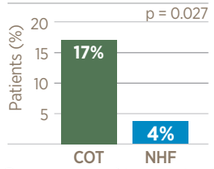
Outcome

Occurrence of hypoxemia and post-operative pulmonary complications (PPC) at 72 hours

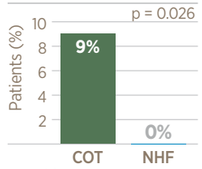
Results

- The rate of hypoxemia with COT was more than two times greater than with NHF (29.6% vs 12.5%, p<0.05).
- PaO_2, PaO_2/FiO_2, and SaO_2/FiO_2 were significantly improved with NHF (p < 0.05) in the first 72 hours.

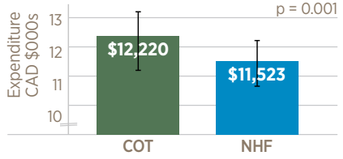
Reduced need for NIV



Reintubation rate



Comparison of hospitalization expenditures



Granton et al. 2020 [37]

Critical Care Medicine

High-flow nasal cannula compared with conventional oxygen therapy or noninvasive ventilation immediately postextubation: a systematic review and meta-analysis.

Study

Systematic review and meta-analysis to determine the safety and efficacy of NHF compared to COT or NIV in critically ill adult patients only immediately post-extubation.

Method

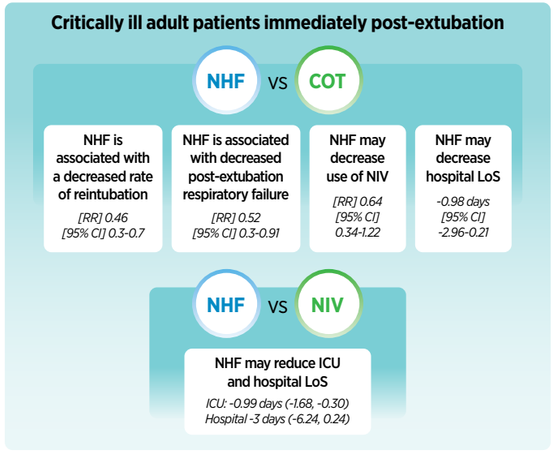
Systematic review conducted using the search terms 'high flow nasal cannul*' etc AND (adult OR mature OR grown) with filters of publication date from 1 Jan 2007 to 09 Oct 2019; Humans; English; Spanish.

This search identified 492 studies and the meta-analysis was performed on 8 RCTs.

100% of the analyzed studies used F&P Optiflow Systems.

Results

- There were no delays in escalating therapy.
- No significant difference in secondary outcomes.



Hernández et al. (Oct) 2016 [19]

Journal of the American Medical Association

Effect of post-extubation high-flow nasal cannula vs noninvasive ventilation on reintubation and post-extubation respiratory failure in high-risk patients: A randomized clinical trial.

Design

3 center RCT

Patients

n = 604, patients at high risk for reintubation

Intervention

NHF

Control

NIV

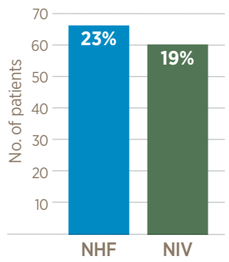
Outcome

Reintubation and post-extubation respiratory failure within 72 hours

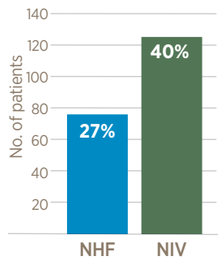
Results

- NHF was non-inferior to NIV for preventing reintubation and post-extubation respiratory failure.
- No patients in the NHF group suffered adverse effects requiring withdrawal of the therapy, compared to 42.9% of patients in the NIV group.

Reintubation



Post-extubation respiratory failure



Hernández et al. (Apr) 2016 [18]

Journal of the American Medical Association

Effect of post-extubation high-flow nasal cannula vs conventional oxygen therapy on reintubation in low-risk patients.

Design

7 center RCT

Patients

n = 527, patients at low risk for reintubation

Intervention

NHF for 24 hrs post extubation

Control

COT for 24 hrs post extubation

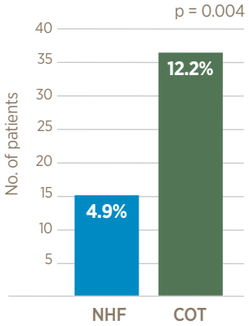
Outcome

Primary: reintubation within 72 hours

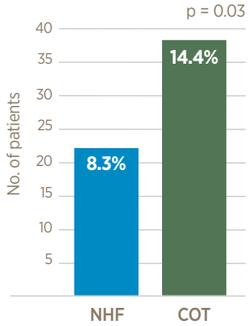
Secondary: post-extubation respiratory failure, adverse events, and time to reintubation, ICU and hospital LoS

Results

Reduced reintubation



Reduced respiratory failure



COMPLEMENTARY SUPPORT

Thille et al. 2019 [38]

Journal of the American Medical Association

Effect of post-extubation high-flow nasal oxygen with noninvasive ventilation vs high-flow nasal oxygen alone on reintubation among patients at high risk of extubation failure: a randomized clinical trial.

Design

30 centered RCT

Patients

n = 641, patients at high risk of extubation failure in the ICU

Intervention

NHF with NIV (≥ 48hrs)

Control

NHF alone (≥ 48hrs)

Outcome

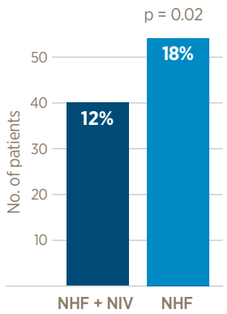
Primary: reintubated at day 7

Secondary: post-extubation respiratory failure at day 7, reintubation rates up until ICU discharge, and ICU mortality

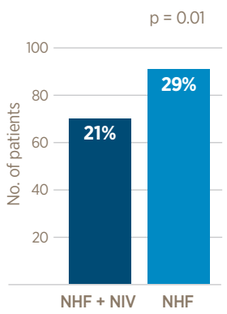
Results

Primary: reintubated at day 7

Reintubation at day 7



Reduced post-extubation respiratory failure at day 7



Spoletini et al. 2018 [39]

Journal of Critical Care

High-flow nasal therapy vs standard oxygen during breaks off noninvasive ventilation for acute respiratory failure.

Design

Pilot 5 center RCT

Patients

n = 47, NIV patients on NIV due to ARF or respiratory acidosis

Intervention

NHF

Control

COT

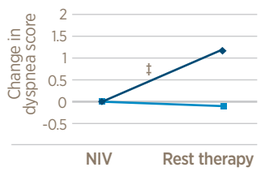
Outcome

Duration of NIV therapy, duration of rest break.

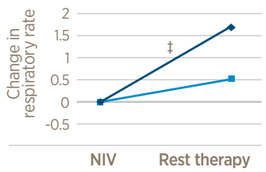
Results

- No significant difference in duration of NIV therapy or duration of rest break between NHF and COT.
- Dyspnea, RR and SpO_2 increased during COT breaks but not during NHF breaks.

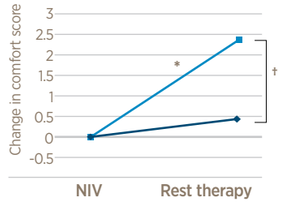
Change in dyspnea score



Change in respiratory rate



Change in comfort score



* $p \leq 0.05$ NHF compared to NIV

‡ $p \leq 0.05$ COT compared to NIV

† $p \leq 0.05$ NHF compared to COT during rest break

PROPHYLACTIC SUPPORT

Pirret et al. 2017 [40]

Intensive & Critical Care Nursing

Nasal high flow oxygen therapy in the ward setting: A prospective observational study.

Design

Prospective observational study

Patients

n = 67, patients in the ward with respiratory failure (despite receiving COT) or at risk of respiratory deterioration.

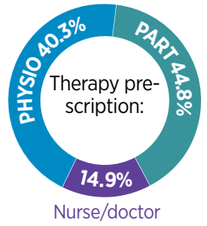
Outcome

Primary outcome: RR, HR, SpO_2

Secondary outcome: dyspnoea and sputum retention

Intervention

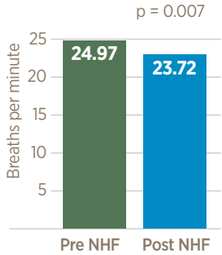
NHF with the involvement from The Patient at Risk Team (PART) and physiotherapist



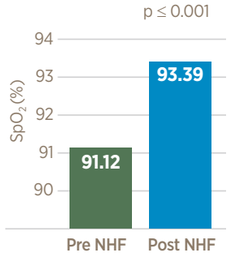
Results

- There were no delays in escalating therapy.
- No significant difference in secondary outcomes.

Respiratory rate



SpO_2



Usage

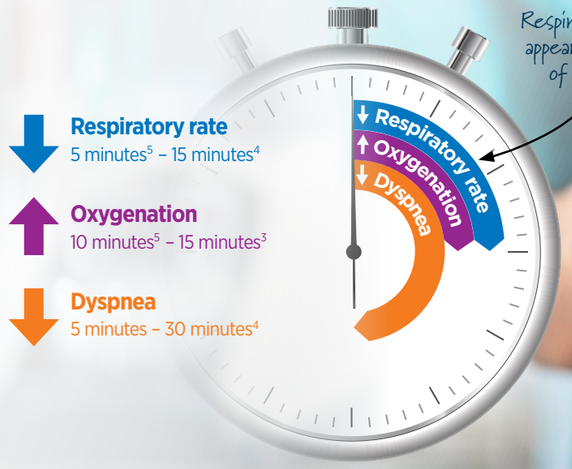
There is an ever-increasing body of clinical literature which may provide guidance on the day-to-day application of Optiflow NHF therapy.

When are the effects of Optiflow NHF seen?

Sztrymf[4] demonstrated Optiflow NHF therapy was associated with sustained beneficial effects on oxygenation and physiological parameters for patients with acute respiratory failure.

Similarly Rittayamai[5] showed significant improvement in post-extubation patients.

These studies may provide guidance on patient responses to the therapy.



Respiratory rate reduction appears to be a predictor of therapy success.[1]

Respiratory rate
5 minutes[5] – 15 minutes[4]

Oxygenation
10 minutes[5] – 15 minutes[3]

Dyspnea
5 minutes – 30 minutes[4]

Is there a way to predict the outcome of NHF?

The validated ROX index[41] predicts failure in adults with AHRF receiving NHF, at 4 time intervals: 2, 6, 12 and > 12 hours. It's an easy-to-use dynamic bedside tool.

ROX index: Predicting NHF success and failure

$$\frac{SpO_2 \div FiO_2}{\text{Respiratory rate}} = \textbf{ROX index}$$

'Healthy' example	'Patient' example
$\frac{95 \div 0.21}{15} = 30.2$	$\frac{95 \div 0.85}{37} = 3.0$

ROX index trend over time is more important than a single measurement.

The trend of FiO_2 required to maintain target SpO_2 (i.e. 95%) and patient respiratory rate directly effect ROX trend.

NHF success

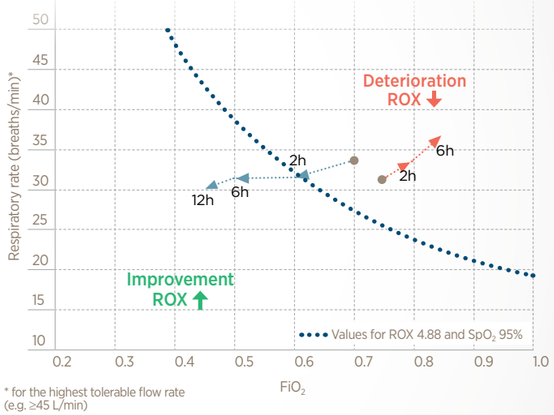
$\frac{SpO_2 \div FiO_2 \downarrow}{\text{Respiratory rate} \downarrow} =$ ROX index

NHF failure

$\frac{SpO_2 \div FiO_2 \uparrow}{\text{Respiratory rate} \uparrow} =$ ROX index

XY plot between respiratory rate and FiO_2

The blue arrows in a vector form demonstrate a change towards NHF success and the red arrows demonstrate the change towards NHF failure. The dotted line shows the values for ROX at 4.88 and the SpO_2 of 95%.



* for the highest tolerable flow rate (e.g. ≥45 L/min)

EDUCATIONAL APP

F&P ROX Vector App

The ROX Vector App proposes a model for considering the trend in ROX values over time.

Available on the App Store

ANDROID APP ON Google play

Optiflow in practice:
IOWA METHODIST MEDICAL CENTER, DES MOINES, IOWA

Jackson et al. 2020 [42]

Respiratory Care

Implementation of high-flow nasal cannula therapy outside the intensive care setting.

Design

Single center cohort observational study
(pre and post NHF implementation)

Patients

n = 346

Intervention

18-month after implementing NHF therapy

Control

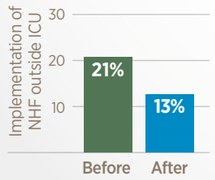
Prior to NHF implementation

Outcome

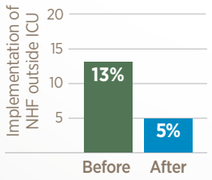
Share education and implementation process.
Report patient outcomes.

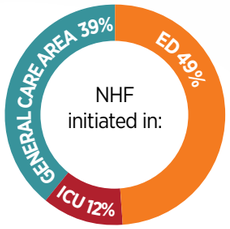
Results

Mortality



Escalation to MV





After implementation:

- **53% (n = 184) of NHF patients avoided the ICU completely**
- **486 ICU days were avoided**

Implementation strategy

1. Protocol of NHF written (for undifferentiated respiratory compromise and increased oxygen requirement).
2. Education of hospital staff: Key groups included respiratory therapists; internal medicine and surgery residents; internal medicine, pulmonology, trauma, cardiology, and emergency medicine physicians; and nurses on all patient floors and in the ED.
3. At least 4 hourly assessment by respiratory therapist.
4. Study team regular review of patient safety and adverse events.

NHF education topics by audience	Physicians and residents	Nurses	Respiratory therapists
Theory and physiology of NHF therapy	●	●	●
NHF protocol	●	●	●
NHF device setup and electronic medical record documentation			●
NHF device maintenance		●	●
De-escalation and weaning	●	●	●

Apply Airvo early for stabilization and benefit the patient throughout their stay

HIGH
MEDIUM
LOW

- Superiority to COT
- Reduced need for therapy escalation
- Easy communication during assessment
- Physiological markers of stabilization
- ED exit to a lower acuity setting

HIGH
MEDIUM
LOW

- Superiority to COT
- Reduced need for intubation/re-intubation
- Reduced ICU length of stay*
- Non-inferiority to NIV*
- ICU discharge to a lower acuity setting

* For post extubation resp. support

HIGH
MEDIUM
LOW

- Superiority to COT
- Continue patient stability outside ICU
- Airway hydration
- Hospital discharge to community

Adjust Airvo settings to suit the patient and environment.

AIRVO STAYS WITH THE PATIENT

F&P Optiflow

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