ERS pocket guidelines on high-flow nasal cannula for acute respiratory failure
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ERS TASK FORCE ON HIGH-FLOW NASAL CANNULA IN ACUTE RESPIRATORY FAILURE

Simon Oczkowski, Canada
Begum Ergan, Turkey
Liewe Bos, The Netherlands
Michelle Chatwin, United Kingdom
Miguel Ferrer, Spain
Cesare Gregoretti, Italy
Leo Heunks, The Netherlands
Jean-Pierre Frat, France
Federico Longhini, Italy
Stefano Nava, Italy
Paolo Navalesi, Italy
Aylin Ozsancak Uğurlu, Turkey
Lara Pisani, Italy
Teresa Renda, Italy
Arnaud W. Thille, France
João Carlos Winck, Portugal
Wolfram Windisch, Germany
Thomy Tonia, Switzerland
Jeanette Boyd, United Kingdom
Giovanni Sotgiu, Italy
Raffaele Scala, Italy

TF Methodologists: Simon Oczkowski, Giovanni Sotgiu

ERS Methodologist: Thomy Tonia
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Question #1: Should HFNC or COT be used in patients with acute hypoxemic respiratory failure?

**Recommendation**

We suggest the use of HFNC over COT in adults acute hypoxemic respiratory failure

- Conditional recommendation
- Moderate certainty evidence

**Evidence on benefits and harms**
- Use of HFNC may result in no difference in mortality or need for escalation to NIV, but may reduce need for intubation compared to COT, with evidence limited by imprecision
- HFNC improves patient comfort, dyspnea, respiratory rate, PaO2, and PaO2/FiO2 ratio, with no difference in PaCO2

**Rationale of recommendation**
- Balance of effects favour HFNC, especially intubation, though some uncertainty; biggest impact likely in patients at high risk of intubation
- No major tradeoffs or variation in patient preferences identified
- Resource considerations likely between centres (devices, O2 use, monitoring)
- Widespread use demonstrates feasibility and acceptability of device

**Implementation considerations**
- Data similar for immunocompetent and immunocompromised patient populations, therefore no separate recommendation made
- Insufficient evidence to make recommendation in COVID-19, but reasonable to apply recommendation in viral hypoxic respiratory failure;
- No recommendation regarding prone positioning
Question #2: Should HFNC or NIV be used in patients with acute hypoxemic respiratory failure?

**Recommendation**

We suggest use of HFNC over NIV in patients with acute hypoxemic respiratory failure

**Evidence on benefits and harms**

- HFNC may have similar effects as NIV on mortality and intubation, but effects are less certain due to imprecision of results
- HFNC is more comfortable than NIV, but does not reduce dyspnea as well
- HFNC results in improved PaO2 and PaO2/FiO2 ratio, with similar PaCO2 and RR

**Rationale of recommendation**

- Balance of effects favour HFNC, though less certainty when compared to COT
- In some cases clinicians may judge that NIV is preferred (e.g. previous use/tolerance of HFNC/NIV; suspected OSA; absence of secretions, overload of respiratory muscle pump etc)

**Implementation considerations**

- Some uncertainty when to use HFNC over NIV, individual patient factors and clinical decision-making needed
- In patients with contraindications to NIV, (e.g. excessive secretions, facial hair/structure resulting in air leaks, poor compliance) HFNC is clearly superior option
- Patients with increased work of breathing, respiratory muscle fatigue, congestive heart failure, a trial of NIV over HFNC may be reasonable
- Clinical judgement as to NIV interface and settings to use

- Conditional recommendation
- Very low certainty evidence

Recommendation

We suggest use of HFNC over NIV in patients with acute hypoxemic respiratory failure
Question #3: Should HFNC or COT be used during breaks from NIV in patients with acute hypoxemic respiratory failure?

**Recommendation**

We suggest use of HFNC over COT during breaks from NIV in patients with acute hypoxemic respiratory failure

- Conditional recommendation
- Very low certainty evidence

**Evidence on benefits and harms, rationale**

- Single study, underpowered for critical outcomes, but similar intubation rate (2/28 vs 0/26, p=0.49); patient comfort, respiratory rate, and dyspnea lower with HFNC
- Considering indirect evidence from recommendation 1, there may be a small benefit to HFNC over COT during breaks from patients on NIV; unlikely to be impact on mortality, intubation given short duration of intervention
- HFNC suggested over COT, where resources permit, on basis of comfort and dyspnea

**Implementation considerations**

- Overall benefits are likely small and primarily related to comfort rather than preventing death or intubation; resource availability is likely the primary factor when choosing to use COT vs. HFNC for breaks from NIV
Question #4: Should HFNC or COT be used in post-operative patients after extubation?

Evidence on benefits and harms
- HFNC may have limited benefits compared to COT in post-operative patients with regard to mortality, intubation, and escalation to NIV, but results are limited by imprecision of results as events were very rare in these studies.
- HFNC has little effect upon comfort, but results in higher PaO2 and PaO2/FiO2, with no effect on PaCO2 or RR.

Rationale of recommendation
- Balance of effects favour HFNC but absolute effects are very small and uncertain, without improvements in comfort and dyspnea.
- Given lack of certainty of effects, use of COT or HFNC is reasonable, primarily driven by resource considerations (HFNC generally more intensive) in this low risk population.

Implementation considerations
- Costs and cost-effectiveness of HFNC and COT will vary between centers, COT may be favored over HFNC in low income countries in terms of limited resource availability.
- HFNC is likely to be a feasible supportive option in patients after surgery, especially those already planned for admission to a monitored setting.

Recommendation
We suggest the use of either COT or HFNC in postoperative patients at low risk of respiratory complications.
Question #5: Should HFNC or NIV be used in post-operative patients after extubation?

**Recommendation**

We suggest either HFNC or NIV in post-operative patients at high risk of respiratory complications

- Conditional recommendation
- Low certainty evidence

**Evidence on benefits and harms**

- Single trial of patients at risk of respiratory failure after cardiothoracic surgery, with point estimates for mortality and intubation favouring NIV over HFNC, but absolute effects may be small due to small number of events in this population
- PaO2 and PaO2/FiO2 were higher in NIV, with similar PaCO2 and RR

**Rationale of recommendation**

- Given low certainty of effects, either HFNC or NIV appear to be reasonable for use in post-operative patients at high risk of respiratory complications
- Individual patient, centre, and resource considerations are likely to play a role in deciding which form of respiratory support to use

**Implementation considerations**

- Individual patient, surgical, and resource considerations should dictate which is used
- Subgroup analysis of the same trial including obese patients (BMI >30, n=231) demonstrated similar effects, indicating obesity alone may not be a determining factor
- Overall effects may be small
Question #6: Should HFNC or COT be used in non-surgical patients after extubation?

**Recommendation**

We suggest HFNC over COT in non-surgical patients after extubation at low or moderate risk of extubation failure

- Conditional recommendation
- Low certainty evidence

**Evidence on benefits and harms**
- HFNC compared to COT may have no effect on mortality, but may reduce need for intubation and escalation to NIV
- HFNC also results in improved comfort, PaO2, PaO2/FiO2 ratio, with similar PaCO2 to COT

**Rationale of recommendation**
- Balance of effects favour HFNC, especially intubation and escalation to NIV, but still some uncertainty due to imprecision

**Implementation considerations**
- Resource use primary consideration when deciding who to extubate to HFNC, and this will likely vary between centres, as absolute effects and cost-effectiveness of universal use of HFNC will be lower in lower risk patient populations
Question #7: Should HFNC or NIV be used in non-surgical patients after extubation?

**Recommendation**

We suggest the use of NIV over HFNC after extubation for patients at high risk of extubation failure unless there are relative or absolute contraindications to NIV

- Conditional recommendation
- Moderate certainty evidence

**Evidence on benefits and harms**

- HFNC may result in similar mortality to NIV but results in a higher risk of re-intubation in high-risk patients
- HFNC is more comfortable than NIV, and results in similar PaCO2, PaO2, PaO2/FiO2 ratio, and RR

**Rationale of recommendation**

- Balance of effects favour NIV, especially reintubation, though comfort higher with HFNC
- TF judged most patient would prefer to avoid intubation despite increased comfort with HFNC
- Some patients may have relative or absolute contraindications to NIV, in which case HFNC would be a reasonable alternative

**Implementation considerations**

- Clinicians need to decide risk of extubation failure, based upon weaning pattern, muscle strength, comorbidities, etc.
- As per question 3, if clinicians choose to extubate a high-risk patient to NIV, breaks with HFNC would appear to be a reasonable approach to use
Question #8: Should HFNC or NIV be used in patients with acute hypercapnic respiratory failure?

**Recommendation**

We suggest a trial of NIV prior to use of HFNC in patients with COPD and acute hypercapnic respiratory failure

- Conditional recommendation
- Very low certainty evidence

**Evidence on benefits and harms**
-HFNC and NIV may result in similar mortality and need for intubation in patients with COPD and acute hypercapnic respiratory failure, but certainty of evidence is low, due to very serious imprecision
- More comfort with HFNC but similar dyspnea, PaO2, PaO2/FiO2 ratio, PaCO2, RR

**Rationale of recommendation**
- Certainty of evidence comparing HFNC and NIV is low, but suggests similar effects; by contrast the evidence for NIV with hypercapnic COPD is of high quality and robust; TF judged more evidence is needed before HFNC can be considered first line treatment over NIV

**Implementation considerations**
- In most patients with acute hypercapnic respiratory failure, a trial of NIV is warranted; many patients will rapidly improve and can be de-escalated to HFNC; patients who do not tolerate NIV can trial HFNC
- In the included studies, HFNC flows were set between 35-60 LPM, and titrated up to maximal tolerance, SpO2 targets were usually 88-92%; if HFNC is used these are a reasonable starting point
- Some ICU ventilators have integrated both HFNC and NIV software, making the interface the only substantive cost difference