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Healthcare Repository
Rapid Evidence Search and Summary

Question submitted to RapidInfo4U

- What is the evidence to support high flow nasal oxygen in COVID-19 management?
- Does high flow nasal oxygen result in increased droplet dispersion and aerosol generation in COVID-19 patients?

Short Answer

High flow nasal oxygen for the management of COVID-19 is a controversial topic due to a lack of high-quality research into its efficacy and its potential as an aerosol-generating procedure. Systematic reviews commissioned by the World Health Organization found that high-flow nasal cannulas *may* reduce the need for invasive ventilation and the escalation of treatments over conventional oxygen therapy in COVID-19 patients. However, they caution that this potential advantage must be weighed against the currently unknown risk of droplet and aerosol transmission: there is currently no research evidence directly examining the consequent dispersion of COVID-19 virus for this procedure. A number of actions can reduce any potential risk: deliver HFNO in negative-pressure rooms and/or ensure proper ventilation; use an increased area of precaution; ensure staff have protective PPE; and place surgical masks on patients receiving the HFNO.

Long answer

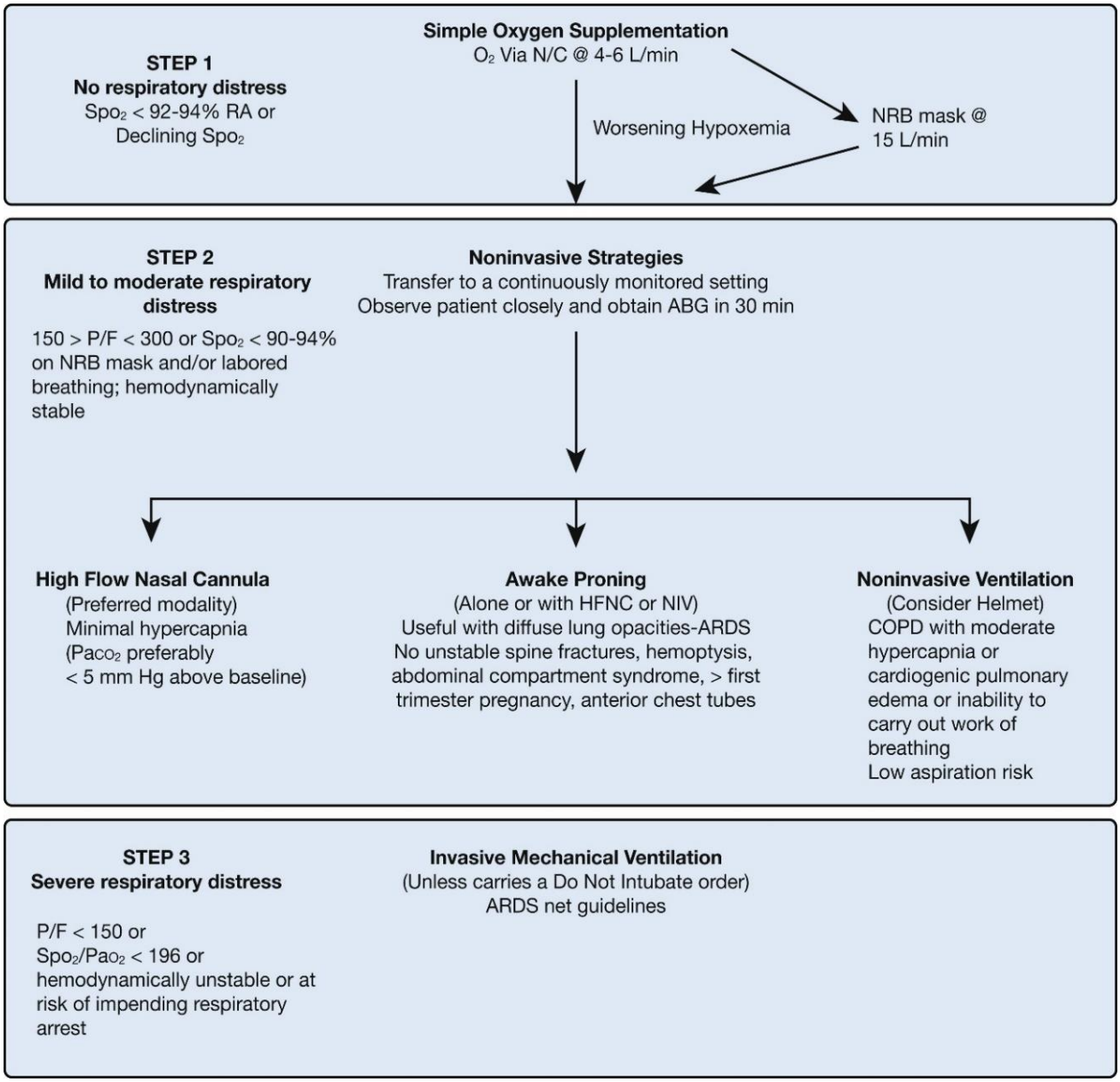
In November of this year a panel of international experts in advanced airway management published a report on consensus opinions regarding controversial topics in COVID-19, one of which was high-flow nasal oxygen (HFNO) therapy [1]. Based on their review of the literature they conclude the following [1, p.4]:

1. HFNO should be considered for the management of acute respiratory failure and after tracheal extubation of patients with COVID-19 as long as optimal environmental measures (e.g. negative-pressure rooms, proper ventilation) and protective PPE are available for healthcare workers

2. There is insufficient evidence on the potential risks of aerosol generation and viral spread during HFNO and no evidence that it increases the risk of COVID-19 cross infection to healthcare workers.
3. More research of high-quality is needed to clarify the risk involved in delivering HFNO and to determine risk-reducing interventions.
4. Selecting HFNO in patients with COVID-19 should be determined by a risk/benefit ratio determined by the clinician for each patient until more evidence is available.

Writing in the scientific journal, Chest, Raoof and colleagues also discussed HFNO as a controversial topic in COVID-19 management due to the lack of evidence [2]. In this useful article they take a practical approach to describing the application of HFNO, including the common indications and contraindications. Reproduced below is their algorithm for respiratory failure in COVID-19 [2, p. 1996]. The paper also tabulates the varying recommendations in guidelines related to HFNO for the management of COVID-19, detailing that some guidelines caution against routine use of HFNO as a potentially aerosol-generating procedure while others recommend it as a first-line approach [2].

This uncertainty is mirrored in the findings of a survey of critical care practitioners that investigated the initial ventilation strategy of respondents based on severity of COVID-19 [3]. A total of 502 practitioners from 40 countries on six continents completed the survey. The authors report that frontline clinicians depend on isolated and varied guidelines for the management of COVID-19. They found that practices involving ventilatory support were highly heterogeneous, with limited use of standard protocols [3]. When asked about their initial ventilation strategy 53.8% (n=270) of practitioners used HFNO for mild cases; 17.3% (n=87) of practitioners used HFNO for moderate cases; and 1% (n=5) of practitioners used HFNO for severe cases [3]. Only 38.8% of these clinicians reported using a standard protocol for HFNO [3].



ABG = arterial blood gas; HFNO = high-flow nasal cannula; N/C = nasal cannula; NIV = noninvasive ventilation; NRB = nonrebreather; P/F = Pao2/Fio2 ratio; RA = room air; Spo2 = arterial oxygen saturation as determined by pulse oximetry.

Figure 1. *Algorithmic approach to respiratory failure in coronavirus disease 2019.* Taken from Raoof, S., Nava, S., & Carpati, C. [2, p. 1996).

To provide guidance to practitioners on the use of HFNO in patients with COVID-19 the World Health Organization commissioned two systematic reviews, which were published as one report in September of this year [4]. The first assessed the evidence regarding the efficacy and safety for HFNO and the second assessed the risk of transmitting the virus through droplet dispersion and aerosol generation when delivering HFNO.

Systematic review 1: The efficacy of high flow nasal oxygen

This review examined the evidence for the use of HFNO compared with conventional oxygen therapy in patients with acute hypoxemic respiratory failure [4]. This review included 12 randomised control trials, with a total of 1989 patients who were critically ill with acute hypoxemic respiratory failure. There were no eligible studies that examined patients with COVID-19 or other coronavirus infections. There were no reported differences between HFNO and conventional oxygen therapy in terms of mortality, hospital length of stay, ICU length of stay, patient reported dyspnoea or comfort [4]. The quality of this evidence ranged from very low to moderate. It was found that HFNO reduced invasive ventilation and escalation of oxygen therapy, though this evidence was categorised as low certainty. There was variability in how the included studies reported treatment related complications and so this data could not be pooled. However, the authors state that there was no apparent difference in risk of complications with HFNO compared to conventional oxygen therapy. The conclusion from the systematic review on efficacy is that HFNO *may* reduce the need for invasive ventilation and the escalation of treatments over conventional oxygen therapy in COVID-19 patients with acute hypoxemic respiratory failure [4].

Systematic review 2: Droplet dispersion and aerosol generation associated with high flow nasal oxygen

This review examined the risks of droplet dispersion, aerosol generation, and associated transmission associated with HFNO [4]. The review included 7 studies and the evidence was categorised as very low certainty. The studies were of healthy volunteers with simulated

procedures and did not examine droplet dispersion and aerosol generation of microbes like those of COVID-19. The authors conclude that more research is needed to determine the risk, if any, of HFNO and suggests a number of risk reducing strategies when delivering HFNO [4]:

- Ensure adequate room ventilation
- Limit healthcare personnel exposure to the patient
- Use an increased area of precaution
- Use of high-filtration fit-tested respirators (eg, N95, FFP2) for healthcare workers
- Use of a surgical face mask on patients receiving HFNO

Conclusion

High flow nasal oxygen for the management of COVID-19 is a controversial topic due to a lack of high-quality research into its efficacy and its potential as an aerosol-generating procedure. Systematic reviews commissioned by the World Health Organization found that high-flow nasal cannulas *may* reduce the need for invasive ventilation and the escalation of treatments over conventional oxygen therapy in COVID-19 patients. However, they caution that this potential advantage must be weighed against the currently unknown risk of droplet and aerosol transmission: there is currently no research evidence directly examining the consequent dispersion of COVID-19 virus for this procedure. A number of actions can reduce any potential risk: deliver HFNO in negative-pressure rooms and/or ensure proper ventilation; use an increased area of precaution; ensure staff have protective PPE; and place surgical masks on patients receiving the HFNO.

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Rapid Evidence Search & Summary (RESS)

Our team of multidisciplinary researchers and clinicians in conjunction with the University of Limerick Library and Information Services have developed a detailed protocol for conducting a Rapid Evidence Search & Summary (RESS) to answer questions submitted to RapidInfo4U. Our RESS protocol uses PICO or PEO methods to refine your question and follows a detailed search procedure capturing guidance documents from governments, institutions and professional bodies; searching clinical and COVID specific repositories; and identifying the most recent reviews and RCTs in the scientific literature using established databases.

References

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