

Respiratory Support with Non-Invasive Devices in patients with COVID-19

Authors

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Introduction:

Patients with moderate to severe Covid-19 disease may progress to Acute hypoxemic respiratory failure (AHRF). These patients require respiratory support in the form of high flow nasal cannula (HFNC), noninvasive ventilation (NIV) or invasive mechanical ventilation (MV). Concerns about safety and efficacy lead to initial use of invasive MV amongst early Covid-19 patients with AHRF. However, now evidence is emerging about the usefulness of noninvasive modalities in the management of these patients.

A) High Flow Nasal Canula (HFNC):

A.1. Indications:

A.1.1. ISCCM suggests that patients with Covid-19 and Acute Hypoxemic Respiratory Failure (AHRF) who continue to be hypoxic /dyspneic ($PaO_2:FiO_2$ ratio >150 and <300) even after receiving routine Oxygen therapy may be considered candidates for HFNC. (B 2a)

A.2. Contraindications:

A.2.1. ISCCM recommends against the use of HFNC in patients with Covid-19 and AHRF in the presence of severe respiratory distress including upper airway obstruction, hemodynamic instability, altered mental status, head injury, upper airway bleeding or inability to manage respiratory secretions. (A 5)

A.2.2. ISCCM recommends against the use of HFNC when there is general scarcity of medical oxygen. (A 5)

A.3. Settings:

A.3.1. ISCCM suggests initiation of HFNC with a flow rate of 60 litres/min and a setting of FiO_2 to achieve target SpO_2 (90-95%). (B 5)

A.3.2. ISCCM suggests that Covid-19 patients on HFNC be continuously monitored and FiO_2 and flow be titrated to target adequate oxygenation, patient comfort and tolerance. (B 5)

A.3.3. ISCCM suggests that in patients with Covid-19, when weaning a patient from HFNC, FiO₂ be reduced first before flow. (B 5)

A.4. Escalation of support:

A.4.1. ISCCM suggest escalation of respiratory support in patients who require high FiO₂ (>50%) to either NIV or Invasive ventilation, as appropriate.

A.5. Minimizing wastage:

A.5.1. ISCCM recommends the enforcement of all appropriate measures to ensure minimum Oxygen wastage. (A 5)

B) Non-Invasive Ventilation (NIV):

B.1. Indications:

B.1.1. ISCCM suggests that when HFNC is not available, adult patients with Covid-19 and AHRF who continue to be hypoxic /dyspneic (PaO₂:FiO₂ ratio > 150 and <300) even after receiving optimum Oxygen therapy, may be considered to be candidates for NIV. (B 2a)

B.1.2. ISCCM suggests that patients with Covid-19 and AHRF who continue to be hypoxic /dyspneic (PaO₂:FiO₂ ratio > 150 and <300) even after treatment with HFNC be considered to be candidates for NIV, if there are no indications for immediate endotracheal intubation. (B 3a)

B.2. Contraindications:

B.2.1. ISCCM recommends against the use of NIV in patients with Covid-19 and AHRF who meet the indications for endotracheal intubation and mechanical ventilation (hemodynamic instability, altered mental state, multi-organ failure). (A 5)

B.2.2. ISCCM recommends against initiating NIV in patients with Covid-19 and AHRF whose PaO₂:FiO₂ ratio is <150. (A 2a)

B.3. COVID related special points:

B.3.1. ISCCM suggests the use of NIV in a negative pressure room in an ICU/HDU or in an ICU/HDU exclusively used for the treatment of confirmed Covid-19 patients. (A 5)

B.3.2. ISCCM recommends the use of full personal protective equipment (including but not limited to N95 respirators, gloves, eye protection and body covering gowns) by medical staff working in such wards. (A 5)

B.3.3. ISCCM suggests that when patients are being disconnected from NIV for any reason, the ventilator should be placed in standby mode, to reduce generation of aerosol. (B 5)

B.4. Devices:

B.4.1. ISCCM suggests that either Full function NIV machines with or without Humidifier, or Invasive ventilators with NIV mode may be used for Covid-19 patients with AHRF. (B 3a)

B.4.2. ISCCM suggests that Invasive ventilators with NIV mode be preferred to dedicated NIV machines in covid-19 patients with AHRF. (B 5)

B.4.3. ISCCM recommends use of an appropriate antimicrobial/antiviral filter on the expiratory or appropriate arm of ventilator circuit to prevent exhalational dispersion of the virus. (A 4)

B.4.4. ISCCM suggests that in resource limited settings and when other ventilators are not available and in extreme emergencies, Home CPAP/BiPAP machine may be considered for use in patients with Covid-19 and AHRF. (C 5)

B.5. Interface:

B.5.1. ISCCM suggests the use of Helmet/non-vented mask (Full face or nasal) as an interface when using NIV in patients with Covid-19. (B 2a)

B.5.2. ISCCM suggests that where available, Helmet interface be the interface of choice among the wide range of available interfaces, when using NIV in patients with Covid-19. (B 2a)

B.6. Location of NIV:

B.6.1. ISCCM recommends using NIV in Covid-19 patients in either well staffed Intensive Care Units or in appropriately equipped and staffed High Dependency units. (A 5)

B.6.2. ISCCM recommends against the use of NIV in non ICU/HDU location. (A 5)

B.7. Settings and O2 support:

B.7.1. ISCCM recommends the use of CPAP as the preferred mode for Covid-19 patients developing AHRF. (A 2a)

B.7.2. ISCCM suggests the use of Bilevel Positive Airway Pressure (Pressure support, CPAP and backup rate) in selected patients with AHRF and in those patients who have additional Type 2 respiratory failure. (B 2b)

B.8. Care of patients on NIV:

B.8.1. ISCCM suggests providing Covid-19 patients with adequate and appropriate nutritional intake and if required, providing additional nutritional supplements, either orally or through a nasogastric (NG) tube. To reduce time off NIV, patients may be provided nutrients dense liquid diet which may reduce time taken for consuming meals. (B 5)

B.8.2 ISCCM suggests appropriate and regular mouth care, positioning and other care to prevent pressure sore (including those caused by face/nasal mask), appropriate care to prevent pulmonary aspiration of gastric contents (including stopping NG feeds prior to prone positioning in patients following awake prone protocol). (B 5)

B.9. Monitoring:

B.9.1. ISCCM suggests that Covid-19 patients on NIV should be closely monitored. Once NIV is initiated a decision on whether to continue NIV or shift to invasive ventilation, should be taken within 1-2 hours. Objective scores like the HACOR score may be utilized for predicting patients at high risk for NIV failure. (B 5)

B.9.2. ISCCM recommends not delaying endotracheal intubation and invasive mechanical ventilation in patients with Covid-19 and AHRF who are deteriorating despite adequate management with mask oxygen or HFNC or NIV. (A 2a)

B.9.3. ISCCM suggest that Covid-19 patients who have been continued on NIV should be monitored frequently including assessment of SpO₂ (preferably continuous), hourly vital signs (RR, HR and BP) and neurological status monitoring, ABGs as clinically indicated (preferably within 1 hour of NIV initiation and repeated after 4-12 hours and atleast once daily). Also, breathing pattern and accessory muscles use, etc. must be monitored. (B 5)

B.9.4. ISCCM suggests that in Covid-19 patients with AHRF of NIV, SpO₂ values should be maintained above 90%, but not more than 95%. (B 5)

B.9.5. ISCCM suggests that special focus should be given to monitoring of fluid balance and intake to prevent AKI in these patients. There should be adequate factoring in of fluid losses/dehydration over previous few days, reduced venous return due to raised intrathoracic pressure, etc. (B 5)

B.10. Post Extubation Support:

B.10.1. ISCCM has no suggestion for the use of NIV in post-extubation period in patients with Covid-19 due to lack of sufficient data. |

B.11. Weaning from BIPAP:

B.11.1. ISCCM suggests that in patients with Covid-19, weaning from NIV should follow a standardized protocol driven approach. (B 5)

B.12. When to choose invasive support:

B.12.1. ISCCM suggests the use of Invasive ventilation when patients on NIV develop high work of breathing (increasing respiratory rate and use of accessory muscles of respiration) or altered mental status. (B 5)

B.13. Complications:

B.13.1. ISCCM suggests that for patients who have been on NIV, clinicians should be on the lookout for complications, including but not limited to pressure sores on the face due to mask and straps, conjunctival/corneal abrasions, gastric distension, pneumothorax, pneumomediastinum, subcutaneous emphysema. (B 5)

B.14. Minimising Barotrauma:

B.14.1. ISCCM suggests that in patients with Covid-19 on NIV, especially those on prolonged NIV, clinicians should be on the lookout for evidence of barotrauma like pneumomediastinum, subcutaneous emphysema, and/or pneumothorax on chest X-ray. (B 2b)

Conclusions: Respiratory support with HFNC/NIV in Covid-19 patients with AHRF is a useful modality if used with caution in the appropriate patient at the appropriate time. It may lead to avoidance of endotracheal intubation and IMV. Also, when these modalities are being used for patients, appropriate use of safety measures for health-care workers is mandatory.

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