هو الشافی

حمایت تنفسی از بیماران کووید-19

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Guidance for the role and use of non-invasive respiratory support in adult patients with COVID19

Respiratory Failure

Respiratory failure is a condition in which the respiratory system fails in one or both of its gas-exchanging functions:

- *oxygenation*
- *carbon dioxide elimination*

CLASSIFICATION

- ***Acute & Chronic***

- ***Hypercapnic:*** **$PaCO_2$ >45 mmHg**
- ***Hypoxemic:*** **PaO_2 <55 mmHg when $FIO_2 \geq 0.60$**

PATHOPHYSIOLOGY

- ***Controller dysfunction***
- ***Pump dysfunction***
- ***Airway system dysfunction***
- ***Alveolar compartment dysfunction***
- ***Pulmonary vascular dysfunction***

Category	Clinical Status	Suggested action
Green	RR ≥ 20bpm with $SpO_2 \leq 94\%$	Administer O_2 <40% by face mask. If SpO_2 rises to >94%, observe and monitor

Yellow	RR ≥ 20bpm with SpO_2≤94% on FiO_2 ≥40%	Start 15L/min O_2 via nonrebreathe mask *Senior clinical review to consider:* If orientated and able to tolerate well-fitted non-vented face mask, trial CPAP 10cmH_2O with FiO_2 0.6 If further escalation appropriate, consider increasing CPAP 12-15 cmH_2O + 60-100% oxygen if needed If not, IMV if in accordance with TEP
Red	RR ≥ 20bpm with SpO_2≤94% on 15L/min O_2 via non-rebreathe mask and/or patient unable to tolerate CPAP mask, obtunded/ disorientated, rising FiO_2 needs, significant clinical decline	Urgent critical care review and prepare for intubation if in accordance with TEP

- Please consider drug interactions when instituting low-dose sedation to aid tolerance of CPAP/NIV. For example, lopinavir-ritonavir is being evaluated in clinical trials in COVID-19 patients and can substantially increase the bioavailability (and therefore potency) of benzodiazepines, particularly midazolam

- excessive work of breathing is a possible indicator for intubation. The use of NIV (BiPAP) should be reserved for those with hypercapnic acute on chronic ventilatory failure

- CPAP is the preferred form of non-invasive ventilatory support in the management of the hypoxaemic COVID-19 patient. Its use does not replace invasive mechanical ventilation (IMV), but early application may provide a bridge to IMV.

- Assess the response to CPAP in a monitored environment within 30 to 60 minutes, with regular review as clinically indicated thereafter. Where there is no adequate response, where clinical decline continues, or where patient tolerance limits use, early intubation and mechanical ventilation should be sought where appropriate

- Hoods and masks can be distressing for patients, and the use of low doses of agents to improve comfort and tolerance can be considered. Opioids, in appropriate and judicious doses, may help reduce the sensation of breathlessness and also limit very high tidal volumes and respiratory rates – which are thought likely to be driving ongoing patient-induced lung injury (PILI)

- The risk of infection to staff when using such modalities are not thought to be high with appropriate use of personal protective equipment (PPE) .

- Unless there are reasons to suspect CO_2 retention, arterial lines/blood gases are not needed, and patients can be monitored using continuous peripheral arterial oxygen saturation (SpO_2) with an appropriate level of nursing support.

Indications for NIV (CPAP for hypoxaemic respiratory failure; BiPAP for hypercapnic acute on chronic respiratory failure):

- as a ceiling of treatment
- trial to avoid intubation
- to facilitate extubation.

- . It is recommended that CPAP is delivered in a negative pressure room with air exchanges greater than the regulatory threshold (10 cycles per hour) with/without a lobby. However, it is recognised that availability may be limited.

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- If a negative pressure room is not available, a neutral pressure room with air cycling is preferable, or (if not) a simple side-room

- . Wherever non-invasive ventilatory support is used, a clear plan must be in place to determine the threshold for failure and escalation to intubation and invasive mechanical ventilation if appropriate.

- Clinicians must be aware that the resolution of pneumonitis is over a week and the use of CPAP for this length of time will be challenging for the patient.
- Helmet CPAP and mask CPAP can be distressing for patients, and the use of low doses of agents to improve comfort and tolerance can be considered
- . Opioids, in appropriate and judicious doses, may help reduce the sensation of breathlessness and limit very high tidal volumes.

- . Benzodiazepines can be used to moderate anxiety but may interact with other drugs, including some which are being evaluated as treatments for COVID-19 in clinical trials (eg lopinavir-ritonavir) – therefore check for interactions before instituting treatment.
- Sedative and opioid agents should only be administered under the supervision of suitably trained and experienced physicians.

- CPAP should not be used in those with agitation and confusion but may be considered as the ceiling of treatment in some patients.

- CPAP is the primary mode of non-invasive respiratory support for hypoxaemic COVID19 patients. Suggested initial settings are 10 cmH_2O + 60% oxygen.

- The key to successful use of CPAP/NIV is patient tolerance. Different delivery devices can be used to suit individual patient needs. Small doses of benzodiazepine or opioid can be considered to facilitate this

- If NIV is being considered for hypercapnic acute on chronic respiratory failure this should be initiated and reviewed by suitably experienced emergency department, respiratory, anaesthetic or critical care physicians. Suggested initial settings are PS 8-10 cmH_20 + PEEP 5-10 cmH_2O + 60% oxygen, targeting SpO_2 of 88 – 92%.

- Once CPAP/NIV has been begun, clinical progress should initially be reviewed hourly (or more frequently, where clinically indicated) to determine whether there is improvement or deterioration. Frequency of assessment can be reduced if the patient remains stable.

- . Monitoring should focus on the regular measurement of respiratory rate, work of breathing, oxygen saturation and heart rate.
- The use of arterial blood gas monitoring will be assessed on an individual basis and should be provided if $PaCO_2$ is elevated at presentation. Otherwise, the use of simple peripheral arterial oxygen saturation (SpO_2) monitoring is advocated

- . Where compatible with the treatment escalation plan, there should be a low threshold for intubation where there is clinical decline (which may include a rising oxygen requirement, consistently or rapidly declining SpO_2, consistently or rapidly increasing respiratory rate and increased work of breathing). This should trigger immediate assessment for intubation and mechanical ventilation if deemed appropriate.

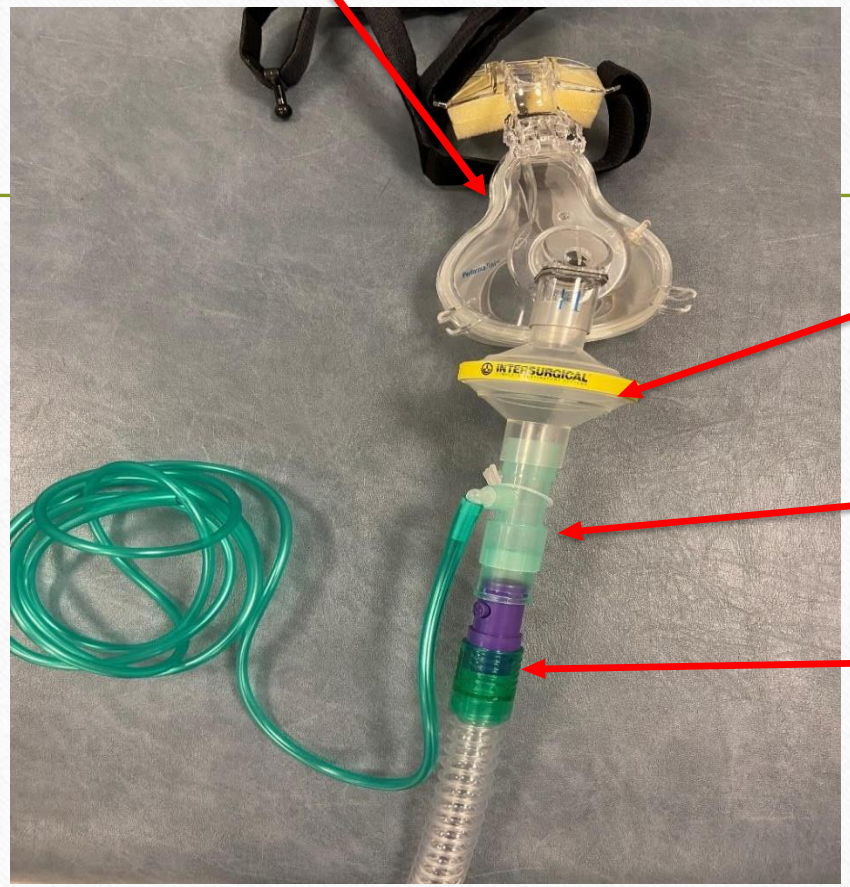
- Consider increasing CPAP support: ie CPAP 12-15 cmH_2O + 60-100% oxygen if needed

- After CPAP is applied, the patient should be reviewed over 30 minutes to detect failed response or further decline. If the patient responds, close observation and monitoring must continue for a further six hours to ensure no decline occurs, with careful monitoring continuing thereafter.

- **Masks**
- Well-fitting oronasal face masks, masks over the whole face, or helmets should produce the least droplet dissemination.
- Vented masks could worsen contamination of the environment.
- Any patient on acute NIV should be managed with a non-vented mask and an exhalation port in the circuit.
- Ensure that the ventilator mode employed supports the use of non-vented masks and exhalation ports.
- Sequence of actions: NIV mask on → ventilator on; ventilator off → NIV mask off.

- **Oxygen**
- Oxygen can be entrained into the circuit, and this should be done at the patient end (Figure 1 below).

Non-vented full-face mask



Bacterial/viral filter

Exhalation

Oxygen entrainer

Exhalation port **DO NOT COVER**