

GRI RESPIRATORY COVID-19 Type 1 Respiratory Failure SOP for CPAP

Indications for CPAP in COVID-19 disease

- 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, can sometimes avoid intubation and can be used as a ceiling of treatment.
- Ascertain ceiling of treatment at presentation (TEP form).
- The NICE Rapid Guideline for Critical Care advises the use of clinical frailty score (CFS) to guide clinical decision-making and discussions around ceilings of treatment with patients and families.
- Deterioration in COVID-19 can be rapid – high RR and tidal volumes in failing patients adds patient induced lung injury (PILP) and these patients appear to do less well when started on CPAP late.
- Consider CPAP early if oxygen saturations <92% on 40% O₂ mask and rising RR (yellow, table 1). If patient is for escalation, discuss early with ICU.
- If not for ICU and this is ceiling of care, CPAP can be useful in single organ failure but in severe COVID-19 pneumonia prognosis may be very poor despite CPAP and a pragmatic decision about whether or not to start CPAP should be made. Benefit may be limited, especially in multi organ failure.
- Confirm initiation of CPAP with the appropriate consultant.

1.

Table 1 refers to patients with **previously normal pulmonary function**. Trigger for escalation is SpO₂ <92%; treatment target is SpO₂ 90-94%.

Consider accepting lower SpO₂ of 88 – 92% in those with pre-existing lung disease.

| Category | Clinical Status | Suggested Action |
|----------|---|---|
| Green | IF RR<20 with SpO ₂ <92% on room air | THEN Administer O ₂ via nasal cannula (1 – 4l/min) or venturi masks, titrating to maintain SpO ₂ 90-94%. Observe & monitor |
| Yellow | IF RR>20 or SpO ₂ <92% on 40% O ₂ mask or Rapidly increasing FiO ₂ requirements | THEN Titrate O ₂ to maintain SpO ₂ 90 - 94% as above AND Urgent senior review to consider transfer to CHDU & CPAP (unvented mask) Titrate (see below) to optimal initial setting of 10cmH ₂ O with 15 Litres O ₂ (FiO ₂ approx 55%) If SpO ₂ <92% consider increasing oxygen to max 30L (FiO ₂ 80%). Ensure ITU aware of patient with high O ₂ requirements If poorly tolerated or no improvement refer for IMV review |
| Red | RR>20 and SpO ₂ <92% on ≥ 60% O ₂ Or unable to tolerate CPAP Or disorientated/ obtunded Or rapidly rising FiO ₂ requirement Or significant clinical decline | If for escalation refer for urgent ICU review if in accordance with TEP |

Equipment

Full PPE requirement including FFP3 mask

Armstrong non-vented mask (Figure 1, clear yellow elbow).

Tubing with exhalation port and filter

(Armstrong tubing has filter and exhalation port in packet) (Figure 2)

Remove clear tube and cap off port at machine end; move filter to exhalation port (Figure 3).

F&P non-vented mask (Figure 4)

Figures 1



Figure 2



Figure 3



Figure 4



Prior to patient set up

Measure patient mask size using mask guide (Figure 5)



Lumis 150 (Figure 6) or Stellar (Figure 7)are suitable for non-vented circuits with high flow oxygen
Plug in and turn on to ensure it is working.

Figures 6



Figure 7



In order to access the clinical settings mode to make changes to pressures press the buttons together as in figure 8 & 9.

Figure 8



Figure 9

Machine set up for CPAP in COVID-19 patients using the Lumis machine.

Hold Home button and circular dial to unlock and access clinical menu to alter settings (Figure 9)

Using the circular dial, scroll and press to select CPAP, starting pressure of 10cmH₂O and full face mask. Ramp Time : off.

Start/Stop: Press top button, lit up in green, to start CPAP. To stop press the top button once.

Machine set up for CPAP in COVID-19 patients using the Stellar machine.

Hold down circular dial and the double ticked button simultaneously to unlock and access clinical menu to alter settings (Figure 8)

Press the double ticked button and select CPAP, starting pressure of 10cmH₂O.

Start/stop: Press the start/stop button once to turn on and the same to turn off.

Attach oxygen tubing to Armstrong mask (red arrow, Figure 9). Ensure there is no kink.
Start O₂ flow 15L/min.
Connect tubing to machine (Figure 10)

Figure 9



Figure 10.



Mask set up

Attach head gear to mask with adjustments straps on the outside

(Figure 11 &12)

Straps should be situated at nape of neck (red arrow) and crown of head (blue arrow) (Figure 13)

Attach filter and tubing to mask

Figure 11



Figure 12





Attaching a humidifier (DO NOT USE WITH F&P MASKS*):

*If a humidifier is used with an F&P mask, the filter becomes saturated and blocks quickly.

Humidification improves patient tolerance and facilitates airway clearance. This humidifier (Figure 14 for Lumis, figure 15 for Stellar) can easily be assembled.

Figure 14



Figure 15.



To open the humidifier, unclip the side (Figure 16), fill up to the “Max” marker (Figure 17) with sterile water.

Figure 16



Figure 17



To connect the humidifier to the Lumis machine, first you must unclip the cover at the right hand side of the machine (Figure 18). Then remove the cover and slide in the humidifier until it clips into place (Figure 19 & 20).

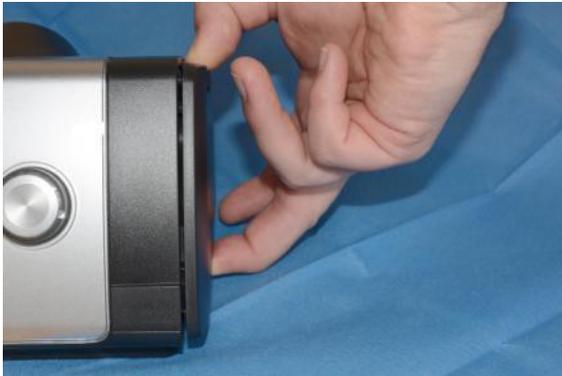


Figure 18



Figure 19



Figure 20

The humidifier attaches directly to the front of the Stellar machine (Figure 21)



Patient set up

Patient education: Indications, options if failure of CPAP,
Sensation / discomfort of CPAP.

If patient is very anxious and high RR, consider pre-medication of morphine/midazolam and a continuous infusion (5mg morphine/5mg midazolam)

Start 15L/min oxygen flow

Attach mask

Adjust straps to seal

Order of set-up: 1st Oxygen on – 2nd mask on- 3rd machine on (to minimise aerosol generation)

When turning off: 1st Ventilator off – 2nd mask off

Titrate CPAP and entrained O₂ flow to maintain SpO₂ 90-94%

Turn on Lumis at CPAP 5cmH₂O and titrate gradually to initial goal of 10cmH₂O of PEEP and 15L

oxygen (FiO₂ ~55-60%). *incremental increase in PEEP will facilitate patient tolerance- this can take 20-30 mins*

Reduce FiO₂ to lowest flow required to maintain target SpO₂ (consider lower target for those with pre-existing pulmonary disease)

Monitoring

- 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, seek early intubation and mechanical ventilation if for escalation. (See Table 2)
- Monitor respiratory rate, work of breathing, oxygen saturation and heart rate.
- Caution because stable patients at the beginning may suddenly become unstable (with refractory hypoxemia and high fever)
- An increase above CPAP support >10 is rarely required and may paradoxically, cause a reduction in patient oxygenation. Only consider increase above 10 cm₂O after senior review.
- With higher levels of CPAP tolerance becomes an issue. Beware excessive mask leak/aerosol generation/intolerance

Table 2

| Clinical Status | Suggested Action |
|---|--|
| Good Response (RR and SpO ₂ stable or improved) | Continue CPAP and O ₂ at current settings, monitor patient closely for further 6 hours. |
| No improvement (e.g. SpO ₂ below target) Increased RR | Review mask fitting & patient tolerance Increase supplementary oxygen Occasional consideration to increase CPAP |
| Further Deterioration, despite increase in CPAP setting and O ₂ delivery and /or attempt with alternative interface (hood) | Urgent critical care review as per treatment escalation plan (e.g. intubation) If not for ICU and inexorable decline / not tolerating CPAP ask for senior review. Consider alternative interface (nasal high flow) or withdrawal of CPAP and comfort measures |

Tolerability and comfort

- 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 limit very high tidal volumes and respiratory rates – which are thought likely to be driving ongoing patient-induced lung injury (PILI).
- Consider low dose s.c. infusion (e.g. midazolam 5mg/morphine 5mg, +/- low dose levomepromazine or metoclopramide) early on / at start of CPA.
- The use of NIV/CPAP continuously and for several days may cause accumulation of air in the stomach and intestine with negative effects on the respiratory mechanics: NG tubes are not routinely inserted but can be considered if required. Consider use of laxatives to ensure adequate GI decompression.
- Patients cannot tolerate 24/7 CPAP – breaks off mask are usually needed (when patient should be placed on an oxygen mask or nasal cannulae (maximum 4L/min via nasal cannulae), depending on oxygen requirement to maintain SpO₂ 90-94% (88-92% in significant COPD or other lung disease). Consider HFNO in patients unable to adequately oxygenate on facemask alone.
- High flow facemasks or HFNO with non-rebreathe reservoir bags should be considered as a modality to give short breaks to patients from CPAP.
- ***Do not stop CPAP abruptly when taking break: decrease CPAP to 5cm H₂O for 10 minutes prior to stopping for a break***

Nutrition

- Fluid support is needed
- Many patients need CPAP for 24 hours a day and for many days. Consider providing enteral or parenteral feeding early on

Weaning / discontinuation

- Weaning should not be done overnight; this is when people are most likely to need additional positive pressure.
- A trial of weaning CPAP/NIV to conventional oxygen therapy can be considered when SpO₂ is maintained on face mask / nasal cannula O₂ for breaks and when FiO₂ is 60% or less.
- Consider approach used in acute NIV- lengthen breaks off machine over time but continue with nocturnal breathing support.
- If patients are on less than 10cmH₂O CPAP during the day, consider increasing the pressure overnight back to 10cmH₂O.

When stopping CPAP: 1st Ventilator off – 2nd mask off

See next page for recommended 'Traffic Light' system for weaning of CPAP

Consider restarting CPAP if:

- RR increase > 30bpm and / or increase by > 10 bpm
- HR increases by 20bpm for > 30 minutes
- Inability to maintain target saturations
- Sustained increase in BP
- Increased work of breathing
- Patient reported increased dyspnoea and / or fatigue.

CPAP Weaning Principles *(NB This is a guide not absolute rules!)*

Target oxygen saturations 90 – 94% (type 1 RF) or 88 – 92% (CO2 retainers)

Red

Most patients for first 48 hours CPAP therapy

Patients requiring > 15 litres O₂ to achieve target sats (Stellar machine)

Patients with persistently high RR >30

Guidance;

Continuous CPAP with breaks <1 hour for hydration/nutrition/comfort

Aim to wean O₂ flow rate as tolerated until < 15 litres O₂ required

Use of low dose sc morphine/midazolam for tolerance

Encourage prone/semi-prone position

Use of 15 litres + 6 litres for breaks as required

Consider HFNO for breaks ONLY if patient poorly tolerant of facemask O₂ for breaks (eg. Unable to eat, ver or haemodynamic instability) AND only after d/w medical staff

Amber

Consider in patients after 48 hrs Red CPAP pathway

Tolerating CPAP breaks of <1 hour without need for HFNO

O₂ flow rates <15 litres and RR < 30

Guidance

Aim CPAP breaks for continuous 2 hour period OR 4 hour period , depending on patient tolerance

Use fixed O₂ devices to achieve target sats

Aim RR < 30

Green

Consider in patients tolerating 4 hour breaks on amber pathway

Guidance

Day 1;

Aim for 8 hour DAYTIME break off CPAP

Restart CPAP overnight (similar settings to amber pathway generally though can consider reduction in PEEP individual patients after d/w medical staff)

Day 2;

Aim complete daytime and nocturnal break from CPAP

Aim ward stepdown following successful green wean

Actions if a patient shows signs of deterioration/ trouble shooting 101:

- Check leak level of mask (aim 20-40L/min)
- Check filter - is it wet or are there visible secretions within it? If so, consider changing. **(NB – Do not use humidification with F&P masks - the filters clog very quickly).**
- Is the ventilation tubing set up correctly?
- Do the settings match recorded settings i.e. has a change occurred without communication/documentation.
- Are secretions causing issues; consider asking physiotherapist to review.
- If you have weaned down the CPAP within the last 12 hours then revert back to the previous settings.
- If the patient is having a break off CPAP then put it back on.
- Re-examine to ascertain whether the patient has developed a secondary pneumonia or other complication.
- Summarise what happened in patient record.
- If patient does not recover on reverted settings/back on mask inform medical team and seek support.
- Any problems contact Ventilation CNS Leona Stewart on pager 15673 and/or Physiology department on 25913. Physiology service available 9-4pm 7 days a week.
- Formal trouble shooting work sheet available in CHDU.

Daily review:

- Full PPE required whilst CPAP continues and for 2 hrs after stopping
- Bacterial filters should be changed every 12 hours to prevent increased resistance in circuit when using humidifier
- Check face mask integrity. Change face mask and Velcro straps every 72 hours
- Skin check for nasal bridge breakdown
- Remember when stopping CPAP: **1st Ventilator off – 2nd mask off**
- Following discontinuation of CPAP **2 hours** is recommended for full air circulation and droplet settling. After 2 hours standard PPE can be worn.
- See separate SOP for CPAP delivered with CaStar hood for patient's not tolerating mask CPAP (when available).

Adjuvant therapy:

- Attempt prone or semi-prone positioning with all patients requiring oxygen therapy inc CPAP
- Dexamethasone should be started for all patients with COVID pneumonia who require oxygen therapy
- Consider use of remdesivir for patients with COVID pneumonia who require oxygen and who are in first 10 days of illness (see separate guidance re cautions/contraindications)
- Consider use of IL-6 inhibitors (tocilizumab or sarilumab) for all patients requiring CPAP for COVID pneumonitis
- (see separate guidance re use)



COVID-19 APPROVED GUIDANCE

OFFICIAL SENSITIVE

Note: This guidance has been fast-tracked for approval for use within NHSGGC

Covid-19 Type 1 Respiratory Failure SOP for CPAP - GRI

This guidance is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guidance, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following guidance, it is good practice to record these and communicate them to others involved in the care of the patient.

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|--|---------------------------------|
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