

Guideline regarding oxygen therapy in secondary care set up for Covid:

QUESTION 1:

- 1) Approach to hypoxic patients --- specific what modalities to use?
- 2) Important context specific to note: we have Nasal cannula, mask, NRM, Bipap and one Ventilator. Though, not much comfortable to handle ventilator
- 3) How and when to use (initiate, follow up and taper) various oxygen support devices and Bipap including common do's and don't's

ANSWER:

If SpO₂ < 92% then start supplemental oxygen. Less preferred alternative if oxygen supplies limited can consider: If SpO₂ < 88% then start supplemental oxygen with nasal cannula, if between 88-92% check ambulatory pulse ox and if <88% then start suppl O₂.

- Titrate flow to get SpO₂ ≥ 92%, - do not need 100% (in fact better to stay in **range 92-96%**)(Kenny 2020)
- ¹Recheck pulse ox daily or BID and with symptoms. If on suppl O₂ then this should be done with each vitals check (Q4H), ideally more frequently from those on more high support. **If SpO₂ > 96 always titrate down O₂.**
- Self prone (See below)--- ONLY if patient can adjust their position independently and tolerate lying prone, does not need immediate intubation
 - Information about prone (nice 1 page):
<https://www.pennmedicine.org/updates/blogs/penn-physician-blog/2020/may/proning-during-covid19>
 - Video: <https://www.youtube.com/watch?v=HI-Ts3jojAM>

Supplemental Oxygen sources/devices:

- If mild/often start supplemental oxygen by nasal cannula, usually start at 2-4 L, can increase up to 6L.
- Face mask/nonrebreather if need be, up to 15L.
- HiFlow nasal cannula (if available) -- can go up to 50L - preferred over Noninvasive (reduces need for intubation)(Kenny 2020)
- If not available, and no indication to intubation, then can do noninvasive positive pressure ventilation (Bipap).
 - Hi flow better outcomes (less need for ventilator and mortality) than bipap, but uses up more oxygen (especially when rates higher than 15)
- Trial self prone positioning

¹ <https://www.esicm.org/wp-content/uploads/2020/03/SSC-COVID19-GUIDELINES.pdf>

When to intubate -- mainly clinical decision

- Low GCS and not protecting airway
- Respiratory distress despite Hi flow-- likely will be ARDS in this case
- Should be done by most experienced with N95 mask, face protection
- Discussion with family -- prognosis is poor.
- All same principles : low tidal volume (ARDSnet, VT 4–8 mL/kg of predicted body weight, keep plateau pressure <30), keep even fluid fluid balance (may need diuretics), May need to do extra things like proning (12 to 16 hours per day)
- Problem is that patients often need ventilator for many days --- regardless everyday see if you can wean the settings.

More Detail :Oxygen Sources & Delivery Devices[2]

Nasal Cannula (NC)

- Flow rate maximum 5-6L/min
- Deliver 24-30% O₂ (this is an FiO₂ of 0.24-0.3); variable depending on pt minute ventilation (room air entrainment)
 - - Advantages - ubiquitous; commonly used up to 6LPM; Comfortable and well-tolerated
- - Disadvantages: : Requires humidification if >4LPM (risk of epistaxis); no work of breathing support; but can dry the nose. If patient complain of this use a humidified circuit (oxygen passed through water prior to getting to patient)
- - Use: non-acute ward use, or if mildly hypoxic
- -Start at 2LPM, titrate by 1-2LPM to 5 LPM, can change as often as every 30 min to 1 hr;
- -Wean: TRIAL of WEANING: EVERY SHIFT : Turn off the oxygen completely while monitoring at bedside with pulse oximetry for at least 5 minutes. a. If SpO₂ remains above 92% off oxygen, oxygen therapy may be discontinued. b. If SpO₂ falls below 92%, restart oxygen at lowest rate necessary to keep SpO₂>92%. 2. Recheck SpO₂ after 30 minutes and 1 hour to ensure SpO₂ remains adequate

Facemask (NRB/FM)

- Delivers 30-40%
- Flow rate 5-10L/min
- - Advantages: more comfortable than NC
- - Disadvantages: Limited FiO₂ if high respiratory drive; no work of breathing support
- -Start at 5LPM, titrate by 1-2LPM to 10 LPM
- -WEAN : TRIAL of WEAN EVERY SHIFT : slowly decrease oxygen flow until oxygen saturation is between 92% and 96% (do not go below 6 L/min) . Once on 6LNC can trial NC

Non-rebreather mask

- Bag on mask with valves stopping almost all rebreathing of expired air
- Delivers ~FiO₂ 60-80% with 15L flow rate.
- - Advantages : High FiO₂ ; can be more comfortable than NC ; : works with any pressure source via flow meter;
- - Disadvantages: Limited FiO₂ if high respiratory drive; no work of breathing support
- - Contraindications:
- - Use: acutely unwell patients BUT need to be able to match minute ventilation, so usually this is a bridge to another therapy
- - Start at 10LPM, titrate by 1-2LPM to 15 LPM- need to ensure that reservoir is at least 1/3 full (reservoir bag should not collapse during inspiration)
- - WEAN : TRIAL of WEAN EVERY SHIFT : Slowly decrease oxygen flow until oxygen saturation is between 92% and 96% (do not go below 10 L/min); once improving, trial escalation to facemask

High Flow Nasal Cannulae (HFNC)

- Delivers- can deliver 0.21 - 0.9 FiO₂ at flow rates of up to 50-60 liters/min, both heated 37C and humidified 100% relative humidity; some PEEP (1mmHg per 10LPM)
- - Advantages : High FiO₂, even with high minute ventilation; can titrate flow and FiO₂ ; heated and humidified for comfort; may improve outcomes in acute hypoxemic respiratory failure compared to NIPPV or low-flow O₂ ; small amount positive pressure may help with recruitment; high flow = deadspace washout, may help with work of breathing
- - Disadvantages: need high pressure flow source, uses massive O₂, special device needed
- - Contraindication : cannot tolerate device/facial trauma, rising pCO₂ or increase work of breathing (need NIPPV or intubation), not protecting airway
- - Use: has been game changer in covid for those with high O₂ requirements despite facemask/NRB but do not yet need intubation
- - Start at 10LPM, titrate by 5LPM to 50 LPM
- -- ensure humidification,
- -- Titration: can change as often as every 30 min to 1 hr; wean by same amount and frequency. Every day should try to wean O₂ to goal O₂

Combining low-flow devices

- In some settings where access to high flow oxygen delivery devices is limited, nasal cannula may be combined with a non-rebreather to increase oxygen delivery

Continuous Positive Airway Pressure (CPAP)

- Delivers: high pressure air/oxygen with a tight fitting mask. Positive pressure all the time. Keeps airways open in sleep apnoea or heart failure.

- - Advantages Delivered via face mask or multiple other potential interfaces to splint open the upper airway, increase lung volume & intrathoracic pressure, may be beneficial in reducing cardiac preload/afterload
- - Disadvantages: requires high flow/pressure source to achieve high FiO₂ ; Prolonged use is uncomfortable & causes skin breakdown; limited unloading of inspiratory muscles or provide complete respiratory support
- - **Contraindications:** facial trauma, vomiting, excessive secretions, comatose/low gcs and unable to protect airway, life threatening hypoxia, bowel obstruction, pt intolerance, unstable hemodynamics
- - Use: best in OSA, best in CHF/pulm edema
- - Initial Settings (adults/peds): CPAP or PEEP 5-10; adults:
- - titrate: PEEP as needed up to 15; peds <12 (higher pressures may require slight edation in peds)
- Weaning: -as improves – increase time off CPAP during day for food, drink – often will need HFNC or facemask or NC; if tolerates then can make CPAP for overnight, then stop. See below for a more formal protocol

Bilevel positive airway pressure = “BiPAP”

- -Delivers FiO₂ and high positive pressure on inspiration (IPAP) and lower positive pressure on expiration (EPAP= PEEP).
- -Advantages May avoid intubation in some pts (COPD, cardiogenic pulmonary edema, upper airway obstruction) by decreasing work of breathing and adding PEEP
- - Disadvantages: requires high pressure/flow source to achieve high FiO₂, : Risk of infectious aerosol generation (possibly less if helmet NIPPV); risk of aspiration if patient not alert / unable to protect airway or if inspiratory pressures >20cm H₂ O; pt must be alert enough to remove mask if uncomfortable; skin breakdown with prolonged use;
- - Contraindications: see cpap
- - Uses : copd, for CHF, OHS, atelectasis
- - Initial Settings: IPAP 10/PEEP (EPAP) 5; use higher initial IPAP with obese pts; higher pressures may require sedation in peds
- -Monitor: -Oxygenation, Work of breathing (RR, acc muscle, distress), mentation, Bipap moniotr (minute ventilation and tidal vol ~ 6cc/kg)
- - titration:
 - - persistent hypercarbia: titrate DP (IPAP-EPAP) up to 15 , also to reduce inspiratory work;
 - - persistent hypoxemia : titrate IPAP to max 15 BUT must also increase EPAP to maintaiun TV
 - Wean: -as improves – increase time off Bipap during day for food, drink – often will need HFNC or facemask or NC; if tolerates then can make Bipap for overnight, then stop.
- Formal strategy: BTS / RCP (Hadda and Kumari 2016)recommend a protocol using stepwise reduction in NIV use which takes 4 days for weaning patients are asked :
 - Day 1: continue NIV for as much as possible
 - Day 2: 16 h (including 6 h - 8 h overnight)
 - Day 3: 12 h (including 6 h - 8 h overnight)
 - Day 4: can be discontinued

Intubation and mechanical ventilation

- See covid care protocol for details

Summary

From open critical care presentation

- https://docs.google.com/presentation/d/1lu7IbFBBRHiFzCguiM8co9_Ryxk-FhF_ErJX_gAAI7Q/edit#slide=id.gb59f435379_0_12

Place prongs inside the nostril.
Hook tubing behind ears. Flow rates higher than 5L will dry mucous membranes.



- Start oxygen at **2-5L/min**
- Use **nasal prongs**
- Assess response

If continued distress or $SpO_2 < 90\%$
(or $<94\%$ if pregnant or emergency signs)

Secure mask firmly on face over nose and mouth. Pull strap over head.



- Use **face mask**
- Increase oxygen to **6-10L/min**
- Assess response

If continued distress or $SpO_2 < 90\%$
(or $<94\%$ if pregnant or emergency signs)

Make sure bag is full to deliver highest oxygen concentration. An empty bag is dangerous.



- Use **face mask with reservoir**
- Start oxygen at **10-15 L/min**
& titrate to ensure bag inflates

If continued distress or $SpO_2 < 90\%$
(or $<94\%$ if pregnant or emergency signs)



- Continue to try to find a higher level of care and consider **CPAP, BIPAP or HFNO** if available and adequate O2 supply

REF:

- Excellent reference: <https://covidprotocols.org/en/chapters/inpatient-management/#oxygen-escalation-pathway-bmwgipaly0p9>

ferences

- <https://www.covid19treatmentguidelines.nih.gov/critical-care/oxygenation-and-ventilation/>

REF: [2] <https://opencriticalcare.org/wp-content/uploads/2021/04/Respiratory-Care-Pocket-Card-English-v2021.4-pi58nn.pdf>

Hadda, Vijay, and Rajesh Kumari. 2016. "Protocols for Weaning from NIV: Appraisal of Evidence." *Insights in Chest Diseases* 01 (02). <https://doi.org/10.21767/2577-0578.10014>.

Kenny, Jon-Emile S. 2020. "An Illustrated Primer on COVID-19 Therapy: Part 2." March 25, 2020. <https://pulmccm.org/review-articles/an-illustrated-primer-on-covid-19-therapy-part-2/>.