

Consensus statement on the safe use of respiratory therapy and NIV to minimise aerosolisation of CoVID-19

29 March 2021

Preamble

This document has been developed with input from clinicians at different institutions (both public and private). This is a live document which will continue to be updated as new evidence becomes available. Due to the low rates of community transmission in Australia and New Zealand we have avoided much of the disease thus far compared to our international colleagues. There are now evidence-based guidelines available to guide management of CoVID-19 and ASA has ongoing input into these guidelines. (<https://covid19evidence.net.au>)

Background

CoVID-19 virus is highly contagious. The use of nebulisers, high flow oxygen and non-invasive ventilation all pose a risk of transmission of viral infection to staff and patients. While these therapies offer significant benefits to some patients, there are often alternative approaches to management that have less risk of transmitting viral infection via aerosolization or dispersal of patient generated droplets and aerosols. **The risk of transmission can be minimised by restricting the use of these high-risk therapies to patients that really need them and ensuring health care workers are aware of the risks and use isolation /single rooms and personal protective equipment (PPE).**

Ideally this approach should be applied to all patients, even those who do not have suspected or confirmed CoVID-19. This is to minimise the risk of aerosolisation and dispersal of virus in the patient that is asymptomatic but has CoVID-19. This is especially relevant in a paediatric setting where in contrast with infected adults, most infected children appear to have a milder clinical course including asymptomatic infections. Many hospitals have decided to have a designated CoVID-19 team seeing all patients and planning management.

Hotel quarantine (HQ) presents unique challenges. HQ manages people at high risk of having CoVID-19 in circumstances not designed for delivery of acute health care, with very significant consequences for the broader community if there is CoVID-19 transmission. Given this, all people in hotel quarantine should be treated as suspected or proven CoVID-19.

Risk Assessment

A key to managing risk of transmission and determining appropriate treatment for individual patients is assessing risk in each case.

- *Risk of having CoVID-19:* People in hotel quarantine are at significant risk of being infected with CoVID-19 including with novel strains that are highly prevalent overseas.
- *Risk of current setting:* The facilities and expertise available vary between settings. Hotel quarantine is not designed to manage complex medical care with neither the physical environment nor expertise.
- *Risk of cessation of treatment for individuals:* Expert specialist input should be sought in cases where cessation of therapy is being considered to ensure that it is safe for that individual to temporarily cease therapy, and if not, what alternative arrangements would be needed to safely manage them.

Nebulisation

- Nebulisation of bronchodilators and steroids is not necessary for most patients and this therapy should be replaced by metered dose inhaler (MDI) with a spacer.
- Nebulisation of saline to improve sputum clearance should not be used.
- Nebulisation of antibiotics has clear benefit in only a very limited number of chronic respiratory diseases and should not routinely be used.
- If nebulisation is used in a patient with suspected or known CoVID-19, the patient should be managed in the highest level of isolation available (class N-negative pressure room is optimal) with airborne and droplet PPE precautions for health care personnel including use of N95 masks.
 - Note: this level of care cannot be provided in hotel quarantine or home, so people requiring use of nebulisation for acute medical symptoms should be transferred to an acute hospital for expert care.

High flow oxygen (hospital-based)

- For oxygen therapy the lowest flow rate of oxygen should be used to maintain oxygen saturations to minimize risk of viral aerosolisation and/or dispersal. High flow oxygen therapy via nasal prongs (HFNO) is unnecessary for many patients and where possible, this therapy should be replaced by O₂ via standard nasal prongs/cannula, Hudson mask, or non-rebreather mask.
- However, oxygen flow rates higher than 6L/min can lead to more aerosol dispersion. In this situation humidified HFNO with well-fitted nasal prongs may be a better option and may delay or avoid intubation. The choice of therapy will depend on resources, staffing, PPE etc. and should be made on a case-by-case basis after review by ICU/respiratory/sleep physician.
- If HFNO is to be used in a patient with suspected or known CoVID-19, the patient should be fitted with an interface to minimize leak in the highest level of isolation available (class N-negative pressure room is optimal), with airborne and droplet PPE precautions for health care personnel.

Non-invasive ventilation for acute or chronic ventilatory failure

- Non-invasive ventilation is delivered by a mask or mouthpiece and includes Bilevel ventilation and CPAP for ventilatory failure.
- An important issue is possible aerosolisation and/or dispersal of upper airway secretions by NIV which may assist viral spread. This can occur via the exhalation port of the mask or in the setting of mask leak. Users of these therapies who are infected or potentially infected with CoVID-19 should be aware of this possibility and should not use CPAP or bilevel NIV around others.

Hospital-based

- Patients with suspected or confirmed CoVID-19:
 - Those requiring NIV (including those with COPD, obesity hypoventilation syndromes etc), should use double-limb non-vented masks with an expiratory filter in the circuit. If double-limb circuits are not available, use a single limb circuit with a well fitted non-vented full-face mask, attached to an appropriate microbial filter and exhalation port (on the side of the filter closest to the device)**. Use with full airborne and droplet PPE.
 - In both configurations, a humidifier should not be used as this will saturate the filter and increase airway resistance. The microbial filter should be replaced every 24 hours.
 - Patients should be managed in a negative pressure room if available. Alternatively, in a single room with the door closed with room ventilation optimised and portable HEPA filter. However, airborne and droplet PPE (including N95 masks) must be used.
 - Appropriate remote alarm systems need to be set up with the ventilator and a remote communication system to staff in place
 - Aim to clear patient from needing to be in isolation in a negative pressure room as quickly as possible as this impairs this ability to safely nurse and communicate with patients.
- Patients without suspected or proven CoVID-19:
 - May be treated with non-invasive ventilation (NIV) for standard acute clinical indications. These patients are usually managed in ICU (or in CCU for pulmonary oedema requiring CPAP) or in a specialized respiratory ward.

Hotel quarantine

- People in hotel quarantine should be managed as for suspected or confirmed CoVID-19 above
- Appropriate care and infection control cannot generally be provided in hotel quarantine and people using home NIV should be transferred to an acute hospital with appropriate expertise.

- There are significant risks to ceasing non-invasive ventilation when used for chronic respiratory failure, so treatment should not be stopped without expert advice.

Home

- There is no evidence that the long-term use of NIV (including CPAP) increases the risk of development of upper or lower respiratory tract infections. Therefore, patients without suspected or proven CoVID-19 can continue their usual CPAP/Bilevel NIV.
- Because of the risk of aerosolising virus, users of these NIV who are or are potentially infected with CoVID-19 should be aware of this possibility and should not use NIV around others.
- When suspected CoVID-19 or viral symptoms, subjects should isolate in room with door shut when using NIV and remain isolated from other family members.
- Therapy continuation or discontinuation in the setting of suspected or proven CoVID-19 infection should be discussed by the treating respiratory or sleep physician and individualised depending on patient- related risk/benefit. There are significant risks to ceasing NIV without seeking expert advice.
- Manufacturer guidelines should be followed regarding cleaning/disinfection of mask and tubing.

CPAP for sleep disordered breathing (obstructive sleep apnea)

- Use of CPAP can increase the risk of transmission of viruses such as CoVID-19 through aerosolisation and/or dispersal.
- Therefore, use of CPAP should be avoided in those with suspected or proven CoVID-19 unless clinically necessary.
- Decisions about discontinuing therapy should be made under the advice of a sleep or respiratory physician.
- Humidification may increase this risk so should be avoided when possible in those with suspected or proven CoVID-19.

Hospital-based:

- Patients with suspected or confirmed CoVID-19:
 - Review on an individual basis to determine whether CPAP can be safely discontinued during hospitalisation.
 - Those requiring CPAP should use double-limb non-vented masks with an expiratory filter in the circuit. If double-limb circuits are not available use a single limb circuit with a well fitted non-vented full-face mask, attached to an appropriate microbial filter and exhalation port (on the side of the filter closest to the device). Use with full airborne and droplet PPE.
 - In both configurations, a humidifier should not be used as this will saturate the filter and increase airway resistance. The microbial filter should be replaced every 24 hours.

- Patients should be managed in a negative pressure or single room with the door closed and full airborne and droplet PPE, including N95 masks.
 - A remote communication system is needed to communicate with staff.
 - Aim to clear patient from needing to be in isolation in a negative pressure room as quickly as possible as this impairs this ability to safely nurse and communicate with patients.
- Patients without suspected or proven CoVID-19:
 - Review on an individual basis to determine whether CPAP can be safely discontinued during hospitalisation.
 - If not, use of CPAP should be under expert supervision.

Hotel quarantine:

- Most people using CPAP for obstructive sleep apnoea who are not acutely unwell can cease CPAP for the period of hotel quarantine without significant adverse effects.
- Decisions about cessation of therapy should be discussed with medical staff.
- If ongoing use of CPAP is required
 - Isolate in a single room with appropriate ventilation and keeping door shut in a facility with medical supervision
 - Any staff interactions require full airborne and droplet PPE (including N95 masks) and should be avoided when CPAP is being used
 - This care may not be able to be provided in hotel quarantine, so transfer to an appropriate facility may be required

Home:

- Most people using CPAP for obstructive sleep apnoea who are not acutely unwell can cease CPAP if they develop viral symptoms, suspected or confirmed as having CoVID-19 infection.
- They should contact their treating respiratory or sleep physician to discuss treatment options.
- Because of the risk of aerosolising and/or dispersing virus, those who are infected or potentially infected with CoVID-19 and need to continue with CPAP should not use CPAP around others. They should isolate in room with door shut when using CPAP and remain isolated from other family members.
- Manufacturer guidelines should be followed regarding cleaning/disinfection of mask and tubing.

Commencement of CPAP:

- When community prevalence of CoVID-19 is low, and areas are not declared hot spots the risk of transmission from commencement of CPAP is low.
- If community prevalence is increased or a declared hot spot, temporary cessation of face-to-face commencement should be considered.

- CPAP can be commenced in the community or during an attended CPAP titration sleep study.
- Steps to reduce risk of transmission and risk to staff:
 - Use of pre-screening questionnaires
 - Use of surgical masks is also recommended as physical distancing cannot always be maintained during instrumentation for polysomnography and mask fitting.
- Manufacturer guidelines should be followed regarding cleaning/disinfection of mask and tubing.

Paediatric patients

The information below is provided as an additional guide for clinical staff, highlighting some issues specific to paediatric patients who are either already established on CPAP/NIV/Invasive home ventilation or require initiation of therapy during acute illness. It is not intended to supersede local infection control advice but to support management of this specific patient population who have additional risks that need to be considered.

Introduction

1. Healthy children appear to be less susceptible to CoVID-19 although there are some vulnerable sub-groups (e.g. infants) ^{1,2}.
2. Children may be asymptomatic with CoVID-19.
3. Assumptions about whether all patients should be presumed to have CoVID-19 should be adjusted according to the community spread (load) of the disease and with local advice from individual infectious diseases teams. It is recommended that children who are using aerosolising therapies such as CPAP/NIV or require such therapy to be implemented to treat acute respiratory disease, are considered high risk of spreading disease. Early testing for CoVID-19 in this group will be important at the time of admission to hospital and children should be managed as if positive, with appropriate PPE use and isolation, until results are available.

Key messages in context of children

1. Ensure ongoing management of underlying diseases is not compromised. This may include ongoing use of aerosolising therapies such as hypertonic saline to manage lower respiratory tract disease when there is no effective alternative.
2. Minimise spread through respiratory therapies to others including families and health care workers by implementing infection control measures: e.g. CoVID screening for patients who are using (or are to use) high risk aerosolising therapies at the time of their admission, cohort screened patients using nebulising therapies, appropriate PPE for staff working in those areas.
3. Take appropriate precautions against aerosol spread of disease when managing any patient with acute respiratory deterioration.
4. Therapies- nebulisation, high flow oxygen therapy, non-invasive (NIV and CPAP) and invasive ventilation via tracheostomy.
 - a. Nebulisation and humidification- as per adult recommendations. We should avoid nebulisation if not necessary and bronchodilators should be administered by MDI/spacer. Nebulisation may still be the most appropriate therapy for patients with specific indications: post extubation stridor, critical asthma presentation, and severe croup. Airborne precautions should be maintained for children with respiratory illnesses requiring nitrous oxide for procedures.
 - b. High Flow Oxygen Therapy (HFOT): In general, the use of HFOT should be avoided if other options are effective e.g. low flow oxygen. If HFOT is to be used, then it

should be used at appropriate treatment levels and precautions for aerosol spread of disease implemented.

- c. Non-invasive ventilation – ACUTE IN HOSPITAL SETTING: In general, appropriate respiratory support should not be withheld.
 - i. Discussion with infection control/ID teams is recommended for acute management of patients requiring NIV/CPAP. This should include discussion regarding appropriate PPE, ward or HDU/ICU placement in order to minimise risk of spread of infection, whilst ensuring safe management of ventilation.
 - ii. Continue routine therapy with NIV/CPAP to treat underlying diseases.
 - iii. NIV therapy has clear benefits for many children, including those with acute respiratory failure. However, standard therapy with a vented mask may increase the risk to staff. Interface adjustments to limit aerosolisation and spread of infectious particles should be undertaken only if safe to do so. The use of alternative masks and circuits in young children may increase dead space and lead to poor mask fit (which in turn increases aerosolisation risk) and therefore these risks to the child need to balance with that of spread of infection.
 - iv. Non-vented masks carry additional risks, particularly in young children e.g. suffocation. Use outside of an intensive care setting should generally be avoided.
 - 1. Older children (e.g. >12yrs) can be managed according to adult recommendations using a non-vented mask with a double limb circuit and inline suctioning or with an expiratory filter in the single limb circuit**. This should only occur in settings where staff are trained and familiar with this equipment- usually PICU.
 - 2. Younger children are most safely managed using standard vented masks, and staff protected with appropriate PPE. Adjuncts such as use of a surgical mask over the NIV mask or other barriers can be considered but are unproven.
 - v. If children receiving ventilation via a tracheostomy have a respiratory illness, they should be managed in HDU/ICU to implement closed circuits with in-line suctioning. Changing to a cuffed tracheostomy tube may also be considered.
- d. Non-invasive ventilation – HOME SETTING:
 - i. As per adult guidelines patients without suspected or proven COVID-19 can continue their usual CPAP/NIV/ invasive ventilation therapy.
 - ii. Families should be aware of the increased risk of transmission to household contacts if a child is on NIV and unwell. Physicians may consider advising discontinuation of therapy if the child is not dependent on CPAP/NIV for the period of the acute illness until symptoms resolve (or COVID-19 test negative). The decision of whether to continue or stop CPAP/NIV therapy should be based on whether the risk: benefit assessment favours continued therapy.

iii. In general, children who are on invasive home ventilation via tracheostomy are likely to be dependent on support. In this situation benefit of therapy outweighs risk of transmission and therapy should NOT be ceased. If children in this group become unwell, testing for CoVID-19 should occur as soon as possible, with consideration of appropriate PPE use pending results. Admission to hospital may be required if patients cannot be managed safely at home.

5. Sleep studies- follow local infection control/ID advice for essential urgent studies. Note: As all full paediatric studies are in laboratory studies, there is no current alternative (home, or remote) available for patients who require these diagnostic tests.

** Set up for single limb circuit: Add an additional combined bacterial/viral (hepa) filter between the mask and device tubing e.g. non-vented mask → filter → CO₂ exhalation port on tubing device. Note- this set up may increase dead space and require adjustment in ventilator settings.

References

1. Dong, Y., Mo, X., Hu, Y., Qi, X., Jiang, F. Jiang, Z., Tong, S. **Epidemiology of COVID-19 among children in China.** Pre-publication release *Pediatrics* 2020; doi: 10.1542/peds.2020-0702.
2. Zhang, L., Li, Y. Liu, D., Shen, K., Xu, S., Wong, G. **Clinical characteristics of coronavirus disease 2019 in China.** *N Engl J Med.* DOI: 10.1056/NEJMoa2002032.