

MANAGEMENT OF CRITICAL COVID-19 DISEASE AFTER CONFIRMATION OF TESTS

RAPID SEQUENCE INTUBATION

- Intubation should be done in ICU/ controlled isolation in order to reduce aerosol dispersal.
- Preparation of ventilator in advance to avoid Ambu-bag use for prolonged periods after intubation.
- Assume and prepare for difficult intubation: boogie, stylets, video scopes or Fiber optic flexible laryngoscope if available.
- Check functionality of your suction apparatus.
- Prepare endotracheal tube ties in advance.
- Only 3 people at a time during intubation. Nurse 1 to administer drugs, Nurse 2 to hand suction and other equipment, expert clinician to perform the intubation.
- If possible, use disposable equipment at all times.

COURSE AND MANAGEMENT OF RESPIRATORY COMPLICATIONS

- Once intubated, connect on to the machine and set to the following:
 - FiO₂ 1 (100%) and adjust as shown on the chart.
 - Respiratory rate 15 breaths per minute (aim is to achieve adequate oxygenation; disregard hypercarbia). (Children under 14 years, start at a higher rate).
 - If on Volume Control Mode, set tidal volume to 6mls/kg ideal body weight [IBW (Kg) = Height (cm) MINUS 100 (males) or MINUS 105 (females)].
 - If on Pressure Control Mode, set the driving pressure to aim at a tidal volume of 6mls/kg IBW.
- If necessary, adjust tidal volumes downwards to keep plateau pressures less than 30cmH₂O.
 - Begin with PEEP 10 cm H₂O; increasing as shown on the chart.
 - I:E Ratio starting at 1:2 and adjusting as shown on the chart
- Closed suction system and HME HEPA filters should be preferred to prevent aerosol spread.
- Nurse head raised.
- hourly chest physiotherapy to clear secretions out; use closed circuit suction systems with chest percussions.
- Inspect breathing tubes for kinks, fluid collections or accidental disconnections.
- Use End Tidal capnography if available.
- Proning should be tried when P/F <150 and an adequate number of trained staff are available. { P/F ratio is arterial oxygen concentration divided by fraction of inspired oxygen}.
- Do not attempt to extubate the patient within 3 days of mechanical ventilation (MV), because the initial relief provided by MV leads to a false sense of wellbeing in many patients.
- Weaning off MV should be as per clinician discretion or as per the weaning guidelines provided below.

MV Settings Courtesy ARDSNET: Inclusion Criteria

- Acute onset PaO₂/FiO₂ ratio < 300.
- CXR bilateral diffuse or patchy infiltrations.
- No clinical evidence of left heart failure.
- PH goal 7.30 – 7.45.
- Acidosis management (PH 7.15 – 7.30).
- Increase RR till PH > 7.30 or PaCO₂ < 25 (maximum RR 35).
- If PH < 7.15 despite all above; increase RR to 35; increase Tidal Volume by 1ml/kg till PH >7.15. NB: Plateau pressure of 30 cm H₂O may be exceeded.
- Alkalosis management: PH>7.45; reduce RR if possible.

MV Settings Courtesy ARDSNET

OXYGENATION GOAL: PaO₂ 55-80 mmHg or SpO₂ 88-95%. Use a minimum PEEP of 5 cm H₂O. Consider use of incremental FiO₂/PEEP combinations such as shown below to achieve goal. Where blood ga

Lower PEEP/Higher FiO₂

FiO ₂	0.3	0.4	0.4	0.5	0.5	0.6	0.7
PEEP	5	5	8	8	10	10	10
FiO ₂	0.7	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	12	14	14	14	16	18	18-24

Higher PEEP (or PIP on Pressure Control Setting)/Lower FiO₂

FiO ₂	0.3	0.3	0.3	0.3	0.3	0.4	0.4
PEEP	5	8	10	12	14	14	16
FiO ₂	0.5	0.5	0.5-0.8	0.8	0.9	1.0	1.0
PEEP	16	18	20	22	22	22	24

IMPROVING OXYGENATION: MV Plateau Pressure Settings Courtesy ARDSNET

- PLATEAU PRESSURE (Pplat) GOAL: ≤ 30 cm H₂O.
- Check Pplat (0.5 second inspiratory pause), at least q 4h and after each change in PEEP or VT. If Pplat > 30 cm H₂O: decrease VT by 1ml/kg steps (minimum = 4 ml/kg).
- If Pplat < 25 cm H₂O and VT < 6 ml/kg, increase VT by 1 ml/kg until Pplat > 25 cm H₂O or VT = 6 ml/kg.
- If Pplat < 30 and breath stacking or dys-synchrony occurs: may increase VT in 1ml/kg increments to 7 or 8 ml/kg if Pplat remains < 30 cm H₂O.

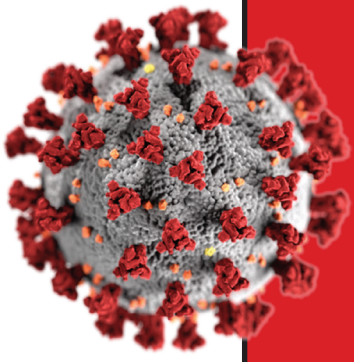
WEANING OFF MV: COURTESY ARDSNET

- Conduct a SPONTANEOUS BREATHING TRIAL daily when:
 - FiO₂ ≤ 0.40 and PEEP ≤ 8 OR FiO₂ < 0.50 and PEEP < 5.
 - PEEP and FiO₂ ≤ values of previous day.
 - Patient has acceptable spontaneous breathing efforts. (May decrease vent rate by 50% for 5 minutes to detect effort.)
 - Systolic BP ≥ 90 mmHg without vasopressor support.
 - No neuromuscular blocking agents or residual blockade.

SPONTANEOUS BREATHING TRIAL (SBT): COURTESY ARDSNET

- If all above criteria are met and subject has been in the study for at least 12 hours, initiate a trial of UP TO 120 minutes of spontaneous breathing with FiO₂ < 0.5 and PEEP < 5:
 - Place on T-piece, trach collar, or CPAP (if two negative nasopharyngeal swabs) ≤ 5 cm H₂O with PS < 5
 - Assess for tolerance as below for up to two hours. a. SpO₂ ≥ 90: and/ or PaO₂ ≥ 60 mmHg b. Spontaneous VT ≥ 4 ml/kg PBW c. RR ≤ 35/min d. pH ≥ 7.3 e. No respiratory distress (distress= 2 or more) i) HR > 120% of baseline ii) Marked accessory muscle use iii) Abdominal paradox iv) Diaphoresis v) Marked dyspnea.
 - If tolerated for at least 30 minutes, consider extubation.
 - If not tolerated resume pre-weaning settings.





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SEDATIVES

Change frequency depending on availability of PPE's.

- Aim at RASS 0 (alert and cooperative) to Negative 2 (responding to mild stimulation).
- Choice depends upon availability.
- I.V. Midazolam 1-5 mg every hour, or 4 – 20 mg every 4 hours (running in the maintenance fluid).
 - Or, Oral Midazolam 15 mg BID crushed and fed through the oral gastric tube.
- I.V. Diazepam 10mg BID/TDS.
- Ketamine 2-4mg/Kg bolus followed by 125mg per hour or 500mg every 4 hours (running in the maintenance fluid). (Add atropine 0.6mg twice a day for drying secretions, but will worsen fevers).
- I.M Morphine 10mg stat then 2 - 5 mg per hour; alternatively, 10 -15 mg every 4 hours, (running in the maintenance fluid and rate depending on haemodynamics).
- I.V. Fentanyl 100mcg stat then 50mcg per hour or 200mcg every 4 hours running in the maintenance fluid.
- If syringe pumps available, you may use either:
 - Dexmedetomidine 0.2 – 1.4 mcg/kg/hour. (Avoid loading doses) OR
 - Remifentanyl 0.05 – 0.3mcg/kg/minute.

INTRAVENOUS FLUIDS

Change frequency of administration depending on availability of PPE's.

- 1.5mls per kg per hour OR 6mls/kg every 4 hours (keep patient 'dry'). Assess urine output as the patient may have been dehydrated due to prior fever , sweating and reduced oral intake.
- Use the 4:2:1 ratio for children under 14 years.

The total fluid intake per day is inclusive of all medications plus oral feeds.

ANTIVIRALS

Change frequency depending on availability of PPE's.

- No recommendations to date.
- Trials using hydroxychloroquine , azithromycin and/ or a combination of lopinavir/ ritonavir in a fixed drug combination are ongoing for patients with severe illness(contact the national Infectious disease unit before commencing).

ANTIBIOTICS

Change frequency depending on availability of PPE's.

- If rising White Cell Count (Neutrophilia); urinary casts; rising Procalcitonin levels.
- The ratio of neutrophils to lymphocytes exceeding 3:1 on the blood film is a marker of severe disease progression.
- Consider empirical broad spectrum antibiotics according to institutional antibiogram profiles.
- Consider escalating or de-escalating once culture/sensitivity results are back.

ANTIPYRETICS

Change frequency depending on availability of PPE's.

- If >50kg and normal liver function, Paracetamol 1g TDS per oral OR
- I.V Paracetamol 1g every 4 hours to a maximum of 4 g per 24 hours.
- NSAIDS worsen progress and outcomes.

MONITORING INTERVENTIONS

Change frequency depending on availability of PPE's.

- Insert a CVC line regardless of need for vasopressors at the earliest opportunity.
- Insert an Arterial line if transduction is possible (for ease of doing laboratory works), at the earliest opportunity.

- Arterial blood gas analysis every four hours and with every change in ventilator settings.
- Hourly urine collecting system if available, otherwise use regular urine bag and estimate by pouring into a measuring container, once, every 4 hours.
- Thromboprophylaxis (use Enoxaparin/ Warfarin/ or Pneumatic devices).
- Ulcer prophylaxis using oral Ranitidine 150mg twice daily, OR I.V. Ranitidine 50 mg twice daily or Proton Pump Inhibitor of choice
- Glycaemia control with soluble Insulin as determined by random blood sugars.
- Pressure area care as per hospital protocols.
- Nutritional support either enteral or parenteral as condition may dictate.

MANAGEMENT OF CARDIOVASCULAR COMPLICATIONS

- Keep MAP>65mmHg in adults and if necessary, use vasopressors as per hospital protocol: paediatric MAP is age related and refer to appropriate age guides.
- Monitor for myocarditis by performing Troponin levels and looking at the ECG on telemetry (avoid performing bedside 12 lead ECG as this involves increased workload for already stressed staff).
- Call cardiology consult if vasopressor requirements suddenly increase.
- Treat any arrhythmias.
- Correct electrolytes.
- CCSK is recommending non-mechanical CPR for the time being.

MANAGEMENT OF RENAL COMPLICATIONS

- Encourage diuresis by giving occasional frusemide boluses of 20mg I.V. ONLY IF patient well hydrated.
- COVID-19 associated AKI maybe pre-renal.
- Aggressively replete electrolytes especially Potassium (>4.5), Magnesium (>2.5) and Phosphate (>2.5). (Measure 4 hourly).
- Rising Creatinine does not mean hypovolaemia (spin urine for casts as renal damage may occur).
- Have a low threshold for haemodialysis for volume management.

MANAGEMENT OF NEUROLOGICAL COMPLICATIONS

- Marked encephalopathy and hyperactive ICU delirium is common.
- If these develop treat with I.V. Haloperidol and discontinue Benzodiazepines.
- Use only enough sedation to achieve lowest level of RASS at negative 2 but lighten sedation as MV requirements decrease.

MANAGEMENT OF GASTROENTEROLOGICAL COMPLICATIONS

- Pass an oral gastric tube immediately after performing the endotracheal intubation and confirm positioning via palpation for turbulence caused by gas entering the stomach.
- Subsequent CXR post intubation can be used to confirm position of NGT tip.
- Attach feeding lines and run as appropriate.
- Ulcer prophylaxis as indicated above.
- Bowel movement as natural but inspect diapers for soiling and change accordingly at the 4 hourly interval.
- Test for swallowing capability before extubation.

