Royal Derby Hospital Critical Care Unit

Interim clinical guidance for the care of the patient with confirmed or suspected COVID-19 EPU / Theatres

Version 2.0 - Prepared by Dr Chris Beet and Dr Craig Morris

6th April 2020 – for review 6th August 2020

Purpose

This document acts as a guide for the care of a patient with confirmed or suspected COVID-19 beyond the immediate intubation and resuscitation period. This document is a work in progress and may be updated.

Patient pathway / clinical trajectory / general principles

Most patients follow a similar clinical course, and patients will be cohorted into clinical areas according to the stage of their illness. EPU/Theatres will focus on the initial phase of the patient's illness. In general, these patients require high FiO_2 but reasonably good lung compliance. Secretion burden is minimal. Most of these patients will require NMBA and prone ventilation. Current international experience suggests that COVID-19 pneumonitis does not behave like a typical viral pneumonia, such as Influenza, nor does it behave like typical ARDS. In the early stages of the illness, microthrombi within the pulmonary circulation resulting in increased dead space seems to be the major issue. This is followed by a fibrotic phase and a cytokine storm accompanied by multi-organ failure.

Based on our current experience, early improvement is observed, followed by a further deterioration at around day 5.

On admission to EPU/Theatres

1. Measure the patient's height (do not estimate it). Complete the laminated bedside sheet with the height, ideal body weight and ideal tidal volume
    - Ideal body weight = height(cm) – 100 (male) or 105 (female)
    - Ideal tidal volume is **6 - 8ml/kg ideal body weight**
    - **If IBW is exceeding 70-75kg, the measurement of height may be wrong! IBW 80kg for a 6ft male.**
2. Establish the patient on pressure controlled ventilation (**use PCV not PCV-VG**) with appropriate tidal volumes and PEEP (see next section)
3. Procedures
    - In **full** PPE, insert arterial line, central venous catheter and nasogastric tube
    - The CVC can be placed in either side of the neck. It is not necessary to reserve the right IJV for ECMO/vascath.
    - Perform chest x-ray to confirm the position of the ETT/CVC/NG and document findings in the notes. Follow the interim guidance on NG tube confirmation (see intranet).

4. Diagnostic sampling
    - The majority of patients will already have been swabbed for COVID-19. If this is the case, there is no need to send repeat samples (the lab will reject them)
    - If COVID-19 sampling has not happened, please send
        i. Deep nasopharyngeal and oropharyngeal swab
        ii. Tracheal aspirate (20ml saline aspirated using closed suction)
    - In addition to COVID-19 sampling, all routine investigations for LRTI must be sent:
        i. Blood culture
        ii. Sputum (or tracheal washing obtained with 20ml Saline and closed suction)
        iii. Urine for legionella and pneumococcal antigen
        iv. Viral swab for respiratory viral panel including influenza
        v. HIV screen – patient and/or family consent **is not required** for this
5. Prognostic sampling
    - In addition to routine ICU admission bloods, please send D-Dimer and Troponin
6. Drug chart (note that there is now a pre-printed drug chart)
    - Please prescribe:
        i. Enoxaparin 40mg OD S/C (dose adjust for obesity or renal function)
        ii. Ranitidine 50mg TDS IV (BD if eGFR <30)
        iii. Carbocisteine 750mg TDS NG
        iv. Senna 15mg BD NG
        v. Lactulose 10ml BD NG
        vi. Antibiotics (see table below)
        vii. NG feed (Nutrison standard 0-60ml/hour)

	No penicillin allergy	**Penicillin allergy**
Patient from community/in hospital <48 hours	Co-Amoxiclav 1.2g TDS IV (where available) OR Ceftriaxone 1g OD IV (if co-amoxiclav not available) PLUS Clarithromycin 500mg BD IV	Levofloxacin 500mg BD IV
Patient in hospital >48 hours	*Until supplies of Tazocin run out, use:* Tazocin 4.5g TDS IV *When supplies of Tazocin run out, use:* Ceftazidime 2g TDS IV Linezolid 600mg BD IV Clarithromycin is **not** needed in these patients	Meropenem 1g TDS IV Clarithromycin is **not** needed in these patients

Ventilation

Initial settings

- PCV mode only (**not** PCV-VG)
- Fresh gas flow 10L/min
- FiO_2 1.0
- PEEP 10cmH_2O
- Rate 14
- I:E 1:1
- The patient's height should be measured with a tape measure, **not estimated**, to determine their ideal body weight.
- The target tidal volume should be **8ml/kg ideal body weight** in the first instance.

Targets

- SpO_2 88-92%
    - Titrate measured (not set) FiO_2
    - Ignore PaO_2
- pH >7.20
    - Ignore $PaCO_2$

Titrating Settings

- Determine driving pressure (P_{peak}-PEEP)
- If driving pressure >15cmH_2O the patient is in the "non-compliant" phenotype. Manage the patient as conventional ARDS
    - V_t 6ml/kg ideal body weight
    - Increase PEEP
- If driving pressure <15cmH_2O the patient is in the "compliant" phenotype. This is **not** ARDS and should not be managed as such
    - Aim to reduce PEEP in increments as long as SpO_2 does not change, to a minimum of 5cmH_2O
- Titrate rate to pH
- Aim to move to I:E 1:1.5 as the FiO_2 improves

Avoid spontaneous breathing / weaning

Local and national experience is that early trials of spontaneous breathing and weaning may be detrimental in these patients. They should be left on PCV mode.

Sedation

- Initial sedation is Midazolam and Fentanyl
- Patients should be curarised with Atracurium or Cisatracurium (subject to stock levels) as a continuous infusion for the first 48 hours.
- After 48 hours, consider stopping the infusion and use boluses of atracurium where necessary (50mg 2 hourly)

Management of severe refractory hypoxaemia

Follow these steps:

1) In full PPE, attempt a recruitment manoeuvre using manual ventilation
2) Check that the filter and tube are not blocked. This is a common problem.
3) Titrate the PEEP upwards. If there is no response, the PEEP is not benefical and should be lowered again.
4) Consider prone position ventilation (see below)
5) Consider other causes e.g. pneumothorax. Consider CXR or US

Troubleshooting extreme hypercarbia ($PaCO_2$ in double digits)

- Blocked filters are common – check and replace.
- Water in the circuit is a common cause of hypercarbia. Feel the circuit to see if it is grumbling. Empty the water trap if necessary.

Prone position ventilation

- This should be considered in all patients with high Oxygen requirements (FiO_2 >0.70). There is a separate SOP for the technique.
- Patients should be proned for a minimum of 16 hours.
- When turned supine, review the need for further proning after 4 hours. Avoid deciding earlier as there is often some transient deterioration after returning to the supine position.
- If the FiO_2 remains <0.70, the patient can be left supine. Otherwise, return them to the prone position.
- If the patient does not demonstrate improvement with prone positioning, a further attempt can be made.
- After two attempts, the patient may be considered a 'non-responder' and may not benefit from further proning – discuss this with the ICU team.
- Based on our observation, patients beyond day 4-5 do not benefit from proning, but this should not be considered an absolute contraindication.

Antibiotics and antivirals

- Secondary bacterial infection is a recognised complication of COVID-19. Therefore all patients will be treated with IV antibiotics. Use the table above to guide the choice of agents. Unless there is a very good reason not to, antibiotics should be discontinued after **5 days.** This pandemic should not be seen as an excuse for poor antimicrobial stewardship.
    - Temperature, CRP and WCC continue to rise beyond day 5 in COVID-19 patients, and are therefore **not** useful markers for antibiotic stewardship, nor is the evolution of CXR changes
- The routine use of antifungals is not recommended. Candida in sputum is a common finding in ventilated patients and usually represents colonisation. It does not need to be treated.

- The use of antivirals, steroids, hydroxychloroquine and other such agents is lacking in evidence, and these agents **will not be used** at present. All patients will be enrolled in the RECOVERY trial. The R&D team will facilitate this process; you don't need to do anything.

COVID-19 results and repeat testing

- COVID-19 sample results usually arrive within 48 hours. Negative patients should be flagged to the ICU team for consideration of transfer elsewhere.
- Routine repeat sampling to confirm negative status is not indicated
- Where there is a high index of clinical suspicion for COVID-19, but the result is negative, repeat testing can be done, but this **must** be discussed with the ICU team first.
- Clinical suspicion is determined by:
    - History of contact/exposure
    - History of viral prodromal illness (myalgia/malaise/fevers)
    - Dry cough
    - Typical CXR features (interstitial picture – consolidation suggests alternative diagnosis)
    - Lymphopenia on admission

Nutrition and bowel care

- Commence enteral feeding as soon as the position of the NG tube has been confirmed (this should have been inserted on admission). Refer to the interim guidance for NG tube confirmation.
- NG aspirates of up to 500mls are not indicative of feeding failure, and feeding should be continued unless aspirates consistently exceed this amount
    - Use prokinetics if the NG aspirate volume exceeds 500ml (metoclopramide 10mg TDS IV for 5 days maximum)
- Commence laxatives early (ideally on admission) – senna and lactulose are recommended. Do not discontinue them unless there are persistent loose stools.
- Commence ranitidine 50mg TDS IV for 5 days or until full NG feed is established, whichever is earlier

Fluids and electrolytes / AKI

- Aim for K^+ >4.0 in most patients. Replacement should be enteral if the patient has a working gut, or neat K^+ via CVC. Avoid KCL diluted in fluids.
- Magnesium replacement is not necessary unless very low or the patient has arrhythmia
- We anticipate that patients will develop hypernatraemia. This does not need to be corrected unless extremely high.
- In general, patients do not need replacement of PO_4^- unless they are at the weaning stage of the illness

    - The enteral absorption of PO_4^- is excellent, and this is the preferred route of administration in patients that have a functioning gut. Sando-PHOS 2 tabs TDS via NG for a maximum of 5 days is more than sufficient
    - Phosphate polyfusors are expensive and wasteful (usually only ¼ of the bottle is given). Avoid them unless the patient is not absorbing NG feed (even when the serum PO_4^- is very low)
- The use of 'maintenance fluids' is strongly discouraged
- Boluses of Hartmann's 250ml can be used where necessary
- Urine output target is 0.2-0.3ml/kg/hr
- Aim for a neutral fluid balance. Insensible losses are high in these patients and AKI is a common complication. The use of diuretics should be restricted to a small number of patients who are developing a significantly positive cumulative fluid balance and should only be prescribed on the advice of an ITU consultant.
- A suggested diuretic regimen where needed is:
    - Furosemide 20mg QDS IV
- Most patients will develop mild-moderate AKI. Gentle rehydration (using boluses rather than a continuous infusion) may be beneficial, however, this should be reviewed carefully and discontinued if it is not helping.
- The decision to start CVVH will be made by the ICU team.

Cardiovascular support

Septic shock is unusual in viral pneumonia and should prompt consideration of an alternative or co-existing diagnosis. Noradrenaline is the first-line vasopressor. Hydrocortisone 50mg QDS IV should be administered for septic shock (Noradrenaline >0.2 mcg/kg/min).

Myocarditis is a recognised complication of COVID-19, and this must be considered in a haemodynamically unstable patient. An echocardiogram will be required urgently. Please discuss these patients with the ICU team.

Resuscitation status

The outcome of cardiac arrest in a ventilated, hypoxic patient is poor, and CPR is an invariably futile intervention, that in the context of COVID-19, places staff at significant risk of inoculation. Consider a RESPECT form for most patients. This **must** be communicated to the family. Remember that this is a medical decision, and you are not obliged to provide CPR. You are only required to inform the family of your decision (not seek their permission). These decisions are best made with a second opinion.

Other

- We have observed in our cohort that IV or NG paracetamol, when administered for pyrexia, causes significant hypotension in COVID-19 patients. Paracetamol **should not** be administered for pyrexia.
- Routine CXR is discouraged. The majority of patients demonstrate worsening features post-admission, but this is not necessarily indicative of the clinical picture

- Avoid CTPA for investigation of PE. Consult the ICU team if PE is suspected
- Please do not independently or routinely make referrals to the ECMO service. This will be done by the ICU team