

Guidance for the critical care management of patients with known / suspected Novel Coronavirus (COVID-19) infection in Bradford Teaching Hospitals NHS Foundation Trust (BTHFT).

Background.

1. COVID-19 is a recently identified airborne High Consequence Infectious Disease (HCID) spread via both the droplet and contact routes of transmission.
2. HCIDs are acute infectious diseases, with a high fatality rate, limited available treatment / prophylaxis options and require an enhanced individual, population and system response in order to contain and manage them effectively.
3. The overall mortality for confirmed COVID-19 infection is approximately 2%. Mortality in otherwise fit and well patients under 49 years old is less than 0.4%. Mortality rises sharply in patients over 60 years old or those with comorbidities. For example, the mortality in patients over 80 years old exceeds 14%, and in patients with cardiovascular disease mortality exceeds 10%.
4. There are 5 HCID (airborne) centres in the UK where patients with confirmed HCIDs such as COVID-19 are preferentially managed; Guy's and St. Thomas' NHSFT, Royal Free London NHSFT (paediatric services via Imperial College NHSFT), Royal Liverpool and Broadgreen University Hospitals NHS Trust (paediatrics via Alder Hey Children's NHSFT), Newcastle upon Tyne Hospitals NHSFT and Royal Hallamshire Hospital Sheffield.
5. The number of COVID-19 cases is now at a level such that BTHFT will be expected to treat patients locally, including those needing critical care.
6. While BTHFT is not a designated HCID(A) hospital, in the event of a patient with confirmed or suspected COVID-19 requiring critical care, local guidance for management is required.
7. National guidance on the management of COVID-19 patients is evolving. It is recommended that the latest advice from Infection Prevention and Control be sought and followed.
8. The latest Department of Health advice on COVID-19 is available via: https://www.gov.uk/guidance/wuhan-novel-coronavirus-information-for-the-public?gclid=EAlalQobChMIInbGyycXi5wIVhrTtCh3p-g76EAAYASAAEgJ-bfD_BwE
9. The latest Intensive Care Society advice on COVID-19 is available via: https://www.ics.ac.uk/ICS/ICS/Pdfs/News/Official_2019-nCoV_critical_care_FAQ_and_advice.aspx

10. The latest BTHFT Infection Prevention and Control guidance is available via: <http://www.bradfordhospitals.int/departments/hospitalServices/infection-control/default.aspx>
11. In the absence of any specific treatment or vaccination for COVID-19 the mainstay of management is supportive care, in combination with appropriate precautions to minimise the risk of infecting other patients, visitors and hospital staff.
12. Current data suggests that up to 10% of hospitalised patients may need critical care admission. Mortality in patients needing critical care support exceeds 65% based on preliminary data from China.

Source of admissions.

1. Referrals of patients with known or suspected COVID-19 to critical care are most likely to come either directly from the Emergency Department, or from Acute Medicine.
2. At present, critically unwell patients presenting to the Emergency Department should be managed in beds 4 or 5 in the resuscitation room as per Emergency Department guidance.
3. Adult patients with suspected COVID-19 admitted via Acute Medicine should be admitted to Ward 7 for assessment.
4. Patients who test positive for COVID-19 will be transferred to Ward 31. There are two Positive Pressure Ventilation Lobby rooms on Ward 31 (A and F) which would be used first. In the event of more than two patients presenting, all patients will be admitted to Ward 31.
5. Paediatric patients with known / suspected COVID-19 should be admitted to the PPVL room on Ward 32. In the event of a paediatric inpatient requiring critical care they would be managed on Ward 32 and transferred to the stabilisation room prior to transfer. Currently, COVID-19 cases in children have been mild with no mortality reported.
6. Patients with known / suspected COVID-19 on Delivery Suite would be isolated in the Snowdrop room prior to transfer.
7. There is now a dedicated area within the Emergency Department for the initial assessment of patients with suspected COVID-19 infection which segregates patients from other categories of patient.

8. Patients with known / suspected COVID-19 requiring critical care admission should ideally be admitted to PPVL rooms 0 or 16 on the Intensive Care Unit.
9. A separate escalation policy for multiple COVID-19 patients needing critical care support has been produced and critical care capacity has been increased in anticipation of multiple admissions.
10. BTFHT is not a designated HCID(A) unit. Critical care transfers from other hospitals of patients with known / suspected COVID-19 require discussion with the duty ICU Consultant.

Personal Protective Equipment (PPE).

1. Spread of COVID-19 is via contact or droplet spread. Close contact, which is defined as being within 2 metres of the patient, or in the same room for a prolonged period without PPE is a risk factor for COVID-19. Procedures that generate an aerosol of respiratory secretions are also high risk.
2. Full respiratory PPE precautions should be taken for all patient contact with known / suspected COVID-19 cases. This includes: long sleeved, fluid-repellent disposable gown, gloves with long tight-fitting cuffs, FFP3 mask (MUST be fit tested and passed) or respirator hood for those with beards, headscarves or failed fit-test, eye protection, such as single use goggles or full-face visors.
3. Hand hygiene should be performed regularly. In particular, hand hygiene after each stage of removing PPE is mandatory.
4. All medical staff should be fit tested for FFP3 masks. Standard surgical face masks do not provide adequate protection for close patient contact or performing aerosol generating procedures.
5. All medical and nursing staff are advised to practise donning / doffing PPE.
6. It is recommended that both the donning and removal of PPE be supervised by a buddy as per IPC / DoH guidance.
7. Disposal of PPE should be performed as per local guidance, which requires waste to be double bagged via the orange waste stream. If a reusable respiratory hood has been used it should be decontaminated following removal as per local guidance.
8. Respirator hoods and correctly fitting FFP3 masks are said to provide equivalent protection. It may be easier to rapidly don a respirator hood in an emergency. It is not possible, however, to use a stethoscope while wearing a respirator hood, which renders clinical examination more difficult.

9. Resuscitation Council guidance is that in the event of a patient with known or suspected COVID-19 having a cardiac arrest, resuscitation team members should don full PPE before commencing cardiopulmonary resuscitation.

Intensive Care Management.

1. COVID-19 is a recently recognised illness and data regarding its clinical course and mortality is still emerging. Published studies are currently small in size and observational in nature and the prognosis may differ between differing healthcare systems.
2. The typical incubation period of COVID-19 appears to be 7-14 days. Incubation periods from 0-27 days have been documented.
3. The number of asymptomatic cases is unclear. It is likely that patients are infectious prior to the onset of symptoms.
4. Approximately 80% of patients have a mild illness, 15% severe, and 5% need critical care support.
5. Patients typically present with fever and a dry cough as initial symptoms. Gastrointestinal symptoms may also be seen. In more severe cases, shortness of breath from approximately day 7 resulting in rapid onset of severe hypoxia secondary to viral pneumonia has been observed. Patient oxygen requirements can rapidly increase to the point of needing mechanical ventilation over the course of 24-48 hours.
6. The median duration from admission to need for critical care support is 7 days, with 7% of patients in one published study needing critical care. The disease course appears to be 2-3 weeks (up to 6 weeks in more severe cases), so patients may need prolonged respiratory support.
7. Anecdotal reports from the USA suggest that a small number of patients can develop severe cardiogenic shock associated with a markedly reduced ejection fraction, which is associated with a high mortality. It is suspected that these patients may have developed either a cardiomyopathy or myocarditis.
8. Overall mortality patients needing critical care admission in China is high at 65%, increasing to 80% if mechanical ventilation is needed.
9. The incidence of ARDS in this group of patients is 67%, with a smaller number of patients developing multiple organ failure.

10. Mildly abnormal liver function tests (elevated transaminases) are common. Leucopenia is common. Serum levels of procalcitonin are typically normal, and C-Reactive Protein may be significantly elevated.
11. Chest CT images in affected patients typically show bilateral changes, with multiple areas of consolidation and / or ground glass opacities common.
12. Viable virus has been isolated from upper and lower respiratory tract secretions, and blood, urine and stool samples.
13. Performing endotracheal intubation may expose the operator to an extremely high viral load and anaesthetists / intensivists have been infected during such procedures based on data from the 2003 severe acute respiratory distress syndrome (SARS) outbreak. If intubating a patient the use of a respirator hood is recommended by the World Health Organisation.
14. Other procedures that are regarded as high risk for aerosol generation include bronchoscopy, cardiopulmonary resuscitation, manual ventilation using a bag and nebulisation of medications.
15. Where possible, such procedures should only be performed in a PPVL room with the minimum possible number of staff present.
16. Following the performance of an aerosol generating procedure, the room should be decontaminated 20 minutes later, as per local guidance, by the clinicians who performed the procedure.
17. Use of facial continuous positive airways pressure (CPAP) or forms of non invasive ventilation (NIV) is controversial. There are concerns that they may increase the viral load in the patient's room. Anecdotal reports from China suggest that the failure rate in NIV is high and the mortality of patients who are mechanically ventilated following failed NIV may be higher.
18. Provision is being made for NIV to be delivered to patients on Ward 31 and it is recommended that discussion between ICU and Respiratory Medicine takes place to determine the best treatment modality for individual patients.
19. Intensive Care Society advice, based on HCID(A) unit experience, is to consider early intubation in patients requiring this level of respiratory support.
20. Venturi oxygen masks, humidified oxygen masks and high flow nasal cannulae may also generate droplets within the room. Delivering supplemental oxygen using nasal cannula covered by a surgical mask has been recommended in order to minimise this.

21. Water humidification should be avoided, and a heat and moisture exchanging filter should be used on all pieces of respiratory equipment.
22. Closed suctioning devices must be used, and breaking the breathing circuit should be minimised.
23. Disposable breathing circuits are recommended. Reusable equipment should be decontaminated after use as per manufacturer instructions.
24. Ventilators should be placed on standby when manually ventilating a patient, and the use of a heat and moisture exchanging filter on a Mapleson C breathing circuit or Ambu bag will reduce aerosol generation from the expiratory valve. If a patient's breathing circuit has to be broken, clamping the tracheal tube is advised to minimise aerosol spread.
25. The use of steroids in patients with respiratory failure due to viral pneumonia is associated with increased mortality and increased viral shedding. The use of steroids for the treatment of ARDS following COVID-19 infection is not recommended by the HCID(A) critical care units unless there is another indication (e.g. associated severe asthma).
26. Management of COVID-19 is otherwise similar to that of other viral pneumonias.
27. The use of prone ventilation and / or neuromuscular blockade appears to improve oxygenation in intubated COVID-19 patients.
28. Fluid overload appears to worsen oxygenation and restrictive fluid resuscitation +/- vasopressor use is recommended for hypotensive patients. Use of diuretics or renal replacement therapy may also be beneficial.
29. Trials of antiviral drugs are underway. At present, it is not possible to recommend the use of antivirals outside the context of a clinical trial.
30. Referral for extra corporeal membrane oxygenation (ECMO) may be considered, but acceptance may be limited by available resources.

Critical Care Transfers.

1. The use of the Hamilton ventilator rather than the Drager Oxylog ventilator is recommended for both intra- and inter hospital transfers as the ventilator tubing is single use.
2. Transfers for investigations should be minimised. Where possible, investigations should be carried out on the patient while they are in a PPVL room.

3. In the event of a patient needing transfer to e.g. the operating theatre or radiology department for investigation / treatment, the transfer must be discussed with the receiving department and Infection Prevention and Control team and the transfer of the patient planned and conducted carefully in order to minimise the risk of spreading infection. Trust protocols for transferring such patients should be followed.
4. In the event of a patient needing an inter hospital transfer for any reason, the patient's known / suspected infection status should be fully discussed with both the receiving unit and Yorkshire Ambulance Service in order that they may both make appropriate preparations.

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