CLINICAL MANAGEMENT PROTOCOL FOR COVID-19

(In Adults)

Government of India
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1. Background

Coronaviruses are large group of viruses that cause illness in humans and animals. Rarely, animal coronaviruses can evolve and infect people and then spread between people such as has been seen with MERS and SARS. The outbreak of Novel coronavirus disease (COVID-19) was initially noticed in a seafood market in Wuhan city in Hubei Province of China in mid-December, 2019, has now spread to 215 countries/territories/areas worldwide. WHO (under International Health Regulations) has declared this outbreak as a "Public Health Emergency of International Concern" (PHEIC) on 30th January 2020. WHO subsequently declared COVID-19 a pandemic on 11th March, 2020.

2. Disease Epidemiology

Current available evidence for COVID-19 suggests that the causative virus (SARS-CoV-2) has a zoonotic source closely related to bat-origin SARS-like coronavirus. It is an enveloped RNA beta coronavirus related to the Severe Acute Respiratory Syndrome (SARS) virus, and the virus has been shown to use the angiotensin-converting enzyme 2 (ACE2) receptor for cell entry.

The persons infected by the novel coronavirus are the main source of infection. At present, majority of the transmission is believed to occur predominantly through the airborne route and droplet released when the infected person coughs, sneezes, or talks. These droplets may also land on surfaces, where the virus has been seen to remain viable for a variable duration of time depending on the type of surface. Infection can also occur if a person touches an infected surface and then touches his or her eyes, nose, or mouth. (known as fomite transmission)

The median incubation period is 5.1 days (range 1–14 days). The precise interval during which an individual with COVID-19 is infectious is uncertain. As per the current evidence, the period of infectivity starts 2 days prior to onset of symptoms and declines rapidly within the first week of symptom onset.

3. Patho-physiology

Most adult patients with COVID-19 predominantly have a respiratory tract infection associated with SARS-CoV-2 infection. However, in a small proportion of cases, the disease can progress to a more severe stage characterized by a dysregulated immune response with hyperinflammation with subsequent development of ARDS.

Autopsy findings have revealed endothelial damage of pulmonary vasculature (Endothelialitis), microvascular thrombosis and extensive alveolar and interstitial inflammation (known as diffuse alveolar damage, DAD, also seen in non-COVID-19 ARDS) that ultimately result in, pulmonary intravascular coagulopathy, , ventilation perfusion mismatch, right to left shunt and refractory ARDS. Hypoxemia, secondary to ARDS may also activate the coagulation cascade thereby creating a vicious circle

4. Case definition[1]

Suspect case

A. A person who meets the clinical AND epidemiological criteria:
Clinical Criteria:
• Acute onset of fever AND cough; OR
• Acute onset of ANY THREE OR MORE of the following signs or symptoms: Fever, cough, general weakness/ fatigue, headache, myalgia, sore throat, coryza, dyspnoea, anorexia/nausea/vomiting, diarrhoea, altered mental status.
AND
Epidemiological Criteria:
• Residing or working in an area with high risk of transmission of virus: closed residential settings, humanitarian settings such as camp and camp-like settings for displaced persons; any time within the 14 days prior to symptom onset; or
• Residing or travel to an area with community transmission any time within the 14 days prior to symptom onset; or
• Working in any healthcare setting, including with in health facilities or within the community; any time within the 14 days prior of symptom onset.

B. A patient with severe acute respiratory illness:
(SARI: acute respiratory infection with history of fever or measured fever of ≥38 C°; and cough; with onset within the last 10 days; and requires hospitalization).

Probable case

A. A patient who meets clinical criteria above AND is a contact of a probable or confirmed case, or linked to a COVID-19 cluster
B. A suspect case with chest imaging showing findings suggestive of COVID-19 disease
C. A person with recent onset of anosmia(loss of smell) or ageusia(loss of taste) in the absence of any other identified cause.
D. Death, not otherwise explained, in an adult with respiratory distress preceding death AND was a contact of a probable or confirmed case or linked to a COVID-19 cluster.

Confirmed case

A. A person with a positive Nucleic Acid Amplification Test (NAAT) including RT-PCR or any other similar test approved by ICMR.
B. A person with a positive SARS-CoV-2 Antigen-RDT AND meeting either the probable case definition or suspect criteria OR
C. An asymptomatic person with a positive SARS-CoV-2 Antigen-RDT who is a contact of a probable or confirmed case.

Source: [1] As per WHO surveillance guidelines

5. Clinical Features

COVID-19 patients reporting to various Covid treatment facilities have reported the following signs and symptoms:

- Fever,
- cough,
- general weakness/ fatigue,
- headache,
- myalgia,
- sore throat, coryza,
- dyspnoea,
- anorexia/nausea/vomiting,

- diarrhoea,
- altered mental status.
- Loss of smell (anosmia) or loss of taste (ageusia) preceding the onset of respiratory symptoms has also been reported Loss of smell has been shown to increase the pre-test probability of presence of SARS-COV-2.

Older people and immune-suppressed patients in particular may present with atypical symptoms such as fatigue, reduced alertness, reduced mobility, diarrhoea, loss of appetite, delirium, and absence of fever. Children might not have fever or cough as frequently as adults.

6. Risk factors

The major risk factors for severe disease are:

- Age more than 60 years
- Underlying non-Communicable diseases like cardiovascular disease, hypertension, and CAD, DM (Diabetes Mellitus) and other immunocompromised states, Chronic lung/kidney/liver disease, Cerebrovascular diseases and Obesity

7. Clinical Severity

Table 1: Clinical severity and assessment parameters

Clinical Severity	Clinical presentation	Clinical parameters	Remarks
Mild[2]	Patients with uncomplicated upper respiratory tract infection, may have mild symptoms such as fever, cough, sore throat, nasal congestion, malaise, headache	Without shortness of breath or Hypoxia (normal saturation).	(i) Managed at Covid Care Centre OR at home (as per home isolation guidelines)[2]

[2] Revised guidelines for Home Isolation of very mild/asymptomatic COVID-19 cases (https://www.mohfw.gov.in/pdf/RevisedguidelinesforHomeIsolationofmildasymptomaticCOVID19cases.pdf)

Moderate	Pneumonia with no signs of severe disease	**Adults** with presence of clinical features of dyspnea and or hypoxia, fever, cough, including SpO_2 90 to ≤93% on room air, Respiratory Rate more or equal to 24 per minute.	Managed in Dedicated Covid Health Centre (DCHC)
Severe	Severe Pneumonia	**Adults** with clinical signs of Pneumonia plus one of the following; respiratory rate >30 breaths/min, severe respiratory distress, SpO_2 <90% on room air.	Managed in Dedicated Covid Hospital (DCH)
	Acute Respiratory Distress Syndrome	**Onset**: new or worsening respiratory symptoms within one week of known clinical insult. **Chest imaging** (Chest X ray and portable bed side lung ultrasound): bilateral opacities, not fully explained by effusions, lobar or lung collapse, or nodules. **Origin of Pulmonary infiltrates**: respiratory failure not fully explained by cardiac failure or fluid overload. Need objective assessment (e.g. echocardiography) to exclude hydrostatic cause of infiltrates/ oedema if no risk factor present. **Oxygenation impairment in adults**: Mild ARDS: 200 mmHg < PaO2/FiO2 ≤ 300 mmHg (with PEEP or CPAP ≥5 cm H_2O) Moderate ARDS: 100 mmHg < PaO2/FiO2 ≤200 mmHg with PEEP ≥5 cm H_2O) Severe ARDS: PaO_2/FiO_2 ≤ 100 mmHg with PEEP ≥5 cm H_2O)	

Severe (Continued)	Sepsis	**Adults**: Acute life-threatening organ dysfunction caused by a dys-regulated host response to suspected or proven infection. Signs of organ dysfunction include: altered mental status, difficult or fast breathing, low oxygen saturation, reduced urine output, fast heart rate, weak pulse, cold extremities or low blood pressure, skin mottling, or laboratory evidence of coagulopathy, thrombocytopenia, acidosis, high lactate or hyperbilirubinemia.	
	Septic Shock	**Adults**: persisting hypotension despite volume resuscitation, requiring vasopressors to maintain MAP ≥65 mmHg and serum lactate level > 2 mmol/L.	

8. Infection Prevention and Control Practices[3]

Infection prevention control (IPC) is a critical and integral part of clinical management of patients and should be initiated at the point of entry of the patient to hospital (OPD or Emergency Department). Standard precautions should always be routinely applied in all areas of health care facilities. Standard precautions include hand hygiene; use of appropriate PPE to avoid direct contact with patients' body fluids, secretions (including respiratory secretions). Standard precautions also include prevention of needle-stick or sharps injury; safe waste management; cleaning and disinfection of equipment; and cleaning of the environment.

Table 2: Infection prevention control practices

At triage	Give suspect patient a triple layer surgical mask and direct patient to an earmarked and separate area, an isolation room if available. Keep at least 6 feet distance between suspected patients and other patients. Instruct all patients to cover nose and mouth during coughing or sneezing with tissue or flexed elbow for others. Perform hand hygiene after contact with respiratory secretions.
Apply standard precautions	Apply standard precautions according to risk assessment for all patients, at all times, when providing any diagnostic, clinical care and vaccination services. Standard precautions include hand hygiene and the use of personal protective equipment (PPE) when risk of droplets, aerosols, splashes or in contact with patients' body fluids and secretions (including respiratory secretions). Standard precautions also include appropriate patient placement; prevention of needle- stick or sharps injury; linen management, safe waste management; cleaning and disinfection of equipment; and cleaning of the environment. Best practices for safely managing bio-medical waste should be followed.

Apply droplet and airborne precautions	As per WHO, • Current evidence suggests that the virus spreads mainly between people who are in close contact with each other, typically within 1 metre (short-range). A person can be infected when aerosols or droplets containing the virus are inhaled or come directly into contact with the eyes, nose, or mouth. • The virus can also spread in poorly ventilated and/or crowded indoor settings, where people tend to spend longer periods of time in physical proximity. This is because aerosols remain suspended in the air or may travel farther than 1 metre (long-range). Hence, in all patient care areas, while providing patient care, healthcare worker should wear N-95 mask. In addition, when providing care in close contact with a patient with respiratory symptoms (e.g. coughing or sneezing), use eye protection (face-shield or goggles). Healthcare workers performing aerosol-generating procedures (i.e. open suctioning of respiratory tract, intubation, bronchoscopy, cardiopulmonary resuscitation) use PPE, including gloves, long-sleeved gowns, eye protection, and particulate respirators (N95). Use negative pressure rooms with minimum of 12 air changes per hour for aerosol generating procedures. If not feasible, use well ventilated single rooms using natural or fresh air.
Apply contact precautions	Contact precautions prevent direct or indirect transmission from contact with contaminated surfaces or equipment (i.e. contact with contaminated oxygen tubing/interfaces). Use PPE (triple layer medical mask or N 95 respirator depending upon the risk assessment, eye protection, gloves and gown) when entering room and take precautions to safely remove PPE when leaving. If possible, use either disposable or dedicated equipment (e.g. stethoscopes, blood pressure cuffs and thermometers). If equipment needs to be shared among patients, clean and disinfect between each patient use. Ensure that health care workers refrain from touching their eyes, nose, and mouth with potentially contaminated gloved or ungloved hands. Avoid contaminating environmental surfaces that are not directly related to patient care (e.g. door handles and light switches). Ensure adequate room ventilation. Avoid movement of patients or transport. Perform hand hygiene.

[3] National guidelines for infection prevention and control in healthcare facilities
https://www.mohfw.gov.in/pdf//National%20Guidelines%20for%20IPC%20in%20HCF%20-%20final%281%29.pdf

9. Laboratory Diagnosis

Guidance on specimen collection, processing, transportation, including related biosafety procedures, is available at:
https://www.mohfw.gov.in/pdf/5Sample%20collection_packaging%20%202019-nCoV.pdf

The details of the patients being sampled has to be collected in the ICMR prescribed format (available at:
https://www.icmr.gov.in/pdf/covid/labs/Revised_SRF_Form_22032021_1.pdf)

Sample collection

Preferred sample Throat and nasal swab in viral transport media (VTM) and transported in cold chain.

Alternate Nasopharyngeal swab, BAL or endotracheal aspirate which has to be mixed with the viral transport medium and transported in cold chain.

General guidelines

- Use appropriate PPE for specimen collection (droplet, airborne and contact precautions for URT specimens; airborne precautions using full PPE for LRT specimens). Maintain proper infection control when collecting specimens.
- Restricted entry to visitors or attendants during sample collection.
- Complete the requisition form for each specimen submitted.
- Proper disposal of all waste generated.

Respiratory specimen collection methods:

A. Lower respiratory tract

- Bronchoalveolar lavage, tracheal aspirate, sputum
- Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container.

B. Upper respiratory tract

- Nasopharyngeal swab AND oropharyngeal swab

Oropharyngeal swab (e.g. throat swab): Tilt patient's head back 70 degrees. Rub swab over both tonsillar pillars and posterior oropharynx and avoid touching the tongue, teeth, and gums. Use only synthetic fiber swabs with plastic shafts. Do not use calcium alginate swabs or swabs with wooden shafts. Place swabs immediately into sterile tubes containing 2-3 ml of viral transport media.

Nasopharyngeal swab: Tilt patient's head back 70 degrees. Insert flexible swab through the nares parallel to the palate (not upwards) until resistance is encountered or the distance is equivalent to that from the ear to the nostril of the patient. Gently, rub and roll the swab.

Leave the swab in place for several seconds to absorb secretions before removing.

Clinicians may also collect lower respiratory tract samples when these are readily available (for example, in mechanically ventilated patients).

Recommended Test

Real time or Conventional RT-PCR test (or any other test approved for diagnosis of COVID-19 by ICMR) is recommended for diagnosis. Rapid Antigen Tests are recommended in specific situation. Further details are available at: https://www.icmr.gov.in/pdf/covid/strategy/Advisory_COVID_Testing_in_Second_Wave_04052021.pdf.

Dual infections with other respiratory infections (viral, bacterial and fungal) have been found in COVID-19 patients. Depending on local epidemiology and clinical symptoms, test for other potential etiologies (e.g. Influenza, other respiratory viruses, malaria, dengue fever, typhoid fever) as appropriate.

For COVID-19 patients with severe disease, also collect blood cultures, ideally prior to initiation of antimicrobial therapy.

10. Management of COVID-19

10.1. Management of Mild Cases

Patients with suspected or confirmed mild COVID-19 are isolated to break/suppress the chain of transmission. Patients with mild disease may present to primary care/outpatient department, or detected during community outreach activities, such as home visits or by telemedicine.

Mild cases can be managed at home (subject to fulfillment of norms as stipulated in home isolation guidelines). Patients not fulfilling such criteria or those with co-morbid conditions need to be managed at Covid Care Centre (CCC, set up in urban or rural areas), Primary Health Centers, Community Health Centre (CHC), sub-district and district hospitals (in rural areas).

- Those under home isolation or in CCC or similarly identified rural facilities shall follow physical distancing, indoor mask use and strict hand hygiene.
- Symptomatic management for fever and cough. Take fluids regularly to maintain hydration.
- Patients may perform warm water gargles or take steam inhalation multiple times a day.
- Monitor temperature and oxygen saturation 2 to 4 times per day (by applying a SpO2 probe to fingers).
- Stay in contact with treating physician and report promptly in case of any deterioration in clinical condition.
- Seek immediate medical attention if:
    - Difficulty in breathing
    - High grade fever/severe cough, particularly if lasting for >5 days.
    - A low threshold to be kept for those with any of the high-risk or co-morbid features (Age more than 60 years or Underlying non-Communicable diseases like cardiovascular disease, hypertension, and CAD, DM (Diabetes Mellitus) and other immunocompromised states, Chronic lung/kidney/liver disease, Cerebrovascular diseases and Obesity)

Drug Treatment for patients with mild cases

i. Give Tab Paracetamol for fever. If fever is not controlled with a maximum dose of Tab. Paracetamol 650mg four times a day, consult the treating doctor who may consider advising other drugs like non-steroidal anti-inflammatory drug (NSAID) (ex: Tab. Naproxen 250 mg twice a day).

ii. Consider Tab Ivermectin (200 mcg/kg once a day, to be taken empty stomach) for 3 to 5 days (avoid in pregnant and lactating women)
OR
Tab Hydroxychloroquine (400 mg twice daily for 1 day, followed by 400 mg daily for next 4 days, unless contraindicated)

iii. Inhalational Budesonide (given via inhalers with spacer at a dose of 800 mcg twice daily for 5 to 7 days) to be given if symptoms (fever and/or cough) are persistent beyond 5 days of disease onset.

iv. Systemic oral steroids not indicated in mild disease. If symptoms persist beyond 7 days (persistent fever, worsening cough etc.) consult the treating doctor for treatment with low dose oral steroids.

v. Continue the medications for other co-morbid illness after consulting the treating physician.

In case of falling oxygen saturation or shortness of breath, seek immediate consultation of treating physician/surveillance team, as patient may require hospitalization. Also, patients exhibiting warning signs of deterioration (such as mental confusion, persistent pain or pressure in the chest, bluish coloration of face/lips, dehydration, decreased urine output, etc.), should be immediately admitted to linked Dedicated Covid Health Centre or Dedicated Covid Hospital.

10.2. Management of Moderate Cases

Patients with suspected or confirmed moderate COVID-19 may present to an emergency unit or primary care/outpatient department, or be encountered during community surveillance activities, such as active house to house search or by telemedicine.

The defining clinical assessment parameters are Respiratory Rate of more than or equal to 24 per minute and oxygen saturation (SpO_2) of 90 to ≤ 93%.

Such patients will be isolated in Dedicated Covid Health Centre (DCHC) in identified block level CHC or hospitals or dedicated blocks of District hospital or Medical College hospitals.

The patient will undergo detailed clinical history including assessment of co-morbid conditions, measurement of vital signs, Oxygen saturation (SpO2) and radiological examination of Chest through serial X-ray, Complete Blood Count and other investigations as indicated.

Clinical Management of Moderate cases

i. Symptomatic treatment such as antipyretic (Paracetamol) for fever and pain, anti- tussives for cough

ii. Adequate hydration to be ensured

iii. Oxygen Support:
Target SpO_2: 92-96% (88-92% in patients with COPD). The initial device choosen for administering oxygen (nasal prongs, simple face mask, or masks non-rebreathing reservoir bag) depends upon the severity of hypoxia and work of breathing. In general, If HFNC or simple nasal cannula is used, triple layered medical mask should be applied over it.

iv. Anticoagulation

Prophylactic dose of Un-Fractionated Heparin (UFH) or Low Molecular Weight Heparin (LMWH) (e.g., enoxaparin 0.5 mg / Kg body wt per day SC)
There should be no contraindication or high risk of bleeding [Contraindications: End Stage Renal Disease (ESRD), active bleeding, emergency surgery]. Consider unfractionated heparin in ESRD.

v. Anti-inflammatory or immunomodulatory therapy

Consider IV methylprednisolone 0.5 to 1 mg/kg OR IV Dexamethasone 0.1 to 0.2 mg/kg usually for a duration of 5 to 10 days. Review the duration of administration as per clinical response. Patients may be initiated or switched to oral route if stable and/or improving.

vi. Antibiotics should not be prescribed routinely unless there is clinical suspicion of a bacterial infection. Few patients with COVID-19 develop secondary bacterial infection. Consider empiric antibiotic therapy as per local antibiogram.

vii. **Awake proning**: Should be encouraged in all patients who require supplemental oxygen therapy.

Criteria to be fulfilled	***Avoid proning***
• *Normal mental status* • *Able to self-prone or change position with minimal assistance*	• *Hemodynamic instability* • *Close monitoring not possible*

Important considerations while proning: <u>Early self-proning in awake, non-intubated patients</u>

- Any COVID-19 patient with respiratory embarrassment severe enough to be admitted to the hospital may be considered for rotation and early self-proning.
- Care must be taken to not disrupt the flow of oxygen during patient rotation
- Typical protocols include 30–120 minutes in prone position, followed by 30–120 minutes in left lateral decubitus, right lateral decubitus, and upright sitting position.

viii. Control of co-morbid condition in particular the glycemic control as per MoHFW's protocol (available at: https://www.mohfw.gov.in/pdf/ClinicalGuidanceonDiabetesManagementatCOVID19PatientManagementFacility.pdf)

ix. Monitoring

- Clinical Monitoring: Work of breathing, Hemodynamic instability, Change in oxygen requirement.

- Serial CXR. HRCT chest to be done ONLY If there is worsening.
- Lab monitoring: CRP and D-dimer 48 to 72 hrly; CBC, KFT, LFT 24 to 48 hrly; IL-6 levels to be done if deteriorating (subject to availability). CBC with differential count, Absolute Lymphocyte count daily.
- Close monitoring of patients with moderate COVID-19 is required for signs or symptoms of disease progression. Provision of mechanisms for follow up and transportation to Dedicated Covid Hospital should be available.

10.3. Management of Severe Cases

10.3.1 Early supportive therapy and monitoring

i. Symptomatic treatment with paracetamol and antitussives to continue

ii. Maintain euvolemia , use conservative fluid management in patients with Severe Covid when there is no evidence of shock.

iii. Respiratory support:

- Give supplemental oxygen therapy immediately to patients with Severe Covid and respiratory distress, hypoxaemia, or shock: Initiate oxygen therapy at 5 L/min and titrate flow rates to reach target $SpO_2 \geq 90\%$ in non-pregnant adults and $SpO_2 \geq 92\text{-}96\%$ in pregnant patients.
- Consider use of NIV/HFNC (Helmet or face mask interface depending on availability) in patients with increasing oxygen requirement, if work of breathing is increasing.
- Intubation should be prioritized in patients with high work of breathing /if NIV is not tolerated., presence of hemodynamic instability, altered mental status or multi-organ failure
- Use conventional ARDSnet protocol for ventilatory management.
- Use contact precautions when handling contaminated oxygen interfaces of patients with COVID – 19.

iv. Anti-inflammatory or immunomodulatory therapy

Inj Methylprednisolone 1 to 2mg/kg IV in 2 divided doses (or 0.2-0.4 mg/kg of dexamethasone) usually for a duration 5 to 10 days.

v. Anticoagulation:

Weight based intermediate dose of prophylactic unfractionated heparin or Low Molecular Weight Heparin (e.g., Enoxaparin 0.5mg/kg per dose SC BD). There should be no contraindication or high risk of bleeding.

*Contraindications: End Stage Renal Disease (ESRD), active bleeding, emergency surgery

** Consider unfractionated heparin in ESRD

vi. Monitoring

- Serial CXR. HRCT chest to be done ONLY if there is worsening.
- Lab monitoring: CRP and D-dimer 24-48 hourly; CBC, KFT, LFT daily; IL-6 to be done if deteriorating (subject to availability).

10.3.2 Management of hypoxemic respiratory failure and ARDS

Recognize severe hypoxemic respiratory failure when a patient with respiratory distress is failing standard oxygen therapy. Patients may continue to have increased work of breathing or hypoxemia even when oxygen is delivered via a face mask with reservoir bag (flow rates of 10-15 L/min, which is typically the minimum flow required to maintain bag inflation; FiO2 0.60-0.95). Hypoxemic respiratory failure in ARDS commonly results from intrapulmonary ventilation- perfusion mismatch or shunt and usually requires mechanical ventilation.(non-invasive or invasive)

High – Flow Nasal Cannula oxygenation (HFNO) or non – invasive mechanical ventilation:

When respiratory distress and/or hypoxemia of the patient cannot be alleviated after receiving standard oxygen therapy, high – flow nasal cannula oxygen therapy or non – invasive ventilation can be considered. Compared to standard oxygen therapy, HFNO reduces the need for intubation. Patients receiving HFNO should be in a monitored setting and cared for by experienced personnel capable of endotracheal intubation in case the patient acutely deteriorates or does not improve after a short trial (about 1 hr).

NIV: setting - PS 5-15 cm H_2O adjusted to tidal volume of 5-7 ml/kg and PEEP 5-10 cm H_2O and FiO_2 @ 0.5 -1.0 titrated to target SpO_2> 94%.

HFNC settings: Start at a flow rate of 20 to 30L/min and an FiO2 of 40%; titrate flow rate upto a maximum of 60L/min in icrements of 5 to 10L/min as determined by RR, work of breathing and SpO_2. If target SpO_2 is not achieved with increasing flow alone, FiO_2 should be increased in steps of 5 to 10% upto a maximum of 100%

- Endotracheal intubation : This should be performed by a trained and experienced provider using airborne precautions. Patients with ARDS, especially those who are obese or pregnant, may de-saturate quickly during intubation. Pre- oxygenate with 100% FiO2 for 5 minutes, via a face mask with reservoir bag, bag- valve mask, HFNO, or NIV. Rapid sequence intubation is appropriate after an airway assessment that identifies no signs of difficult intubation.

- Implement mechanical ventilation using lower tidal volumes (4–8 ml/kg predicted body weight, PBW) and lower inspiratory pressures (plateau pressure <30 cmH_2O). The initial tidal volume is 4 - 6 ml/kg PBW; tidal volume up to 8 ml/kg PBW is allowed if undesirable side effects occur (e.g. dys-synchrony, pH <7.15) and Pplat is <30 mmHg. Hypercapnia is permitted if meeting the pH goal of 7.30-
7.45. The use of deep sedation may be required to control respiratory drive and achieve tidal volume targets.

Lung protective ventilation strategy by ARDS net protocol:

- Tidal volume 6ml/kg, RR 15-35/min, PEEP 5-15cm H_2O; target plateau pressure < 30cm H_2O, target SpO_2 88-95% and/or PaO_2 55-80mmHg

Prone ventilation to be considered when there is refractory hypoxemia; PaO_2/FiO_2 ratio <150 with FiO2> 0.6 with PEEP > 5cm H_2O.

Requirements for safe prone positioning in ARDS

- Start proning if P/F ratio <150 while being ventilated with FiO2 >0.6 and PEEP >5 cm H2O
- Pre-oxygenate the patient with FiO2 1.0
- Secure the endotracheal tube and arterial and central venous catheters
- Adequate number of staff to assist in the turn and to monitor the turn
- Supplies to turn (pads for bed, sheet, protection for the patient)
- Knowledge of how to perform the turn as well as how to supine the patient in case of an emergency.

C. Contraindications to prone ventilation

- Spinal instability requires special care
- Intra cranial pressure may increase on turning

- In patients with severe ARDS, prone ventilation for 16-18 hours per day is recommended but requires sufficient human resources and expertise to be performed safely.

- In patients with moderate or severe ARDS, higher PEEP instead of lower PEEP is suggested. PEEP titration requires consideration of benefits (reducing atelect trauma and improving alveolar recruitment) vs. risks (end-inspiratory over distension leading to lung injury and higher pulmonary vascular resistance). Tables are available to guide PEEP titration based on the FiO_2 required to maintain SpO_2. In patients with moderate- severe ARDS (PaO_2/FiO_2<150), neuromuscular blockade by continuous infusion should not be routinely used.

- In settings with access to expertise in extracorporeal life support (ECLS), consider referral of patients with refractory hypoxemia despite lung protective ventilation. ECLS should only be offered in expert centres with a sufficient case volume to maintain expertise and that can apply the IPC measures required for COVID – 19 patients.

- Avoid disconnecting the patient from the ventilator, which results in loss of PEEP and atelectasis. Use in-line catheters for airway suctioning and clamp endotracheal tube when disconnection is required (for example, transfer to a transport ventilator).

10.3.3 Management of septic shock

- Recognize septic shock in adults when infection is suspected or confirmed AND vasopressors are needed to maintain mean arterial pressure (MAP) ≥65 mmHg AND lactate is >2 mmol/L, in absence of hypovolemia. Recognize septic shock in children with any hypotension (systolic blood pressure [SBP] <5th centile or >2 SD below normal for age) or

two of the three of the following: altered mental state; tachycardia or bradycardia (HR <90 bpm or >160 bpm in infants and HR<70 bpm or >150 bpm in children); prolonged capillary refill (>2 sec) or warm vasodilation with bounding pulses; tachypnea; mottled skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia.

- In the absence of a lactate measurement, use MAP and clinical signs of perfusion to define shock. Standard care includes early recognition and the following treatments within 1 hour of recognition: antimicrobial therapy and fluid loading and vasopressors for hypotension. The use of central venous and arterial catheters should be based on resource availability and individual patient needs.

- In resuscitation from septic shock in adults, give at least 30 ml/kg of isotonic crystalloid in adults in the first 3 hours. In resuscitation from septic shock in children in well-resourced settings, give 20 ml/kg as a rapid bolus and up to 40-60 ml/kg in the first 1 hr. Do not use hypotonic crystalloids, starches, or gelatins for resuscitation.

- Fluid resuscitation may lead to volume overload, including respiratory failure. If there is no response to fluid loading and signs of volume overload appear (for example, jugular venous distension, crackles on lung auscultation, pulmonary oedema on imaging, or hepatomegaly in children), then reduce or discontinue fluid administration. This step is particularly important where mechanical ventilation is not available.

- Crystalloids include normal saline and Ringer's lactate. Determine need for additional fluid boluses (250-1000 ml in adults or 10-20 ml/kg in children) based on clinical response and improvement of perfusion targets. Perfusion targets include MAP (>65 mmHg or age- appropriate targets in children), urine output (>0.5 ml/kg/hr in adults, 1 ml/kg/hr. in children), and improvement of skin mottling, capillary refill, level of consciousness, and lactate. Consider dynamic indices of volume responsiveness to guide volume administration beyond initial resuscitation based on local resources and experience. These indices include passive leg raising test, fluid challenges with serial stroke volume measurements, or variations in systolic pressure, pulse pressure, inferior vena cava size, or stroke volume in response to changes in intrathoracic pressure during mechanical ventilation.

- Administer vasopressors when shock persists during or after fluid resuscitation. The initial blood pressure target is MAP ≥ 65 mmHg in adults and age-appropriate targets in children.

- If central venous catheters are not available, vasopressors can be given through a peripheral IV, but use a large vein and closely monitor for signs of extravasation and local tissue necrosis. If extravasation occurs, stop infusion. Vasopressors can also be administered through intraosseous needles.

- If signs of poor perfusion and cardiac dysfunction persist despite achieving MAP target with fluids and vasopressors, consider an inotrope such as dobutamine.

10.3.4. Other therapeutic measures

For pregnant patients categorized as severe, consultations with obstetric, neonatal, and intensive care specialists (depending on the condition of the mother) are essential. Patients often suffer from anxiety and fear and they should be supported by psychological counseling.

A treatment algorithm for managing adult cases of COVID-19 available at: https://www.mohfw.gov.in/pdf/COVID19ClinicalManagementProtocolAlgorithmAdults19thMay2021.pdf

11. Investigational Therapies[4]

At present, use of these therapies is based on a limited available evidence. As the situation evolves, and when more data become available, the evidence will be accordingly incorporated, and recommendation upgraded. Further, use of these drugs is subjected to limited availability in the country as of now. Currently, these drugs should only be used in a defined subgroup of patients:

i. **Remdesivir** (under Emergency Use Authorization) may be considered in patients (within 10 days of onset of symptom/s) with moderate to severe disease (requiring supplemental oxygen) with none of the following contraindications:

- Renal or hepatic dysfunction (eGFR <30 ml/min/m2; AST/ALT >5 times ULN (Not an absolute contradiction)
- Pregnancy or lactating females
- Children (< 12 years of age)
- Patients who are NOT on oxygen support or in home settings
- Dose: 200 mg IV on day 1 followed by 100 mg IV daily for 4 days (total 5 days)

ii. Tocilizumab (Off-label) may be considered when ALL OF THE BELOW CRITERIA ARE MET

- Presence of severe disease (preferably within 24 to 48 hours of onset of severe disease/ICU admission).
- Significantly raised inflammatory markers (CRP &/or IL-6).
- Not improving despite use of steroids.
- No active bacterial/fungal/tubercular infection.
- Recommended single dose: 4 to 6 mg/kg (400 mg in 60kg adult) in 100 ml NS over 1 hour.

[4]This document will be updated as more data emerge. The document contains some potential off label/investigational use of medications and is based on a consensus of experts along with the available evidence. An informed and shared decision making is essential before prescribing any of these therapies.

12. Prevention of complications

Implement the following interventions (Table 3) to prevent complications associated with critical illness. These interventions are based on Surviving Sepsis or other guidelines, and are generally limited to feasible recommendations based on high quality evidence.

Table 3: Prevention of complications

Anticipated Outcome	Interventions
Reduce days of invasive mechanical ventilation	• Use weaning protocols that include daily assessment for readiness to breathe spontaneously. • Minimize continuous or intermittent sedation, targeting specific titration endpoints (light sedation unless contraindicated) or with daily interruption of continuous sedative infusions
Reduce incidence of ventilator associated pneumonia	• Oral intubation is preferable to nasal intubation in adolescents and adults • Keep patient in semi-recumbent position (head of bed elevation 30-45º) • Use a closed suctioning system; periodically drain and discard condensate in tubing • Use a new ventilator circuit for each patient; once patient is ventilated, change circuit if it is soiled or damaged but not routinely • Change heat moisture exchanger when it malfunctions, when soiled, or every 5–7 days
Reduce incidence of venous thromboembolism	• Use pharmacological prophylaxis (low molecular-weight heparin [preferred if available] or heparin 5000 units subcutaneously twice daily) in adolescents and adults without contraindications. For those with contraindications, use mechanical prophylaxis (intermittent pneumatic compression devices).
Reduce incidence of catheter related bloodstream infection	• Use a checklist with completion verified by a real-time observer as reminder of each step needed for sterile insertion and as a daily reminder to remove catheter if no longer needed
Reduce incidence of pressure Ulcers	• Turn patient every two hours
Reduce Incidence of stressulcers and gastrointestinal bleeding	• Give early enteral nutrition (within24-48 hours of admission) • Administer histamine-2 receptor blockers or proton-pump inhibitors in patients with risk factors for GI bleeding. Risk factors for gastrointestinal bleeding include mechanical ventilation ≥ 48 hours, coagulopathy, renal replacement therapy, liver disease, multiple co-morbidities, and higher organ failure score
Reduce incidence of ICU-related weakness	• Actively mobilize the patient early in the course of illness when safe to do so.
Prevent and manage Opportunistic infections like mucormycosis	• Judicious use of steroids and other immunosuppressive drugs • Good glycemic control with regular monitoring of blood sugar in both previously diabetic and non-diabetes patients. • Improving infection control practices can prevent healthcare-associated infections.

13. Patient discharge policy

The patient would be discharged from treatment in accordance with the MoHFW's discharge policy available at: https://www.mohfw.gov.in/pdf/ReviseddischargePolicyforCOVID19.pdf.

14. Management of post-COVID complications

The treating physicians are required to follow up recovered patients for post-COVID complications. They will follow the Post COVID management protocol available at: https://www.mohfw.gov.in/pdf/PostCOVID13092020.pdf.