



National Guidelines on Clinical Management of Coronavirus Disease 2019 (COVID-19)

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Disease Control Division
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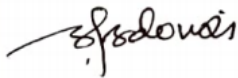
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Preface

Coronavirus Disease-2019 (COVID-19) outbreak, which started in Wuhan, China, in December 2019, have turned into a pandemic. Bangladesh have started the preparation to control and contain the pandemic in the country since January 2020 based on National Preparation and Response Plan. As a part of the preparation process, a guideline on clinical management was developed by Bangladesh Society of Medicine late January, 2020. To further update the document with the latest evidence and the WHO guidelines, we have prepared this Guidelines on Clinical Management of COVID-19. Many esteemed clinicians and public health specialists have contributed to the development of the guidelines. We are grateful for their contribution. We request every clinician/hospital, who will treat COVID-19 'confirmed', 'probable', or 'suspect' cases, to follow the guidelines.

This is a living document. We will update the guidelines from time to time to incorporate latest evidence and recommendations of WHO. We welcome every suggestion and feedback on this document.



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Abbreviation:

AGP	Aerosol Generating Procedure
AST/ALT	Aspartate Aminotransferase/Alanine Amino Transferase
BMP	Basic Metabolic Panel
CAP	Community Acquired Pneumonia
CBC	Complete Blood Count
COVID-19	Coronavirus Disease 2019
CRRT	Continuous Renal Replacement Therapy
GGO	Ground-glass Opacity
CRP	C-Reactive Protein
ECMO	Extracorporeal Membrane Oxygenation
HCP	Health Care Provider
HCW	Health Care Worker
HDU	High Dependency Unit
ICU	Intensive Care Unit
ILI	Influenza like illness
IVIG	Intravenous Immunoglobulins
LAN	Lymphadenopathy
LDH	Lactate Dehydrogenase
LFT	Liver Function Tests
MAP	Mean Arterial Pressure
MERS-CoV	Middle eastern respiratory syndrome
NIPPV	Non-Invasive Positive Pressure Ventilation
PNA	Pulmonary Nodular Amyloidosis
PPE	Personal Protective Equipment
RSV	Respiratory Syncytial Virus
RT-PCR	Real time- Polymerase Chain Reaction
RVP	Respiratory Virus Panel
SARS	Severe acute Respiratory Syndrome
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
VV	Venovenous

Executive Summary

Coronavirus disease-2019 (COVID- 19) pandemic declared by the World Health Organization (WHO) on 11th March 2020, caused by SARS-CoV-2 virus is at exponentially rising state across the globe. Bangladesh is also facing the toll of this highly transmissible zoonotic disease with community transmission (at different rate) across the country. This is a new coronavirus, still evolving, and has put the scientific authority in a puzzle. The epidemic curve of this pandemic, which started in Wuhan of China and had spread to rest of the world, showed a typical pattern of being slow to start with steep rise in few days and the leading to a quick upsurge and thus collapsing the health system of affected country very quickly. The number of affected cases and deaths both have become exponential during this pandemic. WHO considers the agent as highly infectious and urges every nation to take it most seriously. To handle the pandemic, the strategy is containment. The peak can be delayed or more precisely be flattened by isolation of cases, quarantine of contacts and physical distancing of people. Early diagnosis can help by identifying cases and areas for individual and group isolation. From 'draconian' process of complete lockdown to confirmatory diagnosis and isolation is being practiced by almost every nation. Bangladesh has already started different mitigation process to gain some control over this epidemic situation and this guideline is a part of the strategy, addressing the case management of COVID-19 cases in Bangladesh with specific recommendations:

1. Case definition of suspect, probable and confirmed COVID-19 (and death) will be followed by every physicians of Bangladesh which will be updated regularly. All cases have to be reported to the health authority (civil surgeon, DGHS).
2. The concept of testing and isolation of cases, tracking, tracing, and quarantine of close contacts will be followed.
3. The clinical syndrome ranges from mild illness, pneumonia, severe pneumonia, ARDS, sepsis, septic shock and multiorgan failure.
4. Specific test for confirmation will be done by RT-PCR taking samples from upper and lower respiratory tract until and unless serological tests and other WHO recommended tests are available. In case of initial negative test, if suspicion remains high, the patient should be treated as COVID-19 based on clinical judgement and test should be repeated.
5. The mild cases of influenza like illness (ILI) will be managed by telemedicine service.
6. **Every hospital (public and private) shall provide treatment to COVID and non-COVID patients. These hospitals shall create separate zone for COVID and NON COVID patients in the hospital premise (subject to Government policy) and a triage system will be applied to classify and differentiate the patients. COVID zone will have two separate areas; one for confirmed COVID and another for suspected or probable COVID patients.**

7. The mild case with major risk factor, moderate, severe and critical cases will be treated in all public and private hospital in Bangladesh (Severe and Critical cases preferably in tertiary care).
8. The principles of management will be appropriate supportive therapy in pneumonia case ranging from low to high flow oxygen therapy, proning, empiric antibiotic, antiviral (favipiravir in hospitalized patient), anticoagulant for all hospitalized patients, steroids in severe to critical illness and mechanical ventilation for ARDS cases.
9. Every admitted patient with COVID-19 will receive thromboprophylaxis.
10. COVID-19 patients have increased cardiac complications. Observe for features of cardiovascular disease.
11. For critically ill patients, careful fluid (avoid excessive fluid) balance and oxygen administration is the mainstay of therapy. SaO₂ target of 88-96% should be the aim.
12. Consider trial of HFNC (CPAP and NIV where facilities are available), awake proning before mechanical ventilation.
13. A comprehensive system of infection prevention and control (IPC) is important in every aspects of case management from community to hospital ICU. A separate national guideline is available in this aspect.
14. Healthcare personnel do not need to go for self-isolation if they have been in contact with a patient of COVID-19. They can carry on their patient care with proper PPE unless symptomatic or tested positive for COVID-19.

Introduction

COVID-19 is the pandemic disease declared by World Health Organization (WHO) on 11th March 2020 which is a potentially severe acute respiratory infection caused by a novel evolving severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was identified as the cause of an outbreak of pneumonia of unknown cause in Wuhan City, Hubei Province, China, in December 2019. In most cases the clinical presentation is that of a respiratory infection with a symptom severity ranging from a mild influenza like illness, to a severe viral pneumonia leading to acute respiratory distress syndrome that is potentially fatal. But in some cases, presentation may be varied and may involve multiple organs leading to multi organ dysfunction or failure.

Globally 212 countries are reported to have the pandemic going on and the situation is evolving rapidly with global case counts and deaths increasing each day. The World Health Organization rates the global risk assessment as very high and community transmission is occurring in many countries, but it is uncertain how easily the virus spreads between people.

According to the 2020 World Health Statistics published by WHO, the COVID-19 pandemic is causing significant loss of life, disrupting livelihoods, and threatening the recent advances in health and progress towards global sustainable development goals.

In Bangladesh, COVID-19 infections are being reported from Directorate General of Health Service on daily basis. So far, we have around 38292 cases with 544 deaths (28th May, 2020).

Early recognition and rapid diagnosis are essential to prevent transmission and provide appropriate care in time frame. High index of clinical suspicion is needed for diagnosing COVID-19 patient and evaluation should be performed according to pneumonia severity indexes and sepsis guidelines (if sepsis is suspected) in all patients with severe illness.

There is no specific treatment found to be unequivocally effective (regarding mortality) for COVID-19 yet; therefore, the mainstay of management is early diagnosis and optimum supportive care to relieve symptoms and to support organ function in more severe illness. Patients should be managed in a hospital setting when possible; however, home care may be suitable for selected patients; asymptomatics and cases with mild illness (with out risk factor &/or comorbidity) unless there is concern about rapid deterioration or an inability to promptly return to hospital if necessary. Even for those suitable for home care, if self-isolation at home is not possible because of lack of care giver, overcrowding at home or for any other cause, patient should be brought to the hospital for institutional isolation in a designated area. Designated isolation centers with necessary facilities should be developed across the country.

Rationing of medical resources may be required during the pandemic if healthcare infrastructures are overwhelmed. This raises many ethical questions on how to best triage patients to save the most lives. Recommendations have been suggested, but there is no international guidance on this issue yet.

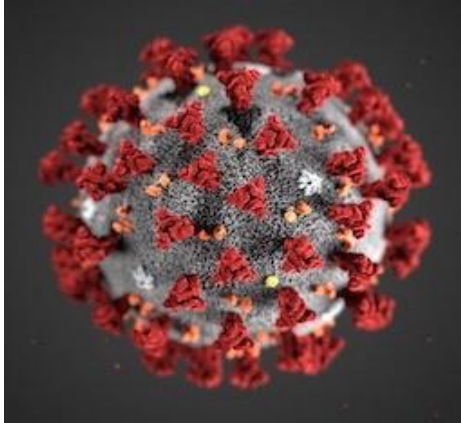
A surveillance-based case definition and approach to diagnosis and management principles are highlighted in this guideline. This version will be updated from time to time in response to the evolving situation of the epidemic in the country, availability of new scientific knowledge, understanding of disease pathology and results of different clinical trials ongoing across the world and in accordance with the guidance provided by different organizations like WHO, CDC, ECDC and others.

Virology

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a previously unknown beta coronavirus that was discovered in bronchoalveolar lavage samples taken from clusters of patients who presented with pneumonia of unknown cause in Wuhan City, Hubei Province, China, in December 2019. Coronaviruses are a large family of enveloped RNA viruses, some of which cause illness in human (e.g., common cold), and others that circulate among mammals (e.g., bats, camels) and birds. Rarely, animal coronaviruses can spread to humans and subsequently spread between people, as was the case with severe acute respiratory syndrome (SARS-CoV) and Middle eastern respiratory syndrome (MERS-CoV).

SARS-CoV-2 belongs to the *Sarbecovirus* subgenus of the *Coronaviridae* family, and is the seventh coronavirus known to infect humans. The virus has been found to be similar to SARS-like coronaviruses from bats, but it is distinct from SARS-CoV and MERS-CoV. The full genome has been determined and published in GenBank.

A preliminary study suggests that there are two major types (or strains) of the SARS-CoV-2 virus in China, designated L and S. The L type was found to be more prevalent during the early stages of the outbreak in Wuhan City and may be more aggressive (although this is speculative), but its frequency decreased after early January. The relevance of this finding is unknown at this stage and further research is required as the virus is still evolving.



Picture showing ultrastructural morphology of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) when viewed with electron microscopically (*Centers for Disease Control and Prevention*)

N.B: Origin, transmission dynamics, viral load, shedding, genetics, pathophysiology of the novel virus (SARS-CoV2) are beyond the scope of this guideline. Interested readers are being encouraged to acquire further knowledge in this regard from peer reviewed sources from biomedical journals and open access sources like WHO, CDC and ECDC.

Case Definition

Suspect case

- a. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath), AND residence in Bangladesh or travel to a country reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset.

OR

- b. A patient/ health care worker with any acute respiratory illness AND having been in contact (see definition of contact) with a confirmed or probable COVID-19 case in the last 14 days prior to symptom onset.

OR

- c. A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath) AND in the absence of an alternative diagnosis that fully explains the clinical presentation.

Probable case:

- a. A suspect case for whom testing for the COVID-19 virus is inconclusive (Inconclusive being the result of the test reported by the laboratory).

OR

- b. A suspect case for whom testing could not be performed for any reason.

Confirmed case:

A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.

Definition of contact:

- a. A contact is a person not having symptoms at present but who has been exposed to suspected/probable case or confirmed case.
- b. Contact timing: 2 days before and the 14 days after the onset of symptoms of a probable or confirmed case.
- c. Contact pattern
 - Face-to-face contact with a probable or confirmed case within 1 meter and for more than 15 minutes.
 - Direct physical contact with a probable or confirmed case.
 - Direct care for a patient with probable or confirmed COVID-19 disease without using proper personal protective equipment¹, OR

1. World Health Organization. Infection prevention and control during health care when COVID-19 is suspected [https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-\(ncov\)-infection-is-suspected-20200125](https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125)

Note: for confirmed asymptomatic cases, the period of contact is measured as the 2 days before through the 14 days after the date on which the sample was taken which led to confirmation.

COVID-19 is a notifiable disease. Please report all cases (confirmed or suspected/probable) to health authority (civil surgeon, DGHS) as surveillance. The clinical data will be reported as Mild (ILI)/ Moderate (Pneumonia), Severe (Severe pneumonia) and Critical (ARDS and Sepsis and Septic shock)

Definition of COVID-19 death:

COVID-19 death is defined (for surveillance purposes) as a death resulting from a clinically compatible illness in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID-19 disease (e.g. trauma). There should be no period of complete recovery between the illness and death.

All deaths should be documented and reported.

Clinical syndromes associated with COVID-19

- Mild illness (Influenza like illness-ILI)
- Pneumonia
- Severe pneumonia
- Acute respiratory distress syndrome
- Sepsis
- Septic shock

<p>Mild illness (ILI)</p>	<p>Patients with uncomplicated upper respiratory tract viral infection may have non-specific symptoms such as fever, fatigue, cough (with or without sputum production), sore throat, nasal congestion, anorexia, malaise, or headache. Rarely, patients may also present with diarrhoea, nausea, and vomiting.</p> <p>The elderly and immunosuppressed may present with atypical symptoms. Symptoms due to physiologic adaptations of pregnancy or adverse pregnancy events, such as dyspnoea, fever, GI-symptoms or fatigue, may overlap with COVID-19 symptoms</p>
<p>Pneumonia</p>	<p>Adult with pneumonia but no signs of severe pneumonia and no need for supplemental oxygen.</p> <p>Child with non-severe pneumonia who has cough or difficulty breathing + fast breathing: fast breathing (in breaths/min): < 2 months: ≥ 60; 2–11 months: ≥ 50; 1–5 years: ≥ 40, and no signs of severe pneumonia</p>
<p>Severe pneumonia</p>	<p>Adolescent or adult: fever or suspected respiratory infection, plus one of the following:</p>

	<p>Respiratory rate > 30 breaths/min.</p> <p>Severe respiratory distress; or</p> <p>SpO₂ ≤ 93% on room air.</p> <p>Child with cough or difficulty in breathing, plus at least one of the following: central cyanosis or SpO₂ <90%.</p> <p>severe respiratory distress (e.g. grunting, very severe chest indrawing);</p> <p>Signs of pneumonia with a general danger sign:</p> <p>Inability to breastfeed or drink, lethargy or unconsciousness, or convulsions.</p> <p>Other signs of pneumonia may be present: chest indrawing, fast breathing (in breaths/min): <2 months: ≥ 60; 2–11 months: ≥ 50; 1–5 years: ≥ 40 (16). While the diagnosis is made on clinical grounds; chest imaging may identify or exclude some pulmonary complications.</p>
Acute respiratory distress syndrome (ARDS)	<p>Onset: within 1 week of a known clinical insult or new or worsening respiratory symptoms.</p> <p>Chest imaging (radiograph, CT scan or lung ultrasound): bilateral / unilateral opacities, not fully explained by volume overload, lobar or lung collapse, or nodules. Patient with pleural effusion unlikely to be COVID.</p> <p>Pulmonary infiltrates/ respiratory failure not fully explained by cardiac failure or fluid overload.</p> <p>Need objective assessment (eg echocardiography or USG) to exclude hydrostatic cause of infiltrates/oedema if no risk factor present.</p> <p>Oxygenation impairment in adults:</p> <ul style="list-style-type: none"> > Mild ARDS: $200 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 300 \text{ mmHg}$ (with PEEP or CPAP ≥ 5 cmH₂O, or non-ventilated) > Moderate ARDS: $100 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 200 \text{ mmHg}$ (with PEEP ≥ 5 cmH₂O, or non-ventilated) > Severe ARDS: $\text{PaO}_2/\text{FiO}_2 \leq 100 \text{ mmHg}$ (with PEEP ≥ 5 cmH₂O, or non-ventilated) > When PaO₂ is not available, SpO₂/FiO₂ ≤ 315 mmHg suggests ARDS (including in non-ventilated patients)
Sepsis	<p>Sepsis: adults</p> <p>Life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection.</p>

	<p>Signs of organ dysfunction</p> <p>Altered mental status</p> <p>Difficult or fast breathing</p> <p>Low oxygen saturation</p> <p>Reduced urine output</p> <p>Fast heart rate, weak pulse, cold extremities or low blood pressure, skin mottling</p> <p>Children: suspected or proven infection and ≥ 2 age- based systemic inflammatory response syndrome criteria, of which one must be abnormal temperature or white blood cell count.</p>	<p>Laboratory evidence of:</p> <p>Coagulopathy</p> <p>Thrombocytopenia $< 50,000/\text{cmm}$</p> <p>Raised lactate</p> <p>Hyperbilirubemia</p>
Septic shock	<p>Adults: persisting hypotension despite volume resuscitation, requiring vasopressors to maintain MAP ≥ 65 mmHg and serum lactate level > 2 mmol/L.</p> <p>Children: any hypotension (SBP < 5th centile or > 2 SD below normal for age) or two or 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 feeble pulse; tachypnoea; mottled or cool skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia (21).</p>	

**Sepsis and septic shock from other causes should be excluded and referred to a non-COVID zone/facility/hospital after proper evaluation.

Testing for COVID-19

Whom to test: All Suspected cases (according to the case definition)

Detection of virus

➤ Specimen- Specimen type include

- Upper airway specimens: Oropharyngeal swabs, nasal swabs, nasopharyngeal secretions,
- Lower airway specimens: sputum, bronchoalveolar lavage fluid, airway secretions

Note: Sputum and other lower respiratory tract specimens have a high positive rate of nucleic acids and should be collected preferentially. SARS-CoV-2 preferentially proliferates in type II alveolar cells (AT2) and peak of viral shedding appears 3 to 5 days after the onset of disease. Therefore, if the nucleic acid test is negative at the beginning, samples should continue to be collected and tested on subsequent days.

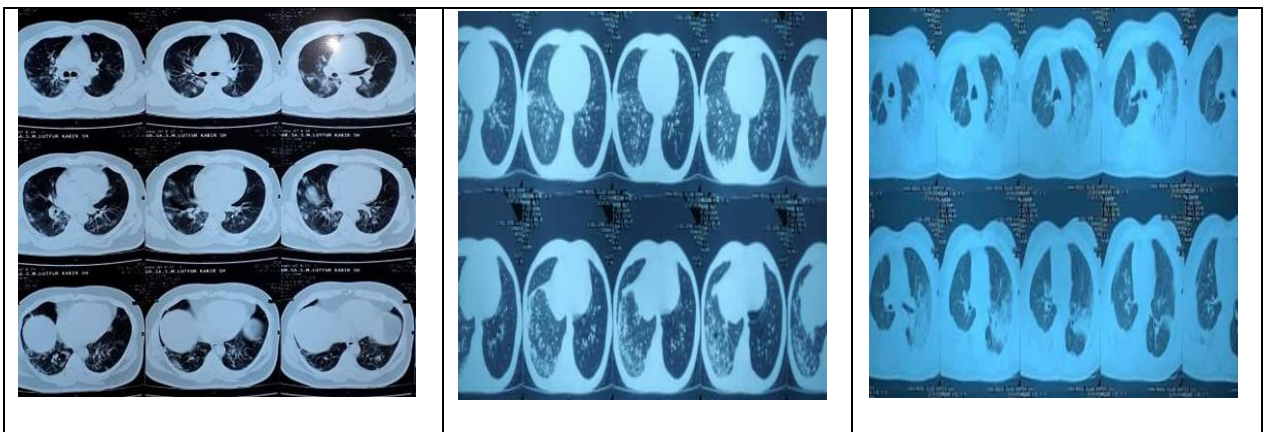
➤ Detection of viral nucleic acid

Nucleic acid testing is the preferred method for diagnosing COVID-19. In our country viral nucleic acid is detected by RT-PCR. The sensitivity of detection depends upon following factors, 1. Specimen site 2. Quality of specimen 3. Temperature of storage 4. Faulty collection techniques 5. Faulty transport.

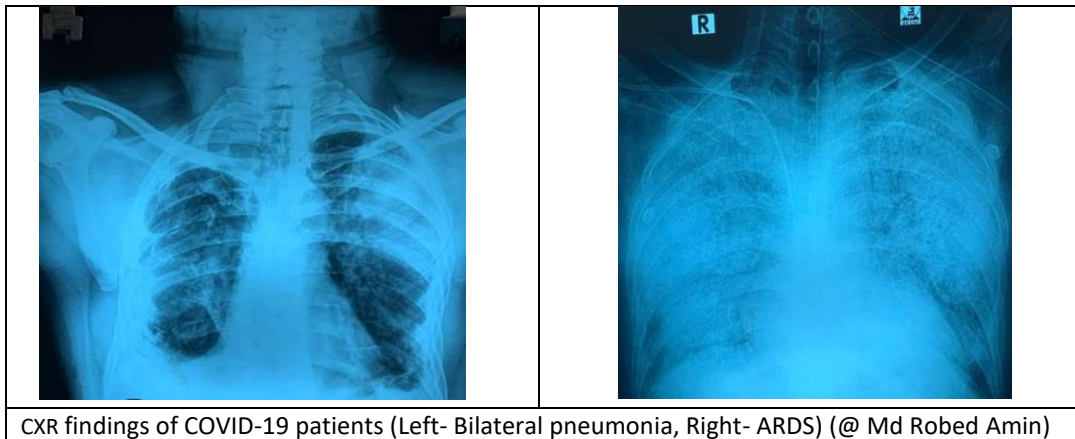
Radiology and imaging.

- CT Chest- a high-resolution CT is highly preferable. Following are the classical CT findings
 - Bilateral involvement in most patients
 - Multiple areas of consolidation
 - Ground-glass opacities (GGO): bilateral, subpleural, peripheral
 - Crazy paving appearance (GGOs and inter-/intra-lobular septal thickening)
 - Bronchovascular thickening in the lesion
 - Traction bronchiectasis
- Chest Xray- Is not as sensitive as HRCT. CT is better than Chest Xray for diagnosis early. Bilateral pneumonia is a common finding of COVID-19 pneumonia
- USG of chest- there are specific sonographic findings however it requires a skilled operator who has training on Pulmonary Ultrasonography

All of the above techniques (CXR, CT, sonography) are nonspecific. Patchy ground-glass opacities may be caused by a broad range of disease processes (e.g. viral and bacterial pneumonias). Ultimately, the imaging is only one bit of information which must be integrated into clinical and epidemiological context.



CT findings of a COVID-19 patient (Ground glass opacities, Bilateral pneumonia) (© Md Robed Amin, A Ghose)



Supportive investigations

- CBC: lymphopenia (83%), leukopenia (9–25%), leukocytosis (24–30%), thrombocytopenia.
- Patients with a low total number of lymphocytes at the beginning of the disease generally have a poor prognosis. Severe patients have a progressively decreased number of peripheral blood lymphocytes. A ratio of Neutrophil to lymphocyte more than 3.5 is a prognostically poor sign.
- CRP and Procalcitonin: most patients with COVID-19 have a normal level of procalcitonin with significantly increased levels of C-reactive protein. A rapidly and significantly elevated C-reactive protein level indicates a possibility of secondary infection.
- Blood culture: to detect secondary bacterial infection.
- Liver and Renal function test, Arterial blood gas analysis.
- Serum Ferritin, S.LDH, D-dimer (D-dimer levels and Ferritin are significantly elevated in severe cases, which is a potential risk factor for poor prognosis).
- Treating clinician may order other relevant investigations if required.

N.B: Normal or low TC of WBC, Lymphopenia, High CRP, Low Procalcitonin; if these are associated with bilateral pneumonia in Chest x-ray or GGO in CT scan of Chest: Diagnosis is COVID-19 during this epidemic.

Clinical Classification

For the practical purpose of patient management, the six syndromes of COVID-19 have been categorized into mild, moderate, severe and critical cases.

Clinical classification for case management		
01	Mild	Influenza like illness (ILI)
02	Moderate	Pneumonia (CRB 65 score 0)
03	Severe	Severe Pneumonia, Sepsis
04	Critical	ARDS, Septic shock

N.B. Some patients of COVID-19 may have hypoxia without clinically evident dyspnoea and cyanosis. Thus, wherever available, pulse oximetry should be used to rule out hypoxia and respiratory failure.

N.B. After evaluation and testing for respiratory distress, cases due to cardiac causes/ non COVID-19 causes will be sent to NON COVID zone.

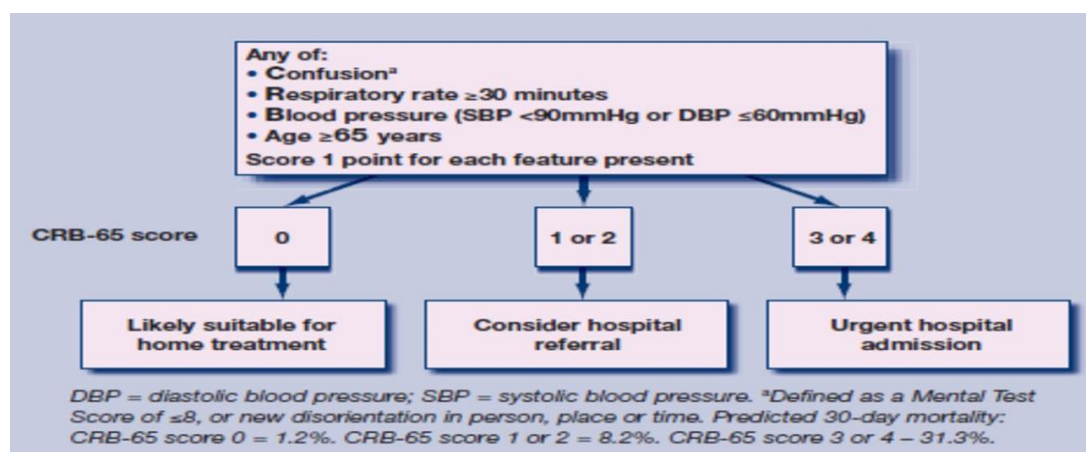


Figure 1: CRB65 Scoring system

Clinical Case definition-

1. Mild cases

- The clinical symptoms are mild, and there is no sign of pneumonia on imaging.
- Symptoms may be: fever, cough, sore throat, malaise, headache, muscle pain without shortness of breath or abnormal imaging

2. Moderate cases

- Fever and respiratory symptoms with radiological findings of pneumonia.
- Respiratory distress with < 30 breaths /min
- Pulse oxymetry showing saturation $> 93\%$ at ambient air

3. Severe cases

Cases meeting any of the following criteria:

- Respiratory distress (≥ 30 breaths/min);
- Finger oxygen saturation $\leq 93\%$ at rest;
- Arterial partial pressure of oxygen (PaO_2)/fraction of inspired oxygen (FiO_2) $\leq 300\text{mmHg}$ ($1\text{mmHg}=0.133\text{kPa}$)

4. Critical cases

Cases meeting any of the following criteria:

- Respiratory failure and requiring mechanical ventilation.
- Shock.
- With other organ failure that requires ICU care.

Treatment Protocol for Hospitalized COVID-19 (Mild/Moderate/Severe) cases

Mild cases can be managed at home through telephone/telemedicine service (Annex 2) while mild case with risk factor, moderate, severe and critical patients should receive hospital care after appropriate triage.

Laboratory investigations

To be chosen based on availability. The most important investigations are initial CBC and Chest X-ray (may require to be repeated). CT scans have high sensitivity for diagnosis even in PCR negatives. Not advised routinely, but if available, will be better than Chest Xray. Any clinically defined case should be tested with RT-PCR (Annex 3 for laboratory and management flow).

Mild cases: CBC with CRP, Chest X-ray, ECG (>50 yr age),

Moderate cases: CBC with CRP, LFT, RFT, Chest Xray (P-A view) (preferably portable), ECG (>50 yr age)

Severe cases: CBC with CRP, LFT, RFT, S electrolytes, ABG, Coagulation profile (D-dimer especially), LDH, Ferritin, Procalcitonin, Lactate, Echocardiogram, Troponin I & Pro-BNP, ECG.

Critical Cases: All investigations for severe cases with additional ICU investigations as deemed necessary.

Case record Form (CRF): All the clinically defined cases (Mild, Moderate, Severe and Critical) in hospital setting need to be documented in a CRF where the demographic, clinical presentation, investigations and treatment will be included. (Annex 9 is the prototype of the CRF)

Management:

Treatment venue will be determined according to severity of the disease:

- Suspected and confirmed cases should be isolated and preferably treated at designated hospitals with effective isolation, protection and infection prevention conditions in place.
- A mild case may be treated in isolation in a single room at home. (Home isolation protocol should be followed).
- Mild cases with comorbidity/risk factor, Moderate & Severe cases should be treated in COVID-19 hospital
- Critical cases should be admitted to ICU as soon as possible.

General management:

- Bed rest and strengthening support therapy.
- Ensuring sufficient calorie intake.
- Monitoring water and electrolyte balance to maintain internal environment stability
- Monitoring vital signs and oxygen saturation.
- Timely providing effective oxygen therapy starting with low flow, including nasal catheter and mask oxygenation, and if necessary, nasal high-flow oxygen therapy.
- Critical cases should be admitted to ICU as soon as possible.

Pharmacological and supportive Treatment:

- A. **Asymptomatic patient:** Supportive care + Isolation protocol (either home or institutional depending on national strategy).

Advice for cases in home isolation:

- Rest at home in self-isolation (If self-isolation at home is not possible because of lack of care giver, overcrowding at home or for any other cause, patient should be brought to the hospital for institutional isolation in a designated area.)
- Physical distancing with family members (If possible, remain in a separate single room)
- No visitor
- Hand wash (20 seconds each time) (Repeated hand wash is beneficial)
- Cough etiquette (use tissue paper or elbow followed by hand wash)
- Medical mask

- B. Mild cases:** A mild case may be treated in isolation in a single room at home. (above mentioned home isolation protocol should be strictly followed).

Symptomatic patients (bed ridden): admitted in isolation ward (especially in risk group like DM, HTN, IHD, Prior Asthma/COPD/ILD patients, Known CKD, CLD, Known Malignancy, High risk pregnancy, Obesity (BMI>25)

- Tab Paracetamol (500mg) 1 tab if temp is more than 101°F
- Antihistamine if there is rhinorrhoea
- Antitussive if there is dry cough
- For Thromboprophylaxis: Enoxaparin – For patients with creatinine clearance (CrCl) >30 mL/min, 40 mg SC once daily; for CrCl 15 to 30 mL/min, 30 mg once daily. Therapeutic dose as follows : enoxaparin 1 mg/kg every 12 hours SC if creatinine clearance (CrCl) >30 mL/min.
- Monitor closely.

N.B:

- Follow up
 - Self-home isolation for 14 days after clinical recovery
 - Ask about: Dyspnoea, chest pain, persistent or worsen dry or productive cough, haemoptysis
- When patient should immediately seek and get hospital care?
 - Respiratory distress
 - Worsening cough and fever
 - Altered mental status
 - Extreme lethargy

Admission criteria

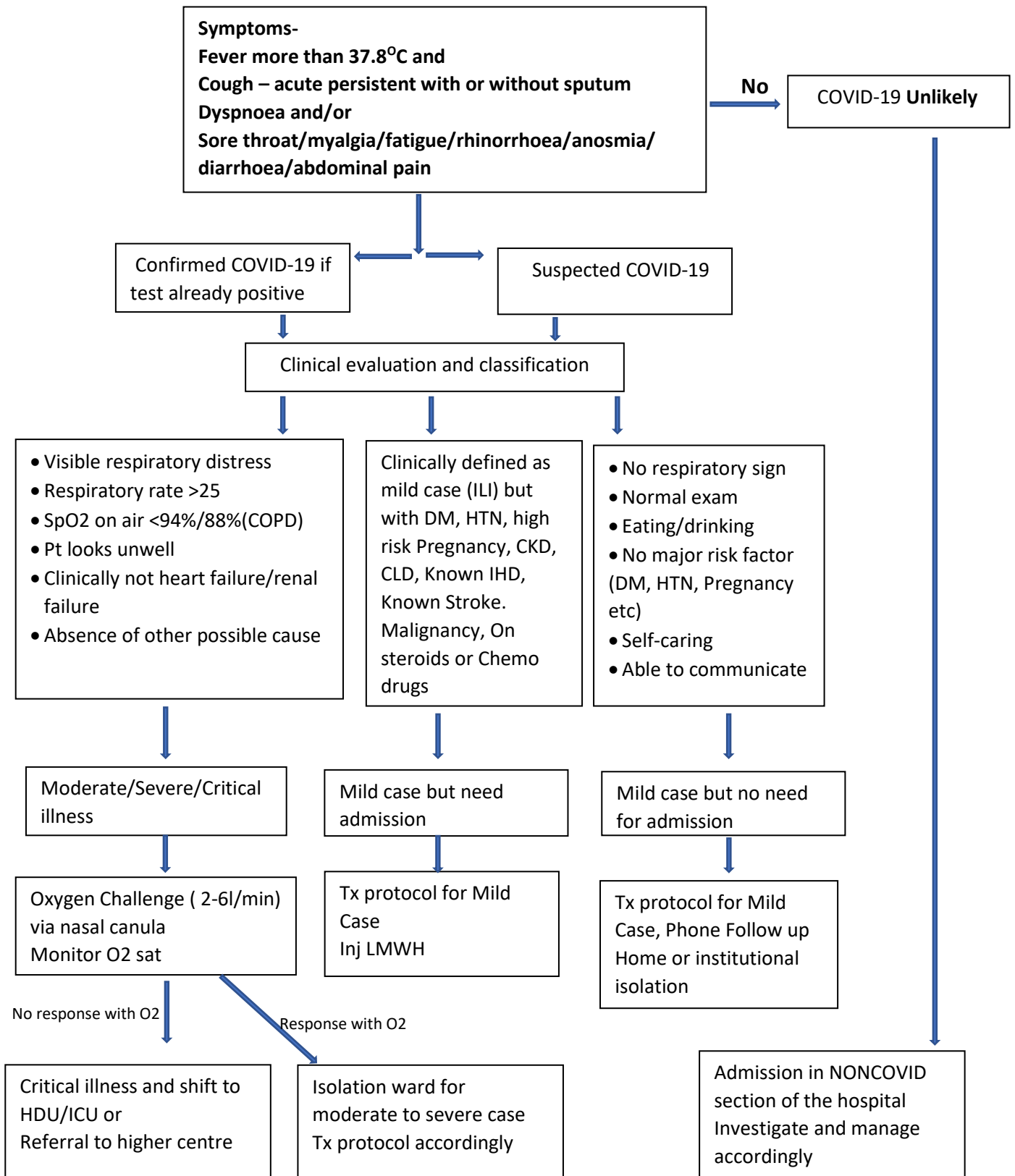
1. All suspected/ confirmed cases of COVID-19 presenting with
 - Mild case with major risk factor [DM, HTN, IHD, Prior Asthma/COPD/ILD patients, Known CKD, CLD, Known Malignancy, High risk pregnancy, Obesity (BMI>25)] and deteriorating mild cases in home/institutional isolation
 - Moderate case- clinical or radiological evidence of pneumonia with CRB65 score 1 or more (Please see figure 1)
 - Severe Pneumonia
 - ARDS, Sepsis, Septic shock
 - Hypoxia (SpO₂ <94%) in the absence of any clinical signs
2. All cases with respiratory distress must be admitted for further evaluation and testing

Hospital Management

Triage:

All hospitals of Bangladesh should have a triage system in their emergency and out-patient department (OPD) or makeshift emergency (like tent). COVID -19 is not only a respiratory disease but a multisystem disorder and hence every hospital should have plan to categorize, deal with and admit patients of COVID-19 as well as Non COVID cases (subject to national strategy). This can be achieved through an appropriate triage system and proper use of infection prevention and control system in hospital with proper use of Personal Protective Equipment. The hospital administration should arrange separate zone/compartment/section/building in the same/separate premise for COVID-19 and Non COVID cases.

The triage at the emergency/OPD will prepare a flow by which the patients coming to hospital can be separated quickly as confirmed COVID-19 cases, suspected cases (which can be COVID or non COVID) and confirmed non COVID cases. The initial triage must also ensure quickest admission and treatment initiation for the cases with priority requiring immediate management in hospital. After initial triage and appropriate separation protocol, when test results become available for suspected cases, the new confirmed cases of COVID -19 cases can be sent to isolation zone/ward/room/cabin and confirmed non-COVID cases will be shifted to their designated section of the hospital. [Every hospital should be prepared from now on to serve both COVID and Non-COVID cases whenever warranted].



This is a simplified triage for every hospital in Bangladesh (Public or private).

Until the RT-PCR test result for SARSCOV-2 is available in suspected case, the patient should remain in isolation ward (suspected patient zone) with every bed at 6 feet distance with proper IPC. When result is

negative and clinical course (with lab reports) is no more consistent with COVID -19, patient may be shifted to Non COVID section of the hospital. When result is negative but clinical course (with supporting lab reports) is consistent with COVID-19, patient will remain in 'suspected patient zone'. If result comes as positive, patient will remain in isolation ward (positive patient zone).

C. Moderate case: Isolation ward (any clinical or radiological pneumonia case)

Mild symptomatic case Treatment Protocol

Plus

- Oxygen through nasal canula 2L /min if required (max 6L/min possible).
- Tab Favipiravir: 1600 mg on day 1 followed by 600 mg BID from day 2 to day 10
- Proning- Prone position at least 4-6 hrs/day
- LMW heparin (Inj enoxaparin) Enoxaparin 1mg/kg SC twice daily/ day (dose adjust with CrCl< 30ml/min)
Or if LMWH cant be given or contraindicated,
Inj Unfractionated heparin (UFH): 60U/kg bolus+12units/kg/hr infusion-for ACS
80U/Kg bolus +18units/kg/hr infusion-for VTE and AF
- Thromboprophylaxis should be given until symptom resolves or improves and followed by Tab rivaroxaban 10 mg once daily for 1 month
- Any Moderate case on treatment – if no response or deterioration at 24 hours in hospital, **Oral Methylprednisolone (60-80 daily) in single or two divided doses for 7 days with anti-ulcerant coverage**

* Inj Remdesivir Dose 200 mg IV infusion (within 30 min-2 hours) on Day 1 followed by 100 mg infusion within (30 min to 2 hours) from Day 2 to Day 5 has been advocated for moderate to severe cases who need oxygen therapy. If remdesivir is started, then other antiviral (favipiravir) should be stopped. Remdesivir should be used at the discretion of consultant working in the hospital.

During management of hospitalized patient in ward or isolation room-

- Avoid Nebulization and advanced respiratory treatments as far possible. Use MDI with volume spacers if required.
- No Bagging.
- Avoid non-invasive ventilation
- Transfer **EARLY to the HDU/ ICU** for increasing respiratory signs/symptoms.

Referral of patients with Severe and Critical COVID-19 (From upazilla health complex /district hospital to tertiary care hospital)

It is extremely difficult to frame rigid guidelines for referral because of non-uniformity in availability of facilities in small hospitals and financial constraints of the patients. However, following are few guidelines to help the treating doctors in taking a decision.

Indications for referral

1. Severe and Critical COVID-19
2. Respiratory distress (not due to over hydration) [ARDS].
3. Persisting oliguria even after correction of dehydration.
4. Multi organ failure.
5. Active bleeding.
6. Any serious Cardiovascular or Cerebrovascular disease (MI, ACS, stroke etc).

The following measures should be taken while referring a patient to referral hospital

Pre-referral:

- Information to family, guardian and patient about diagnosis and treatment plan
- Explain where to refer and how to transfer
- Make sure referral facility has ventilatory or renal replacement support
- Communicate if possible with the referring hospital.
- If possible send the patient in designed ambulance with oxygen and proning with an accompanying medical personnel who can manage the above scenario.

During transfer:

- Give oxygen
- Maintain airway
- Have suction available
- Maintain IV access and infusion IV fluids to correct dehydration
- Provide life support system and guidance to the person accompanying the patient
- Insert a urethral catheter in patient with reduced urine output
- Provide a referral note

(A format for referral card is included in Annex 11)

D. Severe cases with respiratory symptoms (SOB; hypoxia: admit to ICU or even in ward/makeshift ICU): Preferably in Secondary care/Tertiary care

Management of Moderate case protocol (Except oral steroid)

Plus

- Steroids- Inj Methylpredniolone-250 mg daily for 5 days (switch to IV from oral if already started)
- Maintain euvolaemia (Avoid fluid load)
- Early Norepinephrine for hypotension
- Broad spectrum antibiotics—Inj Meropenam 1gm BD
- Inj Remdesavir: 200 mg IV infusion within 30 min-2 hours on Day 1 followed by 100 mg infusion within 30 min to 2 hours from Day 2 to Day 5. Remdesivir should be used at the discretion of consultant working in the hospital. (If favipiravir started in moderate case, it should be stop)
- Consider for cytokine storm/ HLH (Hemophagocytic lymphohiocytesis) picture:
 1. Tocilizumab
 2. Convalescent Plasma therapy

Tocilizumab: Adult Dosing (≥ 18 years): 8 mg/kg (max: 800 mg/dose). Pediatric Dosing (< 18 years): Wt < 30 kg—12 mg/kg; Wt > 30 kg—8 mg/kg (Max: 800 mg/dose) Duration: 1 dose; Can repeat in 12 hours if no clinical improvement. Max 2 doses

Convalescent Plasma therapy: Donor should be healthy patient recovered from COVID-19 and preferably after 28 days with neutralizing titre more than 1:80 and Binding titre more than 1:1000

Escalation of respiratory support: Following are important for severe to critical patients who need intensive monitoring with aim to delay ventilation as far as possible:

- **Try to avoid intubation if at all possible**
- **Prone positioning (more than 12 hrs/day)**
- Accept “permissive hypoxemia” (keep O2 Saturation > 88%)
- **Low flow O2 delivery devices:**
Nasal cannula (up to 6LPM and provide up to 50% FiO2; Simple mask (up to 10 LPM and provide up to 60% FiO2); Venturi mask (up to 15 LPM and provide 50% FiO2); Partial rebreather mask (15 LPM and provide 70% FiO2); Non rebreather mask (15 LPM and provide 100% FiO2)
- **High flow delivery device:**
High Flow Nasal cannula (HFNC): up to 70 LPM and provide 100% FiO2
Advantages: Well tolerated, generate PEEP (1 PEEP for every 10L)
- **Non-invasive positive pressure ventilation:**
CPAP: (Setting 5-20 cmH2O) and used for type I respiratory failure;
BiPAP (Setting EPAP 4-16 cm H2O, IPAP 10-20 cmH2O and minimum pressure support 4 cmH2O) and used for both type I and type II respiratory failure.
 Increase CPAP or EPAP for hypoxia
 Increase pressure support (IPAP-EPAP) for hypercapnia
- **Mechanical ventilation.** (When all the above measures fail and as a last resort)

Monitoring for severe to critical patients (if facility is available)

- Daily: PCT, CRP, IL-6, BNP, Troponins, Ferritin, Neutrophil-Lymphocyte ratio, D-dimer, Mg. CRP and Ferritin are good biomarkers and track disease severity.
- Blood glucose monitoring (especially for DM patients and pt on steroids)
- Monitor QTc interval if using chloroquine/ hydrochloroquine and azithromycin and monitor Mg++ (torsades de pointes is uncommon in monitored ICU patients)
- Follow CXR
- Follow ECHO closely; patient sometime develops severe cardiomyopathy/myocarditis.

Special situation:

Pregnancy: Protocols for treating non-pregnant women should be followed. A multidisciplinary team with Obs and Gynae specialist in lead role should be available for obstetrics related care and emergency.

Known Asthma, COPD and ILD patient: Pulmonologist and Medicine specialist/pediatrician/ID specialist should be consulted for multidisciplinary approach.

Known CKD, CLD patient: Nephrologist and Hepatologist with Medicine specialist/ Pediatrician/ ID specialist should be consulted for multidisciplinary approach.

Known Cardiac patient or cardiac complication due to COVID-19- Cardiologist’s consultation with protocol- based management.

Hospital care Principles

- Mild cases with risk factors, severe and critical cases of suspected (or probable) or confirmed COVID-19 require hospital care.
- Management of such patients warrant immediate implementation of appropriate infection prevention and control measures.
- Patients with severe disease often need oxygenation support.
- Aerosol generating procedures such as endotracheal intubation, bronchoscopy, nebulization, cardiopulmonary resuscitation, open suctioning of respiratory tract, tracheostomy etc. demand specific protection of healthcare workers with appropriate personal protective equipment (PPE).
- The safety of high-flow oxygen and non-invasive positive pressure ventilation in these measures is uncertain, and they should be considered aerosol-generating procedures that warrant specific isolation precautions. Oxygen hood is suitable if patient needs oxygen in general ward.
- Patient with sepsis with or without shock may require treatment in high dependency unit (HDU) or ICU depending on disease severity and clinical judgement of treating physicians.
- If patients develop acute respiratory distress syndrome, intubation with mechanical ventilation will be needed.
- ECMO (extracorporeal membrane oxygenation) may be indicated in patients with refractory hypoxia in ICU setting.

COVID-19 ICU Management Strategies

Respiratory failure:

- It is conventionally defined by an arterial oxygen tension (PaO₂) of <8.0 kPa (60 mmHg), an arterial carbon dioxide tension (PaCO₂) of >6.0 kPa (45 mmHg) or both. (**Silent Hypoxia- Hypoxia without clinical symptoms, common in COVID-19**)
- Hypoxemic respiratory failure (type I) is characterized by an arterial oxygen tension (PaO₂) lower than 60 mm Hg (<8 kPa) with a normal or low arterial carbon dioxide tension (PaCO₂).
- Hypercapnic respiratory failure (type II) is characterized by a PaCO₂ higher than 45 mm Hg (>6 kPa). Hypoxemia is common in patients with hypercapnic respiratory failure.

ARDS (Berlin definition):

- Acute onset <7 days
- Bilateral pulmonary infiltrate
- PaO₂:FiO₂ ration <300 on PEEP 5

ARDS severity	PaO ₂ /FiO ₂	Mortality
Mild	>200, <300	27%
Moderate	>100, <200	32%
Severe	<100	45%

ARDSnet FiO₂/PEEP table:

Lower PEEP/Higher FiO₂

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

Higher PEEP/Lower FiO₂

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

In **Covid-19 patients** the pulmonary injury pattern is not entirely similar to ARDS, as hypoxia is prevalent and pulmonary compliance is generally high. In general, two categories of patients may be identified:

1. High-pulmonary compliance patients with isolated viral pneumonia.

- A) The main finding is hypoxic vasoconstriction, explaining the observed severe hypoxemia. In those patients, the major issue is related to perfusion, as lungs are inflated and increasing PEEP may not help.
- B) High PEEP and prone positioning do not lead to recruitment of collapsed areas, but they only adjust pulmonary perfusion.
- C) Pressure-Controlled, time-cycled ventilation may be a better choice to employ to improve oxygenation
- D) Respiratory rates should not exceed 20 breaths/min
- E) Tidal volumes generated may be much higher than 6 ml/kg (IBW) but should be tolerable as long as plateau pressure is maintained <30 cm H₂O in normal BMI patients. May allow slightly higher plateau pressures based on BMI, chest wall thickness and other factors described in literature.

F) Inverse Ratio Ventilation may be employed in view of above mechanics.

2. Low-pulmonary compliance patients with lung injury pattern similar to traditional ARDS.

- A) These may have concomitant bacterial or other co-infections or interstitial lung injury
- B) Standard ARDSnet strategy should be used for tidal volume, plateau pressure and PEEP goals

Approach considerations:

1- Low flow O2 delivery devices:

Nasal cannula (up to 6LPM and provide up to 50% FiO2; Simple mask (up to 10 LPM and provide up to 60% FiO2); Venturi mask (up to 15 LPM and provide 50% FiO2); Partial rebreather mask (15 LPM and provide 70% FiO2); Non rebreather mask (15 LPM and provide 100% FiO2)

2- High flow delivery device:

High Flow Nasal cannula (HFNC): up to 70 LPM and provide 100% FiO2

Advantages: Well tolerated, generate PEEP (1 PEEP for every 10L)

3- Non-invasive positive pressure ventilation:

CPAP: (Setting 5-20 cmH2O) and used for type I respiratory failure;

BiPAP (Setting EPAP 4-16 cm H2O, IPAP 10-20 cmH2O and minimum pressure support 4 cmH2O) and used for both type I and type II respiratory failure.

Increase CPAP or EPAP for hypoxia

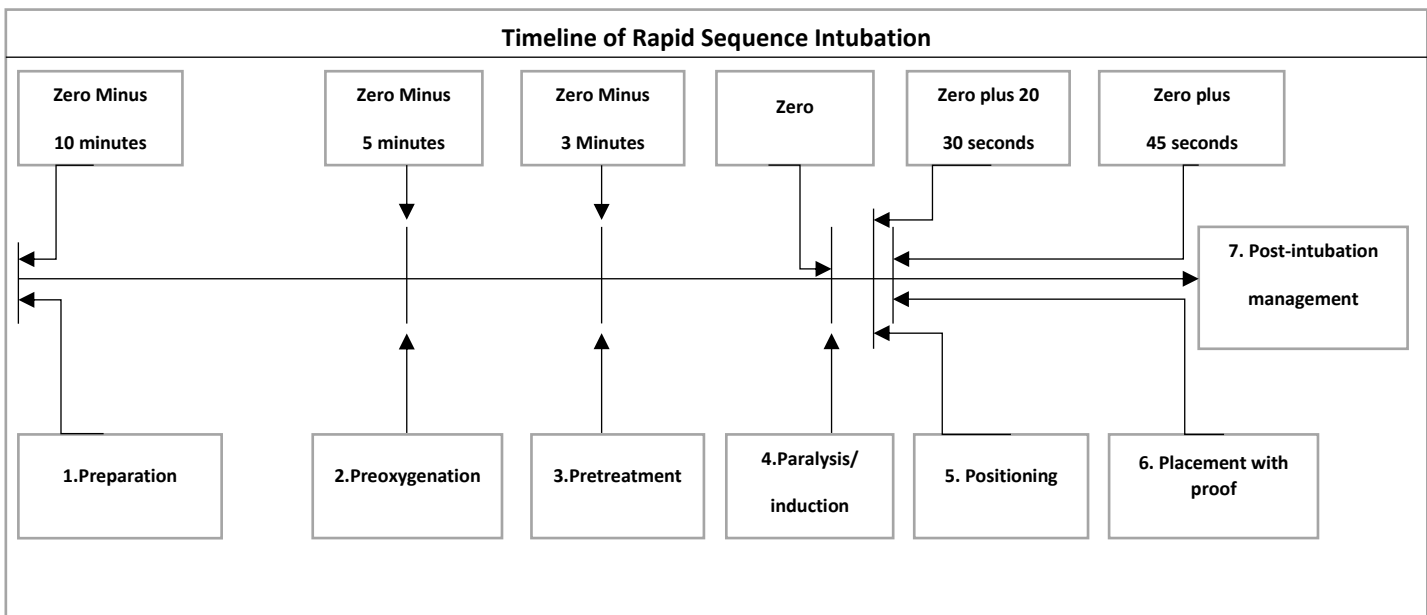
Increase pressure support (IPAP-EPAP) for hypercapnia

4- Mechanical ventilation.

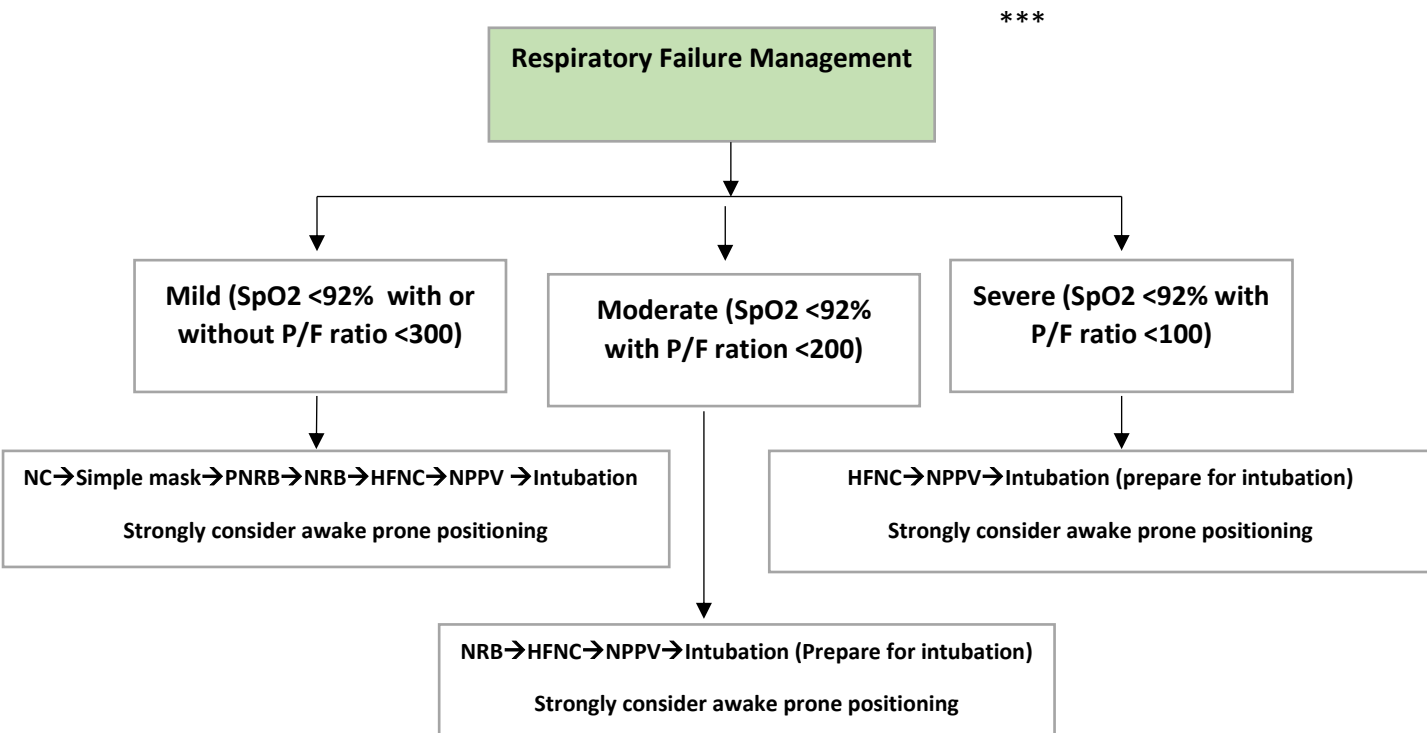
5- Pulmonary vasodilator: Nitric oxide is a lipophilic gaseous molecule that readily diffuses across pulmonary membranes, causing localized vasodilatory effects in the pulmonary vascular bed. It is used to combat vasoconstriction, V / Q mismatching, arterial hypoxemia, and pulmonary hypertension associated with ARDS. NO improves oxygenation but doesn't have any effect on mortality.

6- ECMO

Intubation Protocol	Extubation Protocol
<ul style="list-style-type: none"> • It's an aerosol generating procedure • Use negative pressure or single room • Use proper PPE including face shield/goggles, N95 or KN95 • Bed-up-head -elevated position • Avoid bagging • Use exhalation HME filter if bagging required • Adequate preoxygenation with NRB • Have vasopressors prepared prior to induction Rapid sequence intubation (RSI) using adequate sedation and neuromuscular blockade. • Video laryngoscopy over direct laryngoscopy • Post-intubation and ventilation should only be initiated once ETT cuff is inflated. 	<ul style="list-style-type: none"> • After decision is made to extubate, huddle with nurses to have game plan and back up options • It is aerosol generating procedure • Nurse turns off tube feeding. • All should wear PPE including N95, + face shield /goggles • Airway management equipment outside the room for reintubation • Place surgical mask on patient's face above ETT. • Feeding tube is removed first, mouth and ETT suctioned • Nasal cannula with O2 placed before extubation • Ventilator shut off first • ETT removed and at same time mask pulled down over patient's mouth



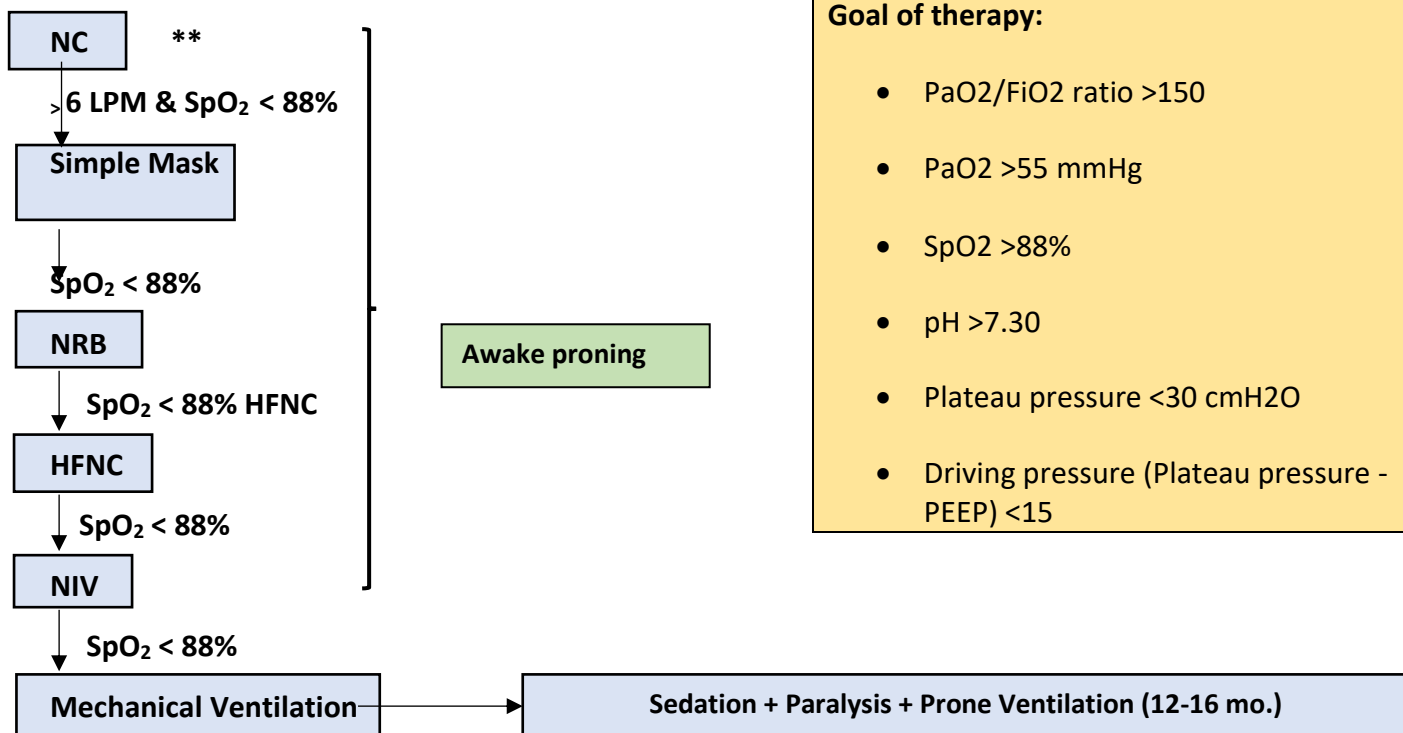
1. **Preparation** – Assemble all necessary equipment, drug, etc.;
2. **Preoxygenation** – Replace the nitrogen in the patient’s functional reserve with oxygen – “nitrogen wash out – oxygen wash in.”
3. **Pretreatment** – Ancillary medications are administered to mitigate the adverse physiologic consequences of intubation;
4. **Paralysis with induction** – Administer sedative induction agent via IV push, followed immediately by administration of paralytic via IV push;
5. **Positioning** – Position patient for optimal laryngoscopy; Sellick’s maneuver, if desired, is applied now;
6. **Placement with proof** – Assess mandible for flaccidity; perform intubation, confirm placement;
7. **Post-intubation management** – Long-term sedation/analgesia/paralysis as indicated;



In USA HFNC is preferred if patient require $NC > 6$ LPM. HFNC is not widely available in Bangladesh;

Awake Proning:
While proning has been used with good result in patient with ARDS but recent anecdotal reports showed benefit in non-intubated patient. A CARP (COVID Awake Repositioning/Proning Protocol) has been suggested.
Early intubation:
Early intubation is discouraged in COVID 19 patient. There is no evidence that early intubation instead of HFNC or NIV improves outcome. Data from China, Italy and USA showed significantly higher mortality rate in intubated patient.

Aerosol Generating Procedures (AGPs)
<ul style="list-style-type: none"> • Intubation • Extubation • Bronchoscopy • Nebulizer • NIV • Open Suction • Tracheostomy • CPR • AMBU/manual bagging



Initial Mechanical Ventilation Setting:

- **Pressure Controlled Ventilation for high lung compliance patients**
 - PC 15 to 25cmH₂O range(above PEEP)
 - Plateau pressure <30cmH₂O
 - Respiratory Rate <20/min
 - Inverse Ratio Ventilation may be used
- **ARDSnet Strategy for low lung compliance patients**
 - TV 4-8 ml/kg IBW based
 - PEEP Strategy as per ARDSnet PEEP/FiO₂Table
- Optimize sedation & analgesia
- Consider Recruitment Maneuver
- Diuresis if clinically indicated
- UOP≥0.5ml/kg/hr. with MAP≥60mmHg

PLATEAU PRESSURE 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 1m/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 1 ml/kg increments to 7 or 8 ml/kg if Pplat remains <30 cm H₂O;

HFNC is preferred if patient require Oxygen>6 LPM. HFNC is not widely available in Bangladesh; NIV should be used in negative pressure or single room.

Recommended Induction Agents and Dosing:

MED	DOSE	RANGE
Propofol	1.5 mg/kg	1-2 mg/kg
Ketamine	2 mg/kg	1-2 mg/kg
Midazolam	0.3 mg/kg	0.2-0.3 mg/kg
Fentanyl	4 mcg/kg	2-5 mcg/kg
Etomidate	0.3 mg/kg	0.2-0.6 mg/kg
Succinylcholine	1 mg/kg	1-2 mg/kg
Rocuronium	1 mg/kg	1-2 mg/kg

Caution: Propofol may increase triglyceride

Recommended Lab tests:

On admission: COVID-19 testing; CBC with differential; LFT; Urea; Creatinine; CRP; D-dimer; Ferritin; LDH; Troponin and BNP.

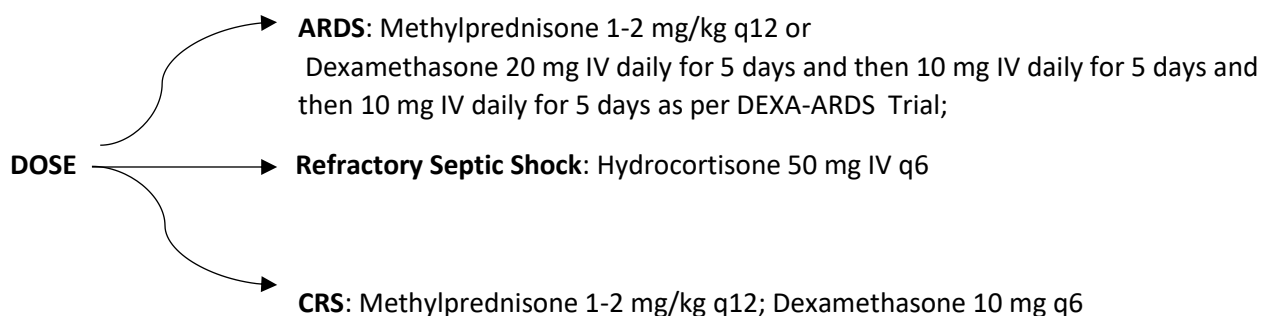
Every 72 hours: CBC with differentials, CRP, D-dimer, Urea, Creatinine and Troponin

Daily lab tests as needed.

MEDICATION THERAPIES and SUPPORTIVE CARE IN ICU:

Steroid:

1. Systemic steroids should in general be **AVOIDED**.
2. SCCM and ESICM recommend steroid in ARDS
3. SCCM and ESICM recommend steroid in severe pneumonia
4. Surviving sepsis campaign recommend steroid in septic shock.
5. ADRENAL trial in 2018 showed decrease ventilator and ICU day with steroid but no mortality benefit
6. APPROCCSS in 2018 trial showed mortality benefit.
7. DEXA-ARDS trial showed (P/F ratio <200) showed mortality benefit
8. Small Chinese retrospective non RCT trials in COVID-19 patient showed decrease ventilator day and mortality benefit.
9. Dose for ARDS:



TOCILIZUMAB:

(Based on available data, the evidence for benefit is weak)

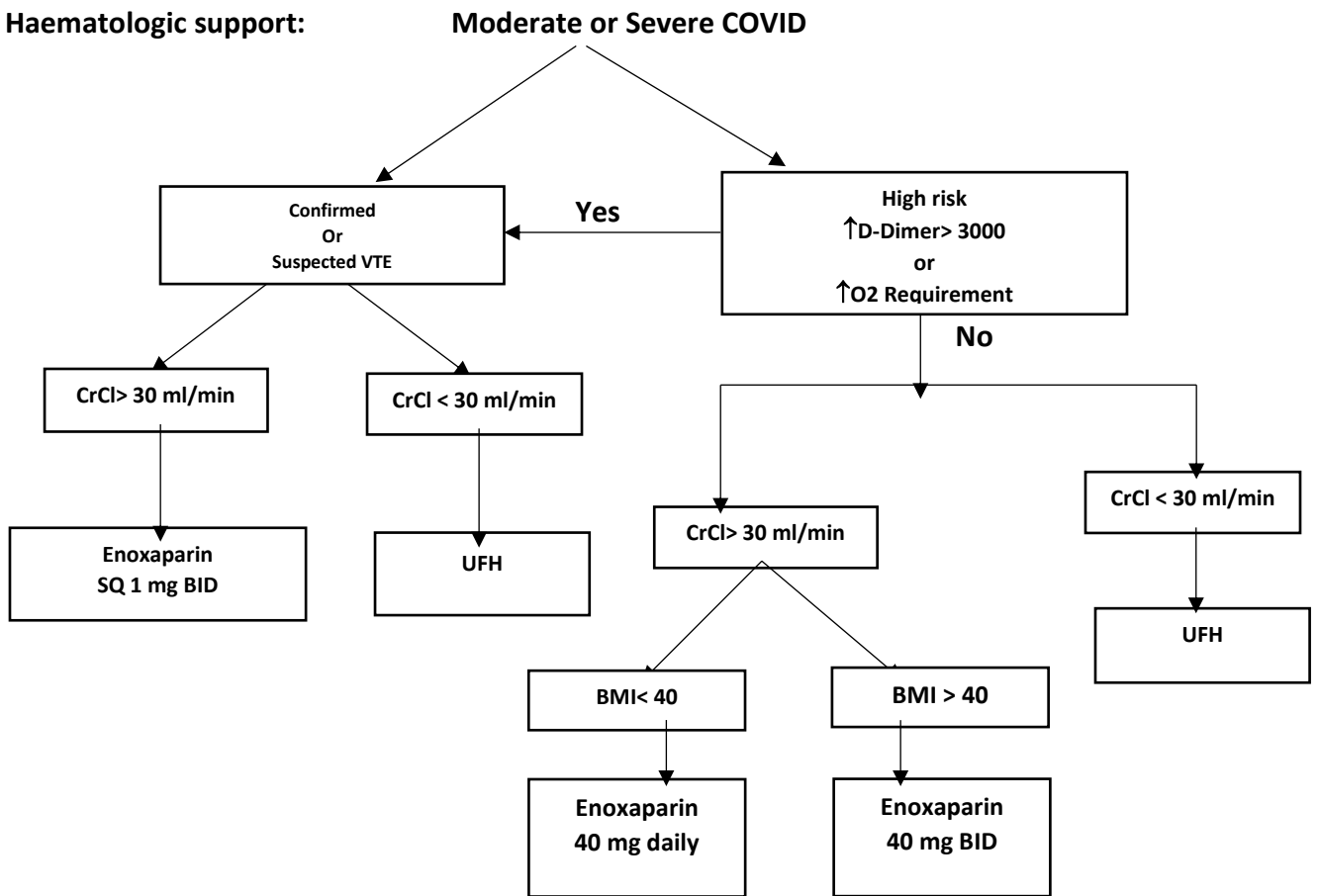
1. COVID-19 positive
2. All of the following respiratory findings:
 - a. Abnormal chest imaging consistent with COVID-19
 - b. Rapidly worsening gas exchange/respiratory status over 24-48 hours and requiring >6 L/min O₂ or on mechanical ventilation
3. Absence of systemic bacterial or fungal co-infection
4. High clinical suspicion for cytokine release syndrome supported by elevated inflammatory markers (e.g., ferritin >600 ug/mL; D-dimer >1.0 mg/L) and clinical declines

Convalescent plasma: (Must meet all criteria):

1. Age >18 years old
2. Positive SARS-CoV-2
3. Admitted in ICU
4. Informed consent
5. Severe or life threatening disease defined by at least one of the following:
 - Increasing dyspnea
 - Respiratory rate >30
 - SpO₂ <88%
 - P/F ratio <300
 - Lung infiltrate >50% within 24-48 hours
 - Septic shock
 - Multi organ failure

Hematological Issues:

Haematologic support:



***UFH:** Unfractionated Heparin

<p>Inclusion: All admitted patients with moderate to severe COVID-19</p> <p>Exclusion: High risk of bleeding as judged by treating physician, older age, advanced liver or renal disease, previous h/o bleeding;</p>
<p>Baseline and daily: CBC, PT/PTT, D-dimer</p>

Empiric antibiotics: Consider strongly as per local antibiogram.

In patients with COVID-19 and hypoxic respiratory failure requiring mechanical ventilation, superinfection is reasonably common in this population. 15% of hospitalized COVID-19 patients developed a secondary bacterial infection and the median time to secondary bacterial infection was 17 days (13 to 19 days). Of all COVID-19 patients in their cohort, 79% had a WBC.

Sedation:

1. Target RASS 0 to -2
2. Target RASS -3 or -4 if continuous NMBA is needed.
3. Fentanyl is the first choice (address pain and sedation).
4. Not routinely utilizing ketamine infusions over other agents such as propofol or midazolam.
5. Dexmedetomidine shouldn't be used as first agent.
6. Propofol and hypertriglyceridemia: Increased risk due to probable HLH-type syndrome monitor CK, acidosis, and early checking of triglycerides.

Neuromuscular blockade:

1. Considerations for NMBA
2. Consider intermittent boluses first and assess for efficacy
3. If continuous infusion is needed due to persistent Dyssynchrony or profound hypoxia
4. Monitor train of four (TOF) to assist in titrating to lowest effective dose
5. Complications of NMBA:
 - a) Corneal abrasion and the need of lubricating eye ointment
 - b) Prolonged weakness
 - c) Higher incidence thrombosis and the need for DVT prophylaxis

Hemodynamic support:

1. Target MAP >60, instead of >65.
2. Consider balanced crystalloid fluid (Ringer lactate, Hartmann's) over normal saline (higher incidence of AKI) and colloid.
3. Fluid sparing strategies and dynamic measures like PLR, Lactate, capillary refilling time to assess fluid status/responsiveness.
4. Conservative over liberal fluid strategy.
5. Norepinephrine as the first-line vasoactive agent, over other agents.
6. If norepinephrine is not available, either vasopressin or epinephrine as the first-line vasoactive agent, over other vasoactive agents.
7. Vasopressin as a second-line agent over increasing norepinephrine.
8. If there is evidence of cardiac dysfunction and persistent hypoperfusion despite fluid resuscitation and norepinephrine, add dobutamine, over increasing norepinephrine dose.
9. Refractory shock add low-dose corticosteroid therapy ("shock-reversal"), over no corticosteroid therapy (IV Hydrocortisone 50 mg q6).

Feeding strategies (Nutrition):

1. Early enteral feeding within 24-48 hours is helpful.
2. Starting feeds at 25-50% caloric goal and increasing to 100% over 3-7 days is reasonable.
3. Use trophic or trickle diet (10-20 cc/hour) in hemodynamically or respiratory unstable patient
4. Don't check gastric residual volumes (GRVs) routinely.
6. Consider post pyloric tube placement or prokinetics in a patient with high GRVs or vomiting.
7. Avoid post pyloric feeding in unstable patient (higher incidence of non-occlusive bowel necrosis)

Blood glucose (BG):

1. Target BG 140-180 mg/dl.
2. Use sliding scale initially but change to drip if requiring higher insulin or BG is not well controlled.

DGHS website have a guideline named 'CARING FOR CRITICALLY ILL COVID- 19 PATIENT: QUICK GUIDE FOR ICU CARE' which can be followed for detailed management strategies.

Caring for infants and mothers with COVID-19: IPC and breastfeeding (Check out paediatrics and OGSB guideline in DGHS website)

- Infants born to mothers with suspected, probable or confirmed COVID-19 infection, should be fed according to standard infant feeding guidelines, while applying necessary precautions for IPC.
- As with all confirmed or suspected COVID-19 cases, symptomatic mothers who are breastfeeding or practising skin-to-skin contact or kangaroo mother care should practise respiratory hygiene, including during feeding (for example, use of a medical mask when near a child if with respiratory symptoms), perform hand hygiene before and after contact with the child, and routinely clean and disinfect surfaces which the symptomatic mother has been in contact with.
- Breastfeeding counselling, basic psychosocial support and practical feeding support should be provided to all pregnant women and mothers with infants and young children, whether they or their infants and young children have suspected or confirmed COVID-19.
- In situations when severe illness in a mother due to COVID-19 or other complications prevent her from caring for her infant or prevent her from continuing direct breastfeeding,

mothers should be encouraged and supported to express milk, and safely provide breastmilk to the infant, while applying appropriate IPC measures.

- Mothers and infants should be enabled to remain together and practise skin-to-skin contact, kangaroo mother care and to remain together and to practise rooming-in throughout the day and night, especially immediately after birth during establishment of breastfeeding, whether they or their infants have suspected, probable or confirmed COVID-19 virus infection
- Parents and caregivers who may need to be separated from their children, and children who may need to be separated from their primary caregivers, should have access to appropriately trained health or non-health workers for mental health and psychosocial support.

Caring for older persons with COVID-19

- For older people with probable or suspected COVID-19, provide person-centred assessment, including not only conventional history taking, but a thorough understanding of the person's life, values, priorities and preferences for health management.
- Ensure multidisciplinary collaboration among physicians, collaboration with nurses, pharmacists, other health care professionals in the decision making process to address multimorbidity and functional decline.
- Early detection of inappropriate medication prescriptions is recommended to prevent adverse drug events and drug interactions for those being treated with COVID-19.
- Older people are at greater risk of polypharmacy, due to newly prescribed medications, inadequate medication reconciliation and a lack of care coordination which increases the risk of negative health consequences

Avoiding medical damage in special populations

Special populations include pregnant women, patients with hepatic and renal insufficiency, patients supported by mechanical ventilation, patients under continuous renal replacement therapy (CRRT) or, extracorporeal membrane oxygenation (ECMO), etc. The following aspects need to be noted during drug administration.

1. Pregnant women: Lopinavir/ritonavir tablets could be used. Favipiravir and chloroquine phosphate are prohibited. (check out OGSB guideline at DGHS website)

2. Patients with hepatic insufficiency Drugs that are excreted unchanged through the kidney are preferred, such as penicillin and cephalosporins, etc.
3. Patients with renal insufficiency (including those on haemodialysis).
Drugs that are metabolized through the liver or excreted through the liver-kidney double channels are preferred, such as linezolid, moxifloxacin, ceftriaxone, etc.
4. Patients under CRRT for 24h For vancomycin, the recommended regimen is loading of 1g and maintenance dose 0.5 g, q12h. For imipenem, the maximum daily dosage should not exceed 2 g.

Discontinuing of transmission-based precaution including isolation and return to workplace criteria:

- For symptomatic patients: At least 3 days have passed without symptoms (no fever without the use of fever reducing medications and significant improvement in respiratory symptoms) and at least 10 days have passes after symptom onset.
- For asymptomatic patients: 10 days after test positive.

Exception: Severe or critical patients may still require ongoing rehabilitation, or other aspects of care, based on clinical needs in the COVID-19 pathway. For these patients several clinical considerations such as medication reconciliation, plan for follow up with clinical provider in place, review of routine immunization status, among others, should be taken into account by treating physicians.

Discharge criteria

1. Resolution of fever without the use of fever-reducing medications e.g paracetamol for at least 3 (three) days and
2. Significant improvement in the respiratory symptoms (e.g., cough, shortness of breath) for 3 days, and
3. After discharge, continue home or facility isolation for the duration which extends from the day of symptom onset to 21th day for hospitalized patients
4. For severe or critical patients – physician’s discretion

Medication after discharge

Generally, antiviral drugs are not necessary after discharge. Treatments for symptoms can be applied if patients have mild cough, poor appetite, thick tongue coating, etc.

Antiviral drugs can be used after discharge for patients with multiple lung lesions in the first 3 days after their RT-PCR test is negative.

Home isolation

Recommended home isolation conditions are:

- Independent living area with frequent ventilation and disinfection.
- Avoid contacting with infants, the elderly and people with weak immune functions at home.
- Patients and their family members must wear masks and wash hands frequently.
- Body temperature are taken twice a day (in the morning and evening) and pay close attention to any changes in the patient's condition.

Follow-up

A specialized doctor should be arranged for each discharged patient's follow-ups. The first follow-up call should be made within 48 hours after discharge. The outpatient follow-up will be carried out 1 week, 2 weeks, and 1 month after discharge.

Examinations include liver and kidney functions, blood test, nucleic acid test of sputum and stool samples, and pulmonary function test or lung CT scan should be reviewed according to the patient's condition. Follow-up phone calls should be made 3 and 6 months after discharge.

Management of patients tested positive again after discharge:

Strict discharge standards should be implemented in hospital. However, there are some reported cases that patients are tested positive again in China, after being discharged based on the standards of national guidelines (negative results from at least 2 consecutive throat swabs collected at an interval of 24 hours; body temperature remaining normal for 3 days, symptoms significantly improved; obvious absorption of inflammation on lung images). It is mainly due to sample collection errors and false negative testing results. For these patients, the following strategies are recommended:

- Isolation according to the standards for COVID-19 patients.
- Continuing to provide antiviral treatment which has been proved to be effective during prior hospitalization.
- Discharge only when improvement is observed on lung imaging and the sputum and
- Stool samples are tested negative for 3 consecutive times (with an interval of 24 hours).
- Home isolation and follow-up visits after discharge in accordance with the requirements mentioned above.

Infection, Prevention and Control

Introduction: Infection prevention and control (IPC) is one of the most important aspects for any healthcare facility to ensure the safety of patients, healthcare personnel and the environment. Every healthcare facility must establish its own infection control protocols for safe operation of all aspects of healthcare delivery. Such protocols need periodic review and updates based on any new outbreaks and available resources in order to remain effective. An effective infection control program requires multidisciplinary approach, participation, commitment and coordination among different departments-administration, engineering, environmental services (cleaning, disinfection and waste disposal), Infectious disease specialists, microbiologists, and in some cases local and governmental agencies. Hospitals and healthcare facilities in Bangladesh must take into consideration other variables such as building structure, single room vs. ward, ventilation, use of air conditioning, fan etc.

Infection Control: Basics Sources of Infection:

Person

- People, including: ○ Patients ○ Healthcare workers ○ Visitors/household members ○ Community members
- Hands are the most common source for spreading infection Environment

Environment

- Dry surfaces in patient care areas (ie. bed rails, medical equipment, countertops, tables, etc.)
- Wet surfaces, moist environments, and biofilms (ie. faucets and sinks, equipment such as ventilators)
- Indwelling medical devices (ie. catheters and IV lines)
- Dust or decaying debris (ie. construction dust or wet substances from water leaks)
- For environmental cleaning and disinfection establish a protocol and checklist and verify compliance.
- Identify and take extra caution for “High touch surface”- bed rails, table top, IV pole, chair, sink, light switch, door knobs, toilet seat, flush handle etc. Clean these surfaces frequently.

Infection control precaution can be broadly divided into two parts:

1. Standard precautions: applies to all patient care
2. Transmission-based precautions: based on organisms and their mode of transmission

1. Standard Precautions:

- Assume that every person is potentially infected or colonized with a pathogen that could be transmitted in the healthcare setting
- Should be used for all patient care at all times
- Hand hygiene before and after each patient encounter
- Gown, gloves, and eye protection as needed e.g. If any contact with bodily secretions is anticipated, gloves/gowns should be used. Similarly, if any splash of secretions is anticipated, use eye protection. Use of gloves does not replace hand hygiene
- Safe disposal and cleaning of instruments/linens per protocol
- Proper cough etiquette
- Hand Hygiene: Hand hygiene is the single most important component of infection control measures. “My five moments of hand hygiene” from the WHO initiative for clean hands: 1. Before touching a patient; 2. Before clean/aseptic procedures 3. After bodily fluid exposure/risk 4. After touching a patient 5. After touching patient surroundings. Proper hand hygiene should be performed for at least 20 seconds.
- Wash with soap and water:
 - When hands are visibly soiled
 - Before eating, after using the washroom
- Use alcohol-based hand sanitizer (minimum 60% alcohol):
 - When hands are not visibly soiled

Cough Etiquette:

- Cough/sneeze into tissue - properly dispose of in waste basket
- Cough/sneeze into sleeve, not hands
- If sick, wear a mask
- Perform proper hand hygiene after coughing/sneezing into tissue or sleeve

2. Transmission-based Precautions:

Contact Precaution:

- Follow Standard precaution, plus gloves/gowns at all times in patient rooms. Gloves/gowns should be removed before leaving patient room or Gloves/gowns should not be reused between visiting multiple patients
- Use dedicated noncritical items (ie. stethoscope, thermometer, BP machine, etc.) for a single patient. If unable to do so, then disinfect each item properly after each use
- A few examples of infection/organism where contact isolation is needed:
 - MRSA, MDRO, CRE
 - Enteric infections Clostridium difficile, Norovirus

Droplet Precaution: Droplets are respiratory secretions ≥ 5 microns

- Transmission occurs within 3-6 ft. of source through coughing, sneezing, talking
- Wear a surgical mask at all times in patient room/area. Remove upon exiting the room

Airborne Precaution: Airborne droplets nuclei are respiratory secretion particles <5 microns and remain suspended in the air for longer time/distance

- Private patient rooms with negative air pressure, 6-10 air change/hour. Uses High Efficiency Particulate Air (HEPA) filter
- Wear respirator, N-95 mask, Powered Air Purifying Respirator (PAPR) ○ All healthcare personnel will have to be trained and fit-tested to be able to use respirator

Contact and Droplet

This requires:

- Rapid identification of suspect cases
- Immediate isolation and referral for testing
- Safe clinical management
- Adherence to standard IPC precautions. A clear understanding of the mode of transmission of COVID-19 is important to implement interventions to control and prevent COVID-19 infection.

Mode of transmission

- Primarily by droplets: When the infected person speaks, coughs, or sneezes, respiratory droplets can enter the mouth, nose, or eyes of people who are nearby or even inhaled by people within close proximity (3-6 feet) of the infected individual.
- Contact: Indirect transmission may occur with contact via hand contaminated by infected person's hand or contaminated surfaces then subsequent self-contamination by touching the eyes, nose, or mouth.
- Possible aerosols/airborne: although less is known about transmission via aerosols or small respirable particles, aerosol generating procedures may play a role in transmitting infection. However, airborne transmission over long distances from person to person is unlikely. ○ Examples of aerosol generating procedures include: intubation, mechanical ventilation, non-invasive ventilation such as BiPAP and CPAP, manual ventilation, cardiopulmonary resuscitation, bronchoscopy, open suctioning of airways, and sputum induction. ○ Although there is limited data, the following procedures may also generate aerosols such as nebulizer administration and high flow oxygen delivery.

Based on mode of transmission following infection control precaution are recommended for SARS-CoV2:

1. Place suspected patient under Investigation (PUI) or confirmed case of COVID-19 in contact and droplet isolation

2. Multiple confirmed cases can be cohorted in a single room/ward, however suspected cases need to be placed in single rooms until confirmed. If single rooms are not available, the patient's bed should be placed at least 1 meter apart in a well-ventilated room.

3. Use a negative pressure room for aerosol generating procedures; if unavailable, use a well-ventilated single room

Strategies to prevent and control COVID-19 infection in healthcare facilities: We can approach and implement the steps to minimize the risk of exposure and control infection at 3 different levels of intervention:

1. The patient: ○ Educate patients on hand hygiene and the importance of wearing face mask/cloth mask. ○ Based on recent findings it is possible for asymptomatic or presymptomatic patients to contribute to the transmission of COVID-19. Current recommendations for source control by symptomatic and asymptomatic individuals include wearing a cloth face covering or facemask. By wearing a facemask or face covering, respiratory secretions from the mouth and nose can be contained and prevent/reduce the spread of SARS CoV-2.

2. The healthcare facility: ○ Establishing triage protocols ○ Establishing separate units for COVID-19 suspected and confirmed cases ○ Providing adequate equipment and resources to practice infection prevention and control including adequate hand hygiene material and implementing environmental cleaning and disinfecting protocols, and providing appropriate personal protective equipment (PPE), as well as proper training to all HCW on how to use PPE.

3. The healthcare worker: ○ Healthcare workers are those in direct contact with patients as well as other ancillary personnel ○ Healthcare workers must be educated and trained on appropriate infection prevention and control basics and appropriate use of PPE based upon their level of interaction with patients. ○ It's important to practice hand hygiene frequently, refrain from touching the face, and avoid touching the front of the mask when wearing a medical mask/respirator

Personal protective equipment (PPE) for healthcare workers: (Annex 6)

(check DGHS website for national guideline on infection, prevention and control document)

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- Bangladesh Society of Medicine (BSM)
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- Obstetrics and Gynaecological Society of Bangladesh (OGSB)
- Bangladesh Society of Infectious and Tropical Diseases (BSITD)

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Annex1: হাসপাতালে কোভিড-১৯ রোগের ব্যবস্থাপনা

হাসপাতালের প্রবেশ মুখে স্বাস্থ্য কর্মী দ্বারা সম্ভাব্য শ্বাসতন্ত্রের সংক্রমণজনিত রোগের লক্ষণসহ (জ্বর, কাশি, শ্বাস কষ্ট) রোগী সনাক্ত। রোগীসহ সকলে মাস্ক পরিধান করবেন এবং সাবান পানি দিয়ে হাত ধুবেন।

- শনাক্তকৃত রোগীকে আলাদা বিশেষ বহির্বিভাগ / জরুরী বিভাগ রুমে স্থানান্তর।
- রোগীর তাপমাত্রা পরিমাপ করা হবে

চিকিৎসক রোগীর ভ্রমণ ইতিহাস বা সংস্পর্শে আসার ইতিহাস লিপিবদ্ধ করবেন এবং স্বাস্থ্য পরীক্ষা করবেন। কোভিড-১৯ রোগের লক্ষণসমূহ থাকলে (জ্বর, কাশি, শ্বাস কষ্ট, গলা ব্যথা, নাক দিয়ে পানি পড়া, ডায়রিয়া, বমি) সেই সাথে ভ্রমণ ইতিহাস বা সংস্পর্শে আসার ইতিহাস থাকলে রোগের আদর্শ সংজ্ঞা অনুসারে সন্দেহজনক কোভিড-১৯ রোগ সনাক্ত করবেন।

সন্দেহজনক কোভিড-১৯ রোগীকে আইসোলেশন ওয়ার্ড বা কেবিনে পাঠান এবং রোগীকে চিকিৎসা প্রটোকল অনুযায়ী চিকিৎসা প্রদান শুরু করুন

সন্দেহজনক কোভিড-১৯ রোগ না হলে রোগ অনুযায়ী চিকিৎসা প্রদান। ভ্রমণ ইতিহাস বা অন্য দেশ থেকে আসা মানুষের/ কোভিড-১৯ রোগীর সংস্পর্শে আসার ইতিহাস থাকলে ১৪ দিনের হোম কোয়ারেন্টাইনে রাখা হবে

রোগীর কাছ হতে কোভিড-১৯ এর RT-PCR পরীক্ষার জন্য নমুনা সংগ্রহ করুন

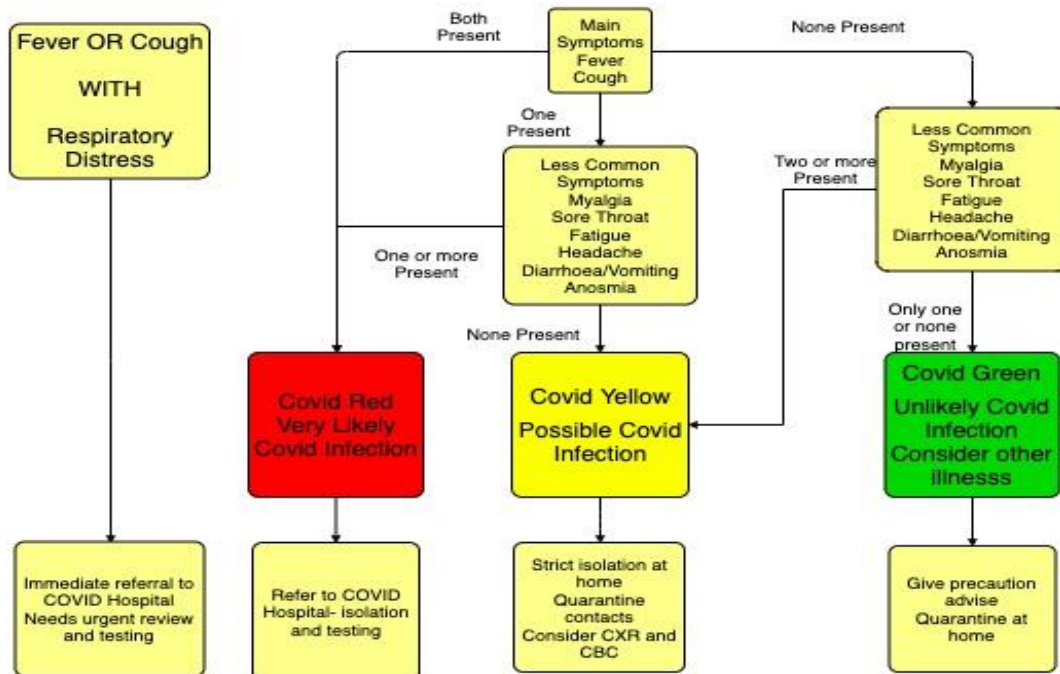
কোভিড-১৯ প্রমাণিত না হলে এবং রোগীর অন্য জটিল সমস্যা না থাকলে চিকিৎসা প্রটোকল অনুযায়ী রোগীকে ১৪ দিনের জন্য বাসায় অবস্থান (হোম কোয়ারেন্টাইন) করতে পরামর্শ দিন।

- কোভিড-১৯ প্রমাণিত হলে রোগীকে চিকিৎসা প্রটোকল অনুযায়ী চিকিৎসা প্রদান অব্যাহত রাখুন
- মৃদু উপসর্গ বিশিষ্ট কোভিড-১৯ রোগের ক্ষেত্রে বিশেষ কোন চিকিৎসা প্রয়োজন হয় না। জ্বরের বা অন্যান্য উপসর্গের সাধারণ চিকিৎসা করুন
- কোভিড-১৯ এর সাথে অন্য রোগ থাকলে (যেমন- ডায়বেটিস, উচ্চ রক্তচাপ, COPD, CKD, CLD, ক্যান্সার, গর্ভাবস্থা ইত্যাদি) এবং বয়স > ৬০ এর বেশি হলে বিশেষ সাবধানতা অবলম্বন করুন
- অন্যান্য পরীক্ষার প্রয়োজন হতে পারে যেমন রক্ত পরীক্ষা, এক্সরে, সিটি স্ক্যান ইত্যাদি। উক্ত হাসপাতালে পরীক্ষার ব্যবস্থা না থাকলে অথবা নিউমোনিয়া বা অন্যান্য জটিলতা সৃষ্টি হলে প্রয়োজনে উচ্চতর হাসপাতালে বা আইসিইউ তে স্থানান্তর করুন

নিউমোনিয়া, সেপটিক শক বা অন্যান্য জটিলতার চিকিৎসা প্রচলিত প্রটোকল অনুযায়ী করুন

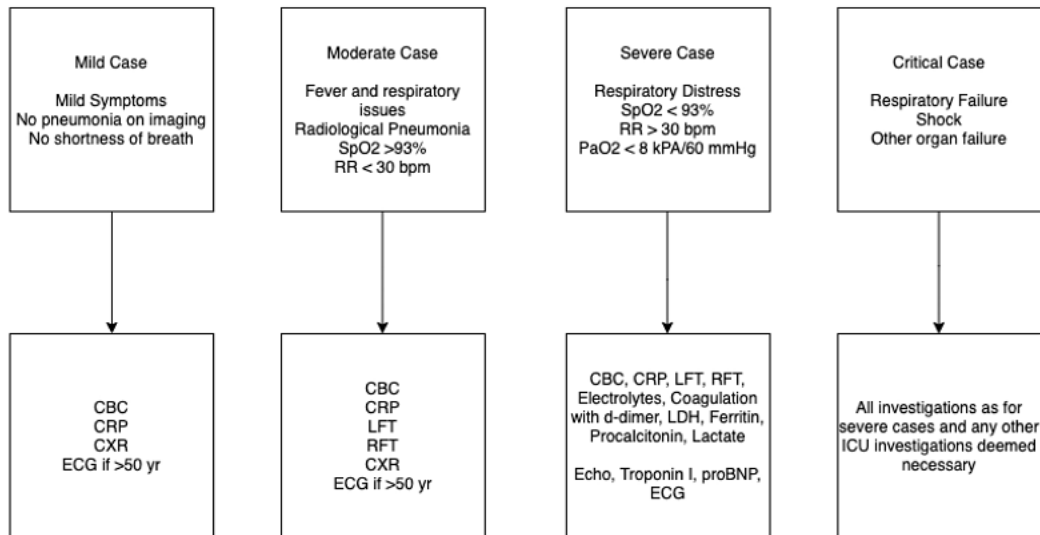
পর পর দুইদিন জ্বরের ওষুধ ছাড়াই জ্বর না থাকলে এবং পর পর দুই দিন কোভিড-১৯ এর RT-PCR পরীক্ষার নেগেটিভ হলে বা চিকিৎসকের পরামর্শমতে রোগীকে হাসপাতাল থেকে ছেড়ে দেয়ার জন্য ছাড়পত্র দিন।

Annex 2: Telemedicine service (likelihood tool and color coded pathway for patients) (all hospital will deal COVID and NONCOVID cases and hence every hospital is COVID hospital now)

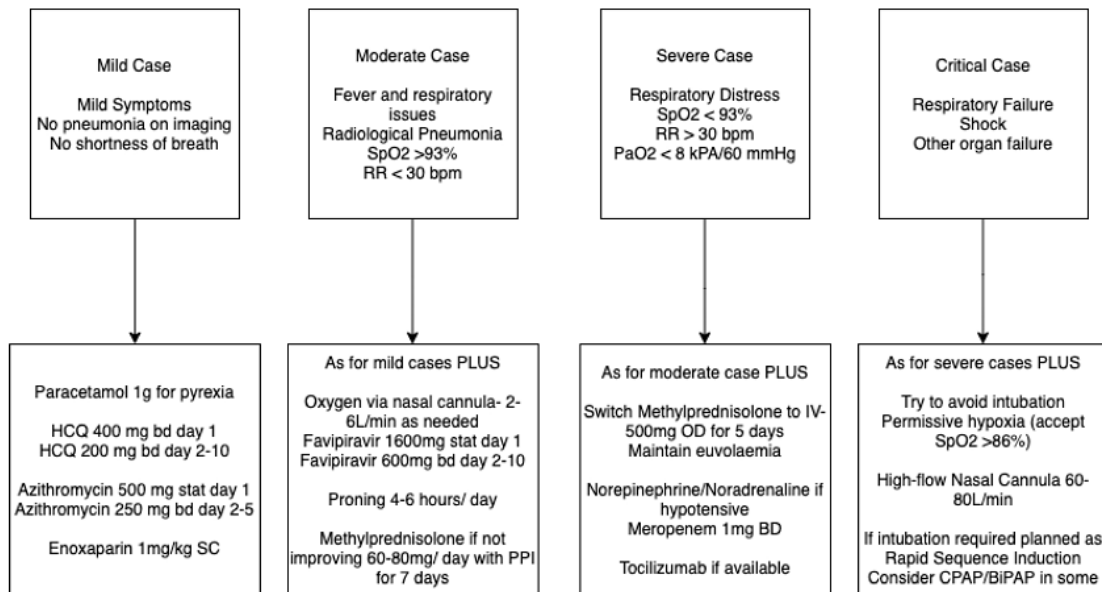


Annex 3 : Investigation and Management flow chart for COVID-19 clinical cases

Investigation Flowchart



Management Flowchart for Inpatients



N.B- In severe case methylprednisolone dose is 2mg/kg /day(on average it is started as 250mg /day).The maximum dose can be given is 500mg/day

Annex-4

Pharmacotherapy

Pharmacological drug

Remdesivir:

- Currently FDA approved this promising drug for emergency use. One RCT (1063 patients)showed there is recovery of 11 days versus 15 days of control group which was found statistically significant while there was not much difference between mortality (8% in Remdesavir vs 11% control), NNT(number needed to treat) was 28.
- Another RCT in China showed no clinical benefit in relation to mortality or recovery from ventilator
- It has activity against SARS-CoV-2 *in vitro*, SARS and MERS-CoV, both *in vitro* and in animal studies.
- The compassionate use of remdesivir through an investigational new drug application was described in multiple case reports of China and US patients with COVID-19.

Favipiravir (starting dose of 1600mg followed by 600 mg BD for 10 days)

- Japan based treatment option for COVID 19 cases when the early regimen fails
- The China study showed marked benefit in a non-randomized trial against lopinavir-Rotinavir
- Currently there are RCT is going on this promising drug and expected to get results within July
- Different regions of world Frontliner use this agents at admitted patients and found benefit in admitted patient when use early

Tocilizumab:

- Treatment guidelines from Different countries include the IL-6 inhibitor tocilizumab for patients with severe COVID-19 and elevated IL-6 levels.
- A clinical trial is under way.

Uncertainty about NSAID use

- Some clinicians have suggested that the use of NSAIDs early in the course of disease may have a negative impact on disease outcome (Day *BMJ* 2020;368:m1086. Epub 17 Mar 2020). These are based on anecdotal reports of a few young patients who received NSAIDs early during infection and experienced severe disease. There is also the concern that the anti-inflammatory properties associated with NSAIDs could have a negative impact on the patient's immune response.
- Use paracetamol (acetaminophen) in place of NSAIDs for reduction of fever.

Annex 5: Personal protective equipment and Donning and Doffing

The Occupational Safety and Health Administration (OSHA) defines PPE as specialized clothing or equipment worn by an employee for protection against infectious materials

Healthcare worker should be trained on proper donning (putting on) and doffing (removal) of PPE

- PPE for protection against COVID-19 include: gowns, gloves, masks and respirators, eye covers (i.e. goggles), or face shields ○ Gowns
 - It's recommended to use long-sleeved water-resistant gowns. If water-resistant gowns are unavailable, a single-use plastic apron can be worn over the non-water-resistant gown. Normal disposable isolation gowns as well as standard surgical gowns may also be used
 - Reusable washable water-resistant cloth gowns may also be used if available
 - The use of boots, coverall, and apron is not required during routine care

Gloves

- Non-sterile disposable patient examination gloves used in the typical healthcare setting are recommended
- Currently the CDC does not recommend double gloves when caring for COVID-19 patients

Masks and respirators

- Surgical or medical face masks are used for droplet precaution
- Respirators include N95, powered air purifying respirator (PAPR), filtering facepiece (FFP2 and FFP3) are used for airborne precautions
- Proper training and appropriate fit testing program are required for the use of respirators
- Recommendations for using surgical masks or N95 respirator:
 - For confirmed COVID-19 patients, the CDC recommendation prefers use of N95 respirators over surgical masks. However, surgical masks are also acceptable for use except during aerosol generating procedures.
 - The Infectious Disease Society of America (IDSA) published their recommendations for the use of masks as shown below. Contingency or crisis settings refer to situations where there are a shortage of masks or respirators such as this COVID-19 pandemic:
 - Eye covers (i.e. goggles) or face shields
 - It is recommended to wear goggles to protect the eye mucosa. The face shield offers additional protection if the reuse of N95/FFP respirators are intended ○ Head covers and shoe covering
 - According to the IDSA there is insufficient data available to support the use of head covering and shoe covers when taking care of COVID-19 patients
 - The European Centre for Disease Control (ECDC) and WHO do not include the head coverings and shoe covers as recommended PPE for healthcare workers taking care of COVID-19 infected patients.

- Due to shortages as a result of the current COVID-19 pandemic, N95 respirators and eye shields may be worn in extended use or reused with appropriate precaution and protocols¹⁰
 - Reuse
 - When the N95 respirator and/or eye shield is removed in between patient encounters
 - There is no set number of reuses for N95 respirators, however up to 5 reuses are recommended

○ Extended use

- When N95 and/or eye shield is used for multiple patients without removal between each patient care

Healthcare workers (HCW) can reuse n95 masks in following way. If an HCW is supplied with 6 N-95/FFP2 masks, they can re-use them up to 2 months, recommended by the CDC without damage or changing its functional integrity.

Key Points:

- It's important to discard N95/FFP3 masks contaminated with blood, respiratory or nasal secretions.
- A cleanable face shield or surgical mask on top of this mask to prevent spilling of bodily fluids can be used.
- Clean hands with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the respirator (if necessary, for comfort or to maintain fit).
- Avoid touching the inside of the respirator. If inadvertent contact is made with the inside of the respirator, discard the respirator and perform hand hygiene as described above.
- Recommended max continuous use of 8 hours in one day between breaks for these masks is extended use. Taking it off(doffing) in the same day during meal break/toilet break and wear it back(donning) after break with precautions is of crucial importance

Detail procedure:

- Day 1- Doffing mask no. 1 using the ribbon attached on the edge of mask, put it in paper bag, write 1 on bag for mask no.1, put it away in well-lit area for next re-use on day 7
- Day 2-Use the mask no.2 on day 2, doffing after hand wash and with precautions, put it in paper bag, write No. 2 on it, keep it away in well-lit area for re-use on day 8. Repeat same cycle for the mask no. 3, 4 and 5, after using them accordingly on day 3,4, 5 and 6.
- Day 7- you will wear the mask you have worn on day 1, as kept it no. 1 labeled bag, re-use as you will use a new one as there is no viable virus attached to its surface.

■ Surgical masks may also be worn in extended use up to 6 hours as long as the outer surface of the mask is not touched by the healthcare worker

- Extended use is preferred over reuse to minimize potential contamination during donning and doffing

Using PPE: Healthcare workers caring for infected patients should perform the following steps to wear PPE before entering the patient room: 1. Gather the appropriate PPE to wear 2. Perform hand hygiene with hand sanitizer 3. Put on isolation gown and make sure to tie all ties on the gown 4. Put on N95 mask or use a facemask if N95 mask is unavailable

○ Do NOT place N95 respirator or facemask under the chin

or store in pockets 5. Put on face shield or goggles for full face coverage 6. Perform hand hygiene by washing hands 7. Put on gloves, making sure to cover the cuff/wrist of the gown

Healthcare workers should perform the following steps to remove PPE: 1. Remove gloves, making sure to avoid further contamination of the hands 2. Remove gown and dispose in appropriate bin 3. Exit patient room 4. Perform hand hygiene by washing hands appropriately 5. Remove face shield or goggles without touching the front of the face shield or goggles 6. Remove N95 respirator or facemask without touching the the front of the N95 respirator or facemask 7. Perform hand hygiene after removing N95 respirator/facemask ○ If required to reuse, perform hand hygiene before putting it on again

Estimated needs of PPE for COVID-19 in the healthcare facility: It is a common misconception in Bangladesh that the number of PPE can be estimated based on the number of physicians or healthcare workers taking care of suspected or confirmed patients of COVID-19. However, the number of sets for PPE depends on the total number of suspected and confirmed cases of COVID-19. This is because PPE should be changed after each patient encounter. The exception is in cases where facemasks/N95 respirators and face shields/eye goggles are worn for extended use purposes in certain situations.

Annex 6: Donning and Doffing of PPE:

COVID-19: Donning of Personal Protective Equipment (PPE)

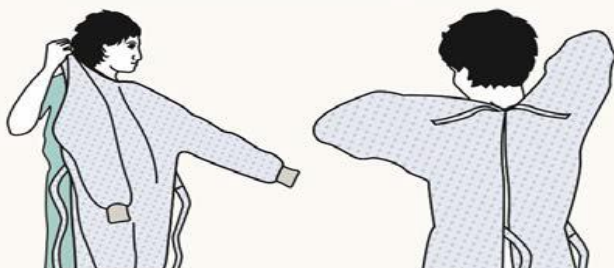
Pre-donning instructions

- ensure healthcare worker hydrated
- tie hair back
- remove jewellery
- check PPE in the correct size is available

Perform hand hygiene before putting on PPE

1

Put on the long-sleeved fluid repellent disposable gown



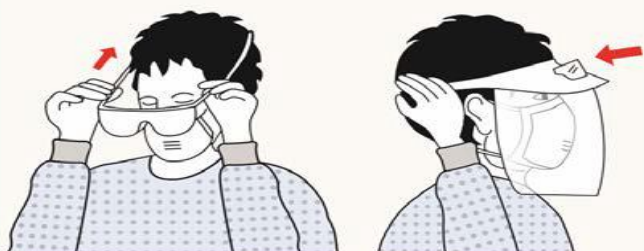
2

Respirator
Perform a fit check.



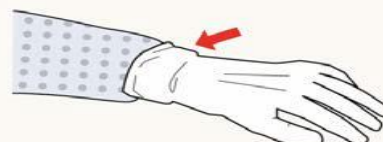
3

Eye protection



4

Gloves



PPE should be put on and removed in an order that minimises the potential for self-contamination.

Remember –

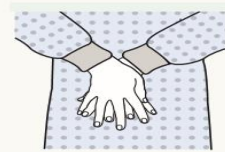
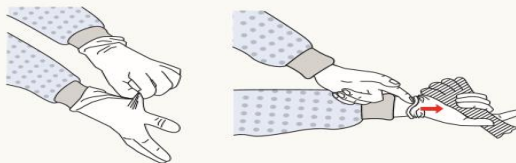
1. Ensure Proper Fit while wearing Respirator – making sure nose and mouth properly covered, mould the metal part over the bridge of the nose and press all around the face seal to be sure it is tightly in place no air leaks around the edges .

Avoid touching the mask while wearing it. Do not leave the mask hanging from one ear or hanging around neck, after each use, please take highest care and properly dispose the masks after use

COVID-19: Removal of Personal Protective Equipment (PPE)

1

Gloves –
the outsides of
the gloves are
contaminated



Clean hands
with alcohol gel

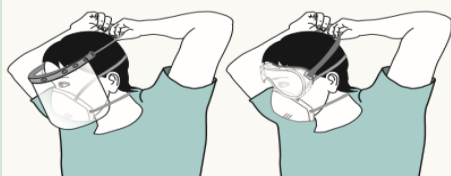
2

Gown –
the front of the
gown and
sleeves will be
contaminated



3

Eye protection -
the outside will be
contaminated



4

Respirator

Clean hands with
alcohol hand rub. Do
not touch the front of
the respirator as it will
be contaminated



5

**Wash
hands with
soap and
water**



The order for PPE removal is *(Please note multiple time hand hygiene required to reduce risk of contamination)*

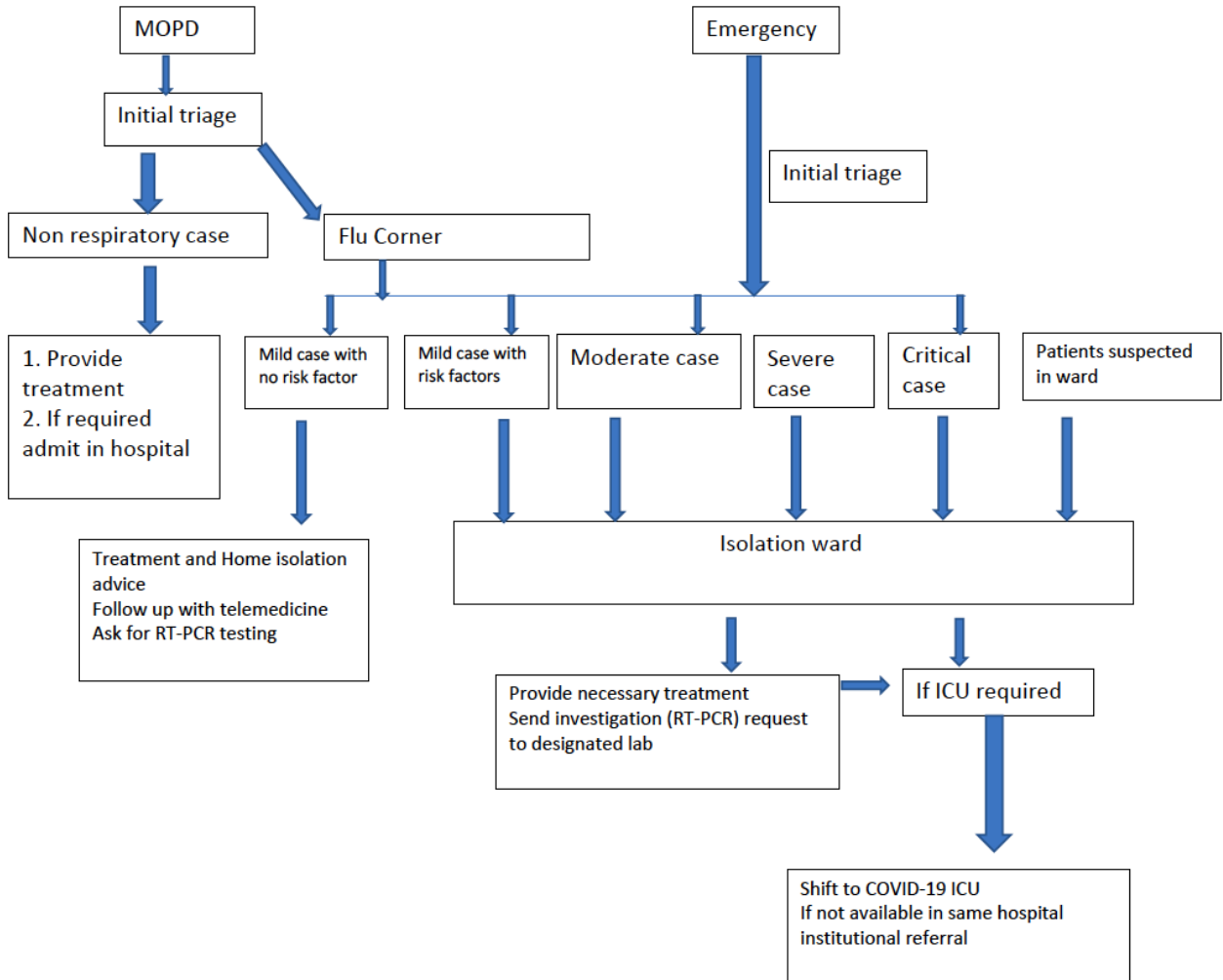
1. gloves 2. hand hygiene 3. apron or gown 4. eye protection 5. hand hygiene
6. surgical face mask or FFP3 respirator 7. hand hygiene

Remember –

1. Remove the mask using the appropriate technique: After putting on, never touch the front of the mask, untie it from behind. Do not touch the front of the gown or gloves as they are contaminated with viruses. If by any chance, after removal or whenever inadvertently touched, clean hands using an alcohol-based hand rub or soap and water if hands are visibly dirty – please wash hands properly with soap. Do not touch face, mouth, nose or eyes.
2. Replace masks as soon as they become damp with a new clean, dry mask. • Do not re-use single-use masks. • Discard single-use masks after each use and dispose of them immediately upon removal.

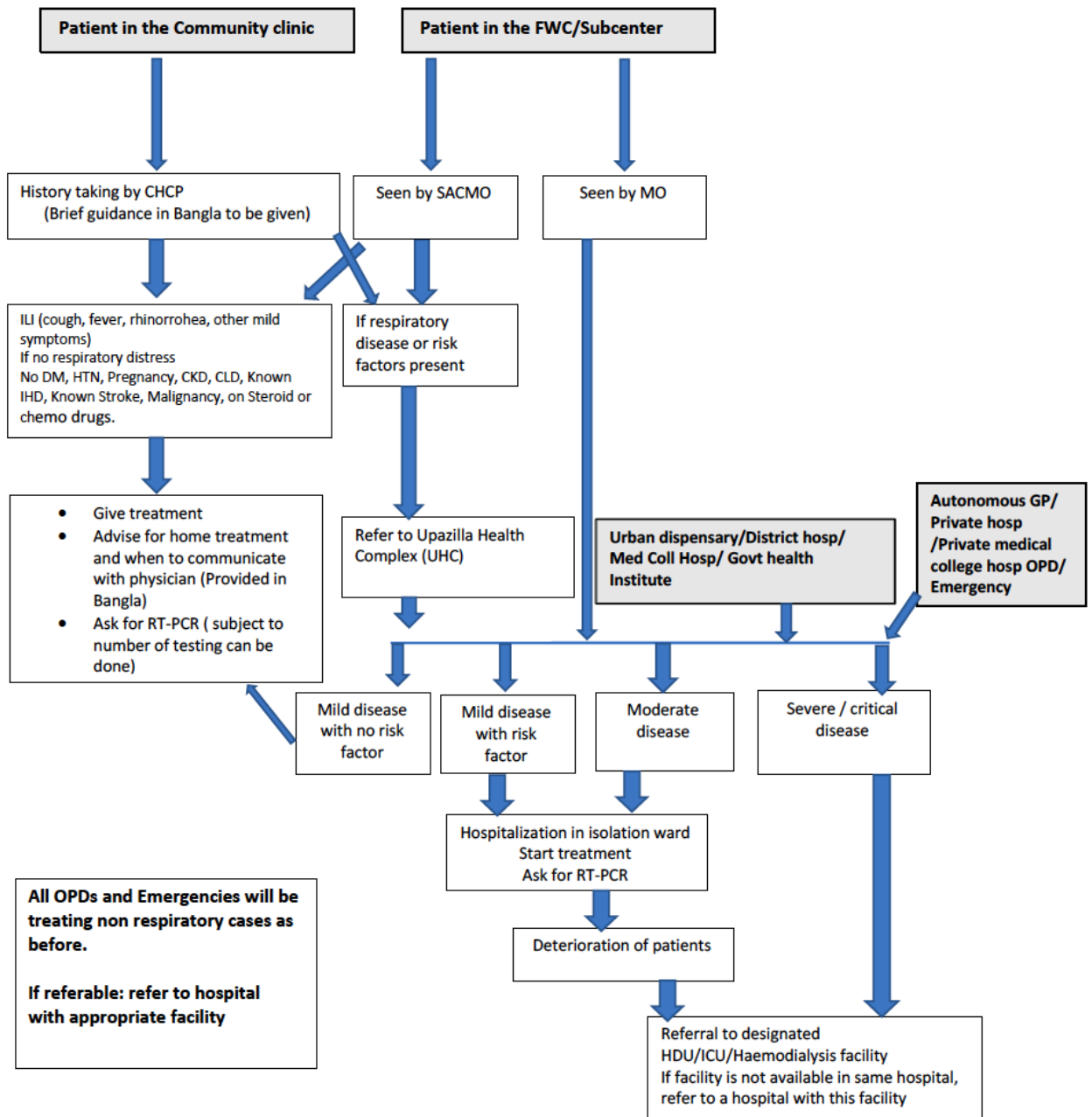
Annex 7: Patient flow chart for non COVID-19 hospital

Patient flow chart for non COVID-19 Hospital



Annex 8: Patient flow chart at national level

Patient flow chart at national level



Annex – 9:



COVID-19 CRF



Case No.:..... Date of Entry:...../...../2020

Patient code number/Hospital registration number:.....

Name (name will not be used in public domain):.....

Age (years or month): |__| |__| Y/M Sex: Male / Female

Address: Division:....., District:....., Upazaila:.....

Union:....., Ward no:....., Road no:, House no:

National ID if known:.....

Occupation:, Contact No:.....

Date of symptom onset:...../...../2020; Date of sample collection:,/...../2020

Date of admission (Only for admitted patient):...../...../2020

Any contact of COVID-19 patient in last 14 days: Yes / No

Any history of travelling or residing in an area reporting COVID-19: Yes / No

Family members affected: Yes/ No; If Yes number:.....

Diagnosis (clinical syndrome) (see NGL for definition): Asymptomatic / Mild / Moderate / Severe / Critical

1. General Symptoms: (Please Tick all symptoms present in the patient)

Fever / Cough / Dyspnoea / Altered sense of smell / Altered sense of taste / Fatigue / Sore throat/ Diarrhoea/ Vomiting / Anorexia / Headache / Confusion / Nasal congestion / Conjunctivitis / Dizziness/ Chest pain / Others (Mention):

2. Signs (Tick): (Please Tick all symptoms present in the patient) Cyanosis/ Crackles / Wheeze /Bronchial breath sound on auscultation SpO2: %; GCS:...../15

3. Vital signs during admission:

Temp (axillary):..... °F, Heart rate:..... /min, BP:..... /..... mmHg; Resp rate:..... /min

4. RT-PCR test: Positive /Negative

Date of sample collection:...../...../2020; Date of result:...../...../2020

5. Lab investigations:

Hb%:....., TC-WBC:....., Neu:.....%, Lymph:.....%, Platelet:....., RBS:....., ALT:....., AST:....., CRP titre:, D-dimer:, Procalcitonin:, Serum creatinine:, HbA1C:, Serum electrolyte: Na⁺:....., K⁺:....., Cl⁻:....., HCO₃⁻:.....
ABG:pH:, HCO3:,CO2:,Alkalosis/Acidosis Tropini n.....

6. Imaging: CXR P/A view (Pneumonitis): Yes / No ECG:.....

CT Chest: Yes / No, Report:.....

7. Risk factors of co-morbidities (PI Tick): DM/ HTN/ Bronchial asthma/ Chronic heart disease/ CVD/ COPD/CKD/CLD/ Smoking/ Obesity/ Chemotherapy Surgery/ HIV/TB/Malnutrition/Dengue/.....

8. Treatment (PI Tick): Oxygen therapy/ IV Fluid/ BI Pressure support required/ Mechanical Ventilation required/ Dialysis required/ Steroid

O2 therapy duration:hrs/days; Mechanical Vent duration: hrs/days

Drug: Azithromycin / HCQ/.....

9. For mild / moderate cases (If not admitted): Home isolation: Yes / No, Institutional isolation: Yes / No;

Date of end of isolation:...../...../2020

10. Repeat PCR: Yes / No

1 st Date:...../...../2020	Result:
2 nd Date:...../...../2020	Result:

11. Date of discharge:...../...../2020;

12. Date of end of isolation:...../...../2020

13. Outcome: Recovered / Referred to higher center / Left by own / Death

14. Contact tracing (to be done by the local health authority): Informed: Yes/ No

.....
Signature of the concerned physician

Annex 10: further reading on ICU management

This recommendation is standard recommendation for survival sepsis campaign for COVID 19 in ICU setting. There is variable grade of recommendation from strong to weak and adjustment is advised through risk benefit in working team of ICU of COVID 19 hospitals in Bangladesh

Haemodynamic

1. In adults with COVID-19 and shock, use dynamic parameters skin temperature, capillary refilling time, and/or serum lactate measurement over static parameters in order to assess fluid responsiveness.
2. For the acute resuscitation of adults with COVID-19 and shock, use a conservative over a liberal fluid strategy.
3. For the acute resuscitation of adults with COVID-19 and shock,
 - i. use crystalloids over colloids.
 - ii. use buffered/balanced crystalloids over unbalanced crystalloids.
 - iii. avoid using hydroxyethyl starches.
 - iv. avoid using gelatins.
 - v. avoid using dextrans.
 - vi. avoid the routine use of albumin for initial resuscitation.
4. For adults with COVID-19 and shock,
 - i. use norepinephrine as the first-line vasoactive agent, over other agents.
 - ii. If norepinephrine is not available, use either vasopressin or epinephrine as the first-line vasoactive agent, over other vasoactive agents, for adults with COVID-19 and shock.
 - iii. avoid using dopamine if norepinephrine is available.
 - iv. add vasopressin as a second-line agent, over titrating norepinephrine dose, if target mean arterial pressure (MAP) cannot be achieved by norepinephrine alone.
 - v. titrate vasoactive agents to target a MAP of 60-65 mmHg, rather than higher MAP targets.
5. For adults with COVID-19 and shock with evidence of cardiac dysfunction and persistent hypoperfusion despite fluid resuscitation and norepinephrine, add dobutamine, over increasing norepinephrine dose.
6. For adults with COVID-19 and refractory shock (when patient do not respond to fluid and inotrope therapy), use low-dose corticosteroid therapy (“shock-reversal”).

Remark: A typical corticosteroid regimen in septic shock is intravenous hydrocortisone 200 mg per day administered either as an infusion or intermittent doses.

Ventilation

1. In adults with COVID-19, start supplemental oxygen if the peripheral oxygen saturation (SPO₂) is < 94%
2. In adults with COVID-19 and acute hypoxemic respiratory failure on oxygen, SPO₂ be maintained no higher than 96%.
3. For adults with COVID-19 and acute hypoxemic respiratory failure despite conventional oxygen therapy, use HFNC over conventional oxygen therapy.
4. In adults with COVID-19 and acute hypoxemic respiratory failure, use HFNC (high flow nasal canula) over NIPPV (non-invasive positive pressure ventilation)..
5. In adults with COVID-19 and acute hypoxemic respiratory failure, if HFNC is not available and there is no urgent indication for endotracheal intubation, a trial of NIPPV with close monitoring and short-interval assessment for worsening of respiratory failure.
6. The use of helmet NIPPV compared with mask NIPPV is an option but there is lack of evidence.
7. In adults with COVID-19 receiving NIPPV or HFNC, close monitoring for worsening of respiratory status is crucial, and early intubation in a controlled setting if worsening occurs.
8. In mechanically ventilated adults with COVID-19 and ARDS, use low tidal volume (V_t) ventilation (V_t 4-8 mL/kg of predicted body weight), over higher tidal volumes (V_t>8 mL/kg).
9. For mechanically ventilated adults with COVID-19 and ARDS, target plateau pressures (P_{plat}) of < 30 cm H₂O.
10. For mechanically ventilated adults with COVID-19 and moderate to severe ARDS, we suggest using a higher PEEP strategy, over a lower PEEP strategy.

Remarks: If using a higher PEEP strategy (i.e., PEEP > 10 cm H₂O), clinicians should monitor patients for barotrauma.

11. For mechanically ventilated adults with COVID-19 and ARDS, use a conservative fluid strategy over a liberal fluid strategy.
12. For mechanically ventilated adults with COVID-19 and moderate to severe ARDS, we suggest prone ventilation for 12 to 16 hours, over no prone ventilation.
13. For mechanically ventilated adults with COVID-19 and moderate to severe ARDS: use, as needed, intermittent boluses of neuromuscular blocking agents (NMBA), over continuous NMBA infusion, to facilitate protective lung ventilation.
14. In the event of persistent ventilator desynchrony, the need for ongoing deep sedation, prone ventilation, or persistently high plateau pressures, use a continuous NMBA infusion for up to 48 hours.
15. In mechanically ventilated adults with COVID-19 ARDS, avoid the routine use of inhaled nitric oxide.

16. In mechanically ventilated adults with COVID-19, severe ARDS and hypoxemia despite optimizing ventilation and other rescue strategies, start a trial of inhaled pulmonary vasodilator as a rescue therapy; if no rapid improvement in oxygenation is observed, the treatment should be tapered off.
17. For mechanically ventilated adults with COVID-19 and hypoxemia despite optimizing ventilation, use recruitment manoeuvres, over not using recruitment manoeuvres.
18. If recruitment manoeuvres are used, we recommend against using staircase (incremental PEEP) recruitment manoeuvres.
19. In mechanically ventilated adults with COVID-19 and refractory hypoxemia despite optimizing ventilation, use of rescue therapies, and proning, use venovenous (VV) ECMO if available, or referring the patient to an ECMO center.

Remark: Due to the resource-intensive nature of ECMO, and the need for experienced centers and healthcare workers, and infrastructure, ECMO should only be considered in carefully selected patients with COVID-19 and severe ARDS.

Therapy

1. In mechanically ventilated adults with COVID-19 and respiratory failure (without ARDS), avoid the routine use of systemic corticosteroids.
2. In mechanically ventilated adults with COVID-19 and ARDS, use systemic corticosteroids.
3. In mechanically ventilated patients with COVID-19 and respiratory failure, use empiric antimicrobials/antibacterial agents.

Remark: if the treating team initiates empiric antimicrobials, they should assess for deescalation daily, and re-evaluate the duration of therapy and spectrum of coverage based on the microbiology results and the patient's clinical status.

4. For critically ill adults with COVID-19 who develop fever, use acetaminophen/paracetamol for temperature control, over no treatment.
5. In critically ill adults with COVID-19, avoid the routine use of standard intravenous immunoglobulins (IVIG), avoid the routine use of convalescent plasma and avoid the routine use of lopinavir/ritonavir.
6. There is insufficient evidence to issue a recommendation on the use of recombinant rIFNs, alone or in combination with antivirals, in critically ill adults with COVID-19.
7. There is insufficient evidence to issue a recommendation on the use of tocilizumab in critically ill adults with COVID-19.

Infection Control and Testing

1. For healthcare workers performing aerosol-generating procedures on patients with COVID-19 in the ICU, use fitted respirator masks (N95 respirators, FFP2, or equivalent), as opposed to surgical/medical

masks, in addition to other personal protective equipment (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles)

2. Perform aerosol-generating procedures on ICU patients with COVID-19 in a negative pressure room.
3. For healthcare workers providing usual care for non-ventilated COVID-19 patients, use surgical/medical masks, as opposed to respirator masks, in addition to other personal protective equipment (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles)
4. For healthcare workers who are performing non-aerosol-generating procedures on mechanically ventilated (closed circuit) patients with COVID-19, use surgical/medical masks, as opposed to respirator masks, in addition to other personal protective equipment (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles).
5. For healthcare workers performing endotracheal intubation on patients with COVID-19, use video-guided laryngoscopy, over direct laryngoscopy, if available.
6. For COVID-19 patients requiring endotracheal intubation, perform endotracheal intubation by the healthcare worker who is most experienced with airway management in order to minimize the number of attempts and risk of transmission.
- 7.1 For intubated and mechanically ventilated adults with suspicion of COVID-19: For diagnostic testing, obtain lower respiratory tract samples in preference to upper respiratory tract (nasopharyngeal or oropharyngeal) samples.
- 7.2 For intubated and mechanically ventilated adults with suspicion of COVID-19: With regard to lower respiratory samples, obtain endotracheal aspirates in preference to bronchial wash or bronchoalveolar lavage samples.

Annex 11: PATIENT REFERRAL FORM

PATIENT REFERRAL FORM

Name of the patient:

Age:

Sex:

Address:

Date and time of admission:

Date and time of referral:

Referred from:

Referred to:

Respiratory distress yes/no

Oliguria yes/no

Jaundice yes/no

Unconscious/Confusion yes/.no

Pregnant yes/no

What drug has been given: HCQ/ Chlorquine/ Azithromycin/ Anticoagulant

Number of doses of each drug received?

Time of last dose of each drug received?

Intake and output in previous 24 hours (Records to be attached):

RT-PCR test: Positive/ Negative/ Report pending/ Not done

Date of sample collection:/...../.....

Reason for referral:

Signature and name of doctor

Annex 12: 'CARING FOR CRITICALLY ILL COVID- 19 PATIENT: QUICK GUIDE FOR ICU CARE'

DGHS website have a guideline named 'CARING FOR CRITICALLY ILL COVID- 19 PATIENT: QUICK GUIDE FOR ICU CARE' which can be followed for detailed management strategies. The link to this document-

https://dghs.gov.bd/images/docs/Notice/27_04_2020_Annex%20Critically%20ill%20COVID19%20management.pdf