

MANAGEMENT PROTOCOL FOR COVID-19

Government of West Bengal

Department of Health and Family Welfare

INDEX

Topics	Page No.
General Principles	2
Case Definition	6
Triage	8
Management of Mild Cases	9
Management of Moderate / Severe Cases	13
Salient Points in Management	15
Management in Critical Care Unit	18
COVID-19 and Pregnancy	26
Key Points	27
Top Sheet for Management of COVID-19	28

GENERAL PRINCIPLES

GENERAL PRINCIPLE FOR OUTDOOR SETTINGS IN ALL HOSPITALS

1. Screening of patients with fever and respiratory tract symptoms in dedicated fever clinics
2. All patients attending fever clinic must wear a face mask, or may be provided with a mask
3. Maintain more than one-meter distance from patient
4. Use appropriate PPE while seeing patients
5. Avoid face-to-face sitting with the patients

GENERAL PRINCIPLE FOR INDOOR SETTINGS IN COVID HOSPITALS

1. All patients Must Always wear a 3-layer surgical mask after admission
2. No family member will be allowed in patient areas to meet the patient
3. Patient will not be allowed to carry any phone/mobile inside the ward along with him/her
4. A designated help line will communicate patient relatives about the patient's condition
5. Separate lifts should be used to transport the patients
6. Patients should be placed in single rooms. If single rooms are not available, patients should be placed sufficiently apart. Distance between two beds should be more than one meter preferably 2 meters.
7. All the paper works, e.g. writing notes in BHT or Treatment Cards should be done in a separate area.
8. Avoid moving and transporting patients out of their room unless medically necessary
9. Clean Environmental surfaces with detergents and 1% Sodium Hypochlorite solution
10. Manage Laundry, Food Service, Utensils and Medical Waste with safe routine procedures

PROTECTIVE GEARS FOR THE HEALTH CARE WORKERS (HCWs)

1. **Health Care Workers (HCWs) should refrain from touching own Mouth, Nose or Eyes with potentially contaminated gloved or bare hands, and touching the surfaces**
2. **HCWs to Practise Hand Hygiene**
 - Before touching a patient
 - Before any clean or aseptic procedure is performed
 - After exposure to body fluid
 - After touching a patient, and after touching the patient's surroundings

- Alcohol-based hand rub (ABHR) preferred if hands are not visibly soiled, Soap and water preferred when they are visibly soiled
- After examining each patient, they must wash their hands (with gloves on) with soap water or ABHR sanitisers

3. Full Set of PPE (Personal Protective Equipment) includes

- N-95 mask
- Eye protection (Goggles) or facial protection (face shield)
- Clean, non-sterile, coverall, long sleeved gown
- Head Cover
- Gloves
- Shoe Cover

4. Donning and doffing of PPEs to be done in separate areas with separate entry and exit





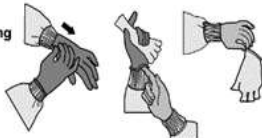




5. **Identify donning and doffing areas in each floor with hand washing facilities**

6. **Advisory of Level of PPE in accordance with the level of Risk**

Area	HCW Category	Risk Level	Recommended PPE	Comment
• Triage Area in OPD • Doctors Chamber at OPD	• Doctor • Sister • Sanitary Staff	Moderate	N-95 Mask and Gloves	Aerosol Generating Procedure Not Allowed
• OPD	• Patient • Patient Party	Low	Triple Layer Medical Mask	Should Practice Hand Hygiene
• Emergency Depart Attending Non-SARI	• Doctor • Sister	Moderate	N-95 Mask and Gloves	Do
• Emergency Depart Attending SARI Pts.	• Doctor • Sister	High	Full Set of PPE	Aerosol Generating Procedure, only if absolutely needed
• Isolation Ward • COVID Ward	• Doctor • Sister	High	Full Set of PPE	Do
• Critical Care Unit	• Doctor • Sister • Technician	High	Full Set of PPE	Do
• Lift Service	• Liftman	Moderate	N-95 Mask and Gloves	Operating Lifts that Carry Patients

Area	HCW Category	Risk Level	Recommended PPE	Comment
• Laboratory	• Doctor • Technician	High	Full Set of PPE	Sample Collection & Transport & Testing
• Sanitation	• Sanitary Staff	Moderate	N-95 Mask and Gloves	Cleaning Surfaces, Floor and Changing Linen
• Mortuary • ICU	• Dead Body Handling Staff	Moderate	N-95 Mask and Gloves	Dead Body Handling
• Administration • Maintenance PWD	• Administrator • Accountant • Engineering	No Risk	No PPE	Administrative office Maintenance

CORRECT SEQUENCE OF DONNING AND DOFFING OF PPE

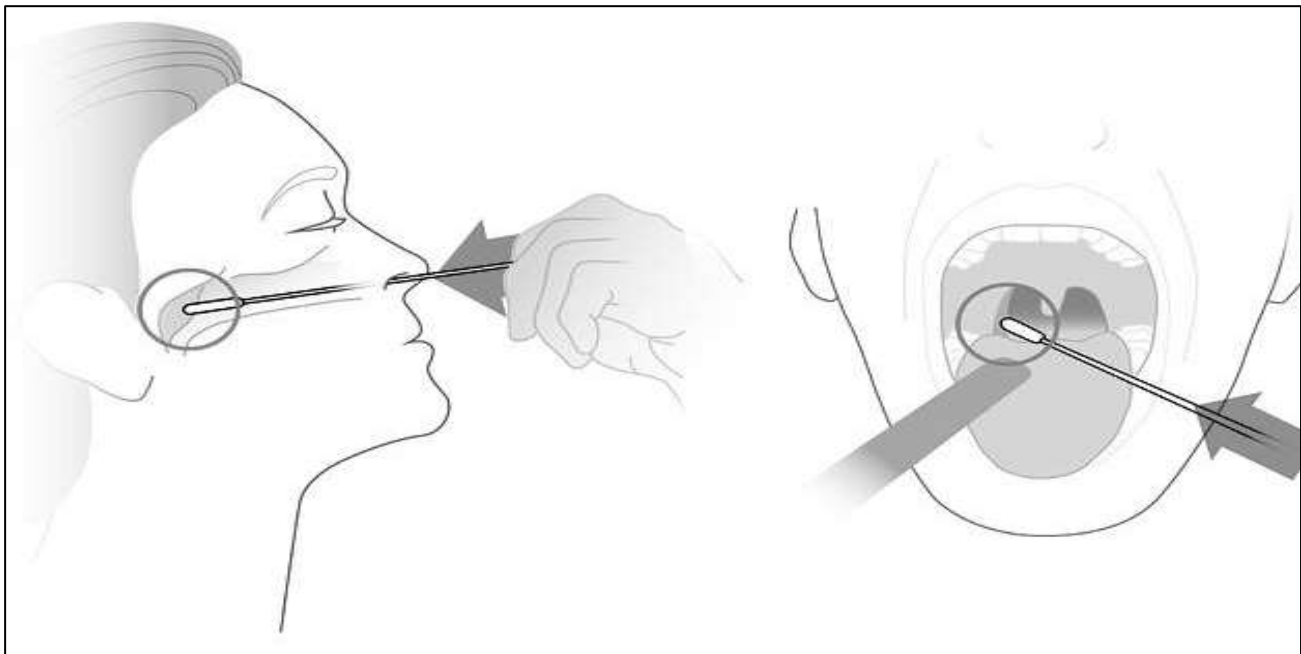
CORRECT SEQUENCE FOR DONNING PERSONAL PROTECTIVE EQUIPMENT (PPE)	CORRECT SEQUENCE FOR REMOVING PERSONAL PROTECTIVE EQUIPMENT (PPE)
<p>The type of PPE used will vary based on the level of precautions required; e.g., Standard and Contact, Droplet or Airborne Infection Isolation.</p> <p style="text-align: center; border: 1px solid black; padding: 2px;">Remove hand jewellery and tie back hair.</p> <p style="text-align: center; border: 1px solid black; padding: 2px;">Clean and dry hands thoroughly.</p> <p>1. GOWN / APRON</p> <p>Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back</p> <p>Fasten in back of neck and waist</p>  <p>2. MASK OR RESPIRATOR</p> <p>Secure ties or elastic bands at middle of head and neck</p> <p>Fit flexible band to nose bridge</p> <p>Fit snug to face and below chin</p> <p>Fit-check respirator</p>  <p>3. GOGGLES OR FACE SHIELD</p> <p>If you wear glasses put them on.</p> <p>Place goggles or face shield over face and eyes and adjust to fit</p>  <p>4. GLOVES</p> <p>Extend to cover wrist</p> 	<p>1. GLOVES</p> <p style="border: 1px solid black; padding: 2px;">Outside of gloves are contaminated—DO NOT TOUCH!</p> <p>Grasp outside of glove with opposite gloved hand; peel off</p> <p>Hold removed glove in gloved hand</p> <p>Slide fingers of ungloved hand under remaining glove at wrist</p> <p>Peel glove off over first glove</p> <p>Discard gloves in waste container</p> <p>Clean and dry your hands thoroughly</p>  <p>2. GOGGLES OR FACE SHIELD</p> <p style="border: 1px solid black; padding: 2px;">Outside of goggles or face shield are contaminated—DO NOT TOUCH!</p> <p>To remove, handle by head band or ear pieces</p> <p>Place in designated receptacle for reprocessing or in waste container</p> <p>Clean and dry your hands thoroughly</p>  <p>3. GOWN / APRON</p> <p style="border: 1px solid black; padding: 2px;">Gown front and sleeves are contaminated—DO NOT TOUCH!</p> <p>Unfasten ties</p> <p>Pull away from neck and shoulders, touching inside of gown only</p> <p>Turn gown inside out</p> <p>Fold or roll into a bundle and discard</p> <p>Clean and dry your hands thoroughly</p>  <p>4. MASK OR RESPIRATOR</p> <p style="border: 1px solid black; padding: 2px;">Front of mask/respirator is contaminated—DO NOT TOUCH!</p> <p>Grasp bottom, then top ties or elastics and remove</p> <p>Discard in waste container</p> <p>Clean and dry your hands thoroughly</p> 
 <p>Capital & Coast District Health Board ΟΡΓΑΝΟ ΚΕ ΤΕ ΥΠΟΥΡΓΕΙΟΥ Infection control January 2005. Developed using CDC Guidelines 2005</p>	

METHODS FOR SPECIMEN COLLECTION AND TRANSPORT

SPECIMEN COLLECTOR MUST WEAR FULL PPE

1. Specimens Collection

- **Nasopharyngeal Swab:** Insert flexible wire shaft minitip swab through the nares parallel to the palate (not upwards) until resistance is encountered indicating contact with the nasopharynx.
 - Swab should reach the depth equal to distance from nostrils to outer opening of the ear.
 - Gently rub and roll the swab.
 - Leave swab in place for several seconds to absorb secretions.
 - Slowly remove swab while rotating it.
- **Oropharyngeal Swab (Throat Swab):** Insert swab into the
 - Posterior pharynx and tonsillar areas.
 - Rub swab over both tonsillar pillars and posterior oropharynx
 - Avoid touching the tongue, teeth, and gums.



2. Storage

- Place swabs immediately into sterile tubes containing 2-3 mL of Viral Transport Media.
- Store specimens at 2 - 8°C for up to 72 hours after collection.

3. Transport

- Send the sample specimen in Viral Transport Media to Testing Centre immediately
- If delayed, store specimens at 2-8°C, and transport overnight on ice pack.

CASE DEFINITIONS

CASE DEFINITION OF CONFIRMED CASE

- A person with laboratory confirmed infection of COVID-19, by RT PCR irrespective of clinical signs and symptoms

CASE DEFINITION OF SUSPECT

- Patient with Fever + Acute Respiratory Illness e.g. Cough / Sore Throat / Respiratory Distress AND a history of travel in last 14 days to an area or territory, or a history of residence in an area or territory, which is reporting local transmission of COVID-19
- Patient with Acute Respiratory Illness who came in Contact with a Confirmed case within last 14 days
- Symptomatic Health Care Worker without any contact history with a Confirmed case
- Asymptomatic Health Care Worker or an asymptomatic close family member who came in Contact with a Confirmed case within last 14 days
- All Patients with Severe Acute Respiratory Illness (SARI)
- A case in whom the COVID-19 test report is inconclusive

CASE DEFINITION OF MILD DISEASE

FEVER $\geq 100^{\circ}$ F with Cough, Sore Throat, Malaise, Myalgia, without Shortness of Breath

CASE DEFINITION OF MODERATE DISEASE

FEVER $\geq 100^{\circ}$ F with or without Respiratory Symptoms - Cough, Sore Throat, Myalgia, Difficulty in Breathing

PLUS, ANY ONE of the following:

1. Respiratory Rate $> 24/\text{min}$,
2. $\text{SpO}_2 < 94\%$ in room air
3. Altered Sensorium - Drowsiness / Confusion / Stupor
4. Infiltrates on Chest X-ray.
5. Altered Liver Function Test or Renal Function Test

CASE DEFINITION OF SEVERE DISEASE

Case with **Moderate Disease Plus ARDS / Acute Respiratory Failure** and/or, **Sepsis with Multi-Organ Dysfunction Syndrome** and/or, **Septic Shock**

ARDS

Adults	Children
<ul style="list-style-type: none"> • Mild ARDS: PaO₂/FiO₂ >200 - ≤ 300 mmHg (with PEEP or CPAP ≥5 cm H₂O, or non-ventilated) • Moderate ARDS: PaO₂/FiO₂ >100 - ≤ 200 mmHg (with PEEP ≥5 cm H₂O, or non-ventilated) • Severe ARDS: PaO₂/FiO₂ ≤ 100 mmHg (with PEEP ≥5 cm H₂O, or non-ventilated) • When PaO₂ is not available, SpO₂/FiO₂ ≤ 315 mmHg suggests ARDS (including in non-ventilated patients) 	<ul style="list-style-type: none"> • Bi-PAP or CPAP ≥5 cm H₂O via full face mask: PaO₂/FiO₂ ≤ 300 or SpO₂/FiO₂ ≤ 264 • Mild ARDS (invasively ventilated): OI ≥ 4 - < 8 or, OSI ≥ 5 - < 7.5 • Moderate ARDS (invasively ventilated): OI ≥ 8 - < 16 or, OSI ≥ 7.5 - < 12.3 • Severe ARDS (invasively ventilated): OI ≥ 16 or, OSI ≥ 12.3
	OI = Oxygenation Index and OSI = Oxygenation Index using SpO ₂

SEPSIS : SOFA Score ≥ 2

Sepsis	SOFA (Total Score 0 – 24)
Life threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection	1. PaO ₂ -FiO ₂ Ratio (Score 0 – 4)
	2. Platelet Count (Score 0 – 4)
	3. Bilirubin (Score 0 – 4)
	4. Glasgow Coma Scale (Score 0 – 4)
	5. MAP & Vasopressor Requirement (Score 0 – 4)
	6. Creatinine and / or Urine Output (Score 0 – 4)
	Sepsis = SOFA ≥ 2 (Baseline score to be assumed as Zero if data not available)

SEPTIC SHOCK

Adults	Children
Persisting hypotension despite volume resuscitation, requiring vasopressors to maintain MAP ≥65 mmHg and serum lactate level > 2 mmol/L	Any Hypotension (SBP 2 SD below normal for age) Or, Any Two of the following :- <ol style="list-style-type: none"> 1. Altered mental state 2. Bradycardia or tachycardia (HR 160 bpm in infants and HR 150 bpm in children) 3. Prolonged capillary refill (>2 sec) or warm vasodilation with bounding pulses 4. Tachypnea 5. Mottled skin or petechial or purpuric rash 6. increased lactate 7. Oliguria 8. Hyperthermia or hypothermia.

TRIAGE

Cases	COVID Hospital Levels
Suspected Mild Case	Level 1
Suspected Moderate / Severe Case (SARI)	Level 2
Test Confirmed Mild Case	Level 3
Test Confirmed Moderate / Severe Case AND Test Confirmed Mild Case with High Risk*	Level 4

* [Patients with Age > 60 years; Chronic Lung Diseases; Chronic Liver Disease; Chronic Kidney Disease; Hypertension; Cardiovascular Disease; Cerebrovascular Disease; Diabetes; HIV; Cancers; on Immunosuppressive drugs.]

A. According to severity Level 1 and Level 2 COVID Hospitals are for COVID Suspects

B. According to severity Level 3 and Level 4 COVID Hospitals are for COVID Cases

N.B.

Not-yet-Tested Suspects and Positive Cases Must Not Be Kept in the Same COVID Hospital

Patient will be Transferred to Appropriate Level according to the Report and the Severity

MANAGEMENT OF MILD CASES

FOLLOWING PARAMETERS SHOULD BE OBSERVED BY DOCTOR / SISTER DURING DAILY ROUNDS AND RECORDED THRICE A DAY / ON WORSENING OF SYMPTOMS

1. Temperature
2. Pulse
3. Respiratory Rate
4. Blood Pressure
5. Urine Output
6. SpO₂
7. Sensorium (conscious, drowsy or stupor)
8. Chest Examination - Breath sound, crepitations and rhonchi

First Seven Features May Be Checked By The On Duty Sister.

INVESTIGATIONS FOR MILD CASES

1. **Complete Hemogram**- common abnormalities are Leukopenia with Lymphocytopenia (On Admission and Daily)
2. **X-Ray Chest PA view** (On admission / every 3rd day/ at worsening of symptoms)

Common X-Ray Chest findings

- Bilateral / Unilateral / Patchy infiltrates
- Ground Glass opacities
- Interstitial Changes



Chest X-ray showing bilateral lung opacities

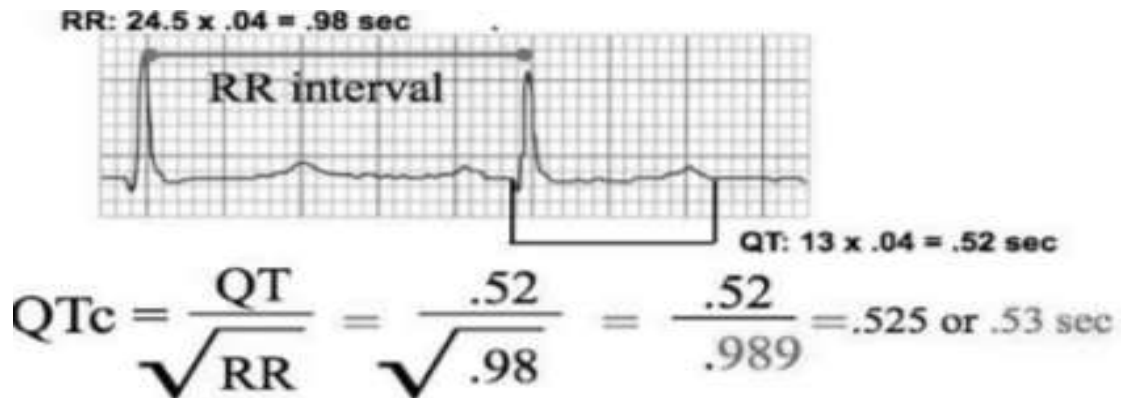


Chest X-ray showing extensive bilateral ground-glass opacities



Chest X-ray showing bilateral, symmetrical peripheral consolidation with perihilar infiltrates

- LFT** - Raised Transaminases, Hyperbilirubinemia (Send on Admission / day 4 / day 7 / on Worsening)
- Serum Creatinine** - May be raised (Send on Admission / day 4 / day 7 / on Worsening)
- ECG** - To look for ST-T changes suggestive of Myocarditis changes and to look for QTc prolongation. If the QTc is prolonged >450 mSecs, Hydroxychloroquine is to be administered cautiously, and to be avoided if it is >500mSecs. (To be done on Admission / on Worsening of symptoms)



- ABG** : (To be done 12 hourly / on Worsening of symptoms)
Calculate PaO₂/FiO₂ Ratio to find the level of ARDS as described above.

Pat. ID:	
Acc. No.:	
Sample No.:	5007
ACID/BASE 37.0°C	
pH	7.53
PCO2	1 57 mmHg
PO2	71 mmHg
BE	21.2 mmol/L
LCO2	48.2 mmol/L
HCO3	46.4 mmol/L
BB	66.6 mmol/L
BEact	21.9 mmol/L
BEecf	23.7 mmol/L
stHCO3	43.6 mmol/L
st.pH	7.661
ch+	29.7 nmol/L
ELECTROLYTES	
Na+	↓ 116 mmol/L
K+	↓ 1.5 mmol/L
Ca++	↓ 0.35 mmol/L
nCa++	0.37 mmol/L

PaO₂ in this ABG is 71 (as shown)

FiO₂ is 0.24, as the was getting Oxygen @ 24% by Nasal Cannula

PaO₂/FiO₂ Ratio in this ABG Report is 71/0.24 = 295.8

Suggestive of mild ARDS

- Nasopharyngeal and Oropharyngeal Swabs for COVID-19 RT-PCR every 2nd day or as necessary**

FEATURES FOR PROGRESSION FROM MILD DISEASE TO MODERATE DISEASE

1. Respiratory Rate >24/min
2. HR >100/min
3. SpO₂ < 94% at Room Air
4. Stupor, Drowsiness or Confusion
5. SBP <90 mmHg, DBP <60 mmHg
6. X-Ray Chest PA- showing Bilateral infiltrate / Unilateral infiltrate / Ground glass opacity
7. ST-T changes in ECG suggestive of Myocarditis
8. Exacerbation of Comorbid Conditions

POOR PROGNOSTIC SIGNS

1. Neutrophil : Lymphocyte Ratio ≥ 3.13
2. Development of Acute Kidney Injury
3. Raised Serum Ferritin
4. Raised Bilirubin or Liver Enzymes
5. Infiltrates & Ground Glass opacities in Chest X-Ray
6. Type 1 Respiratory Failure in ABG or PaO₂/FiO₂ ratio <300
7. Hypotension
8. Features of Myocarditis (Trop-T positive)
9. Elevated Lactate level (>2mmol/lit)
10. Elevated Procalcitonin

TREATMENT OF MILD CASES

Symptomatic Treatment

- Rest
- Paracetamol for FEVER
- Antitussive for COUGH
- ORS for DIARRHOEA
- Metered Dose Inhalers for MILD BREATHLESSNESS
- Plenty of Fluids
- Nutritious Diet

Specific Treatment for High Risk Cases

- Tab. **Hydroxychloroquine** 400mg BD on Day 1, followed by 400 mg OD for 4 Days.

HIGH RISK GROUP : Patients with

- Age > 60 years
- Chronic Lung Diseases
- Chronic Liver Disease
- Chronic Kidney Disease
- Hypertension
- Cardiovascular Disease
- Cerebrovascular Disease
- Diabetes
- HIV
- Cancers
- On Immunosuppressive drugs

WHEN TO REFER TO HIGHER FACILITY

Any patient developing **ANY ONE** of the following:

1. SpO₂ < 94% at Room Air
2. Confusion, Drowsiness
3. SBP <90 mmHg, DBP <60 mmHg
4. X-Ray Chest PA- showing Bilateral infiltrate / Unilateral infiltrate / Ground glass opacity
5. Deranged Liver or Kidney Function

WHEN TO DISCHARGE

1. Patient afebrile without Paracetamol
2. Asymptomatic. No respiratory symptoms
3. Vitals Stable
4. Other organ parameters normal/satisfactory
5. Chest X-ray PA view – Clear
6. Viral clearance in nasal-pharyngeal swabs after two tests become negative at 24 hours apart

FOLLOW UP

- All patients must follow strict Home Quarantine for 14 days after discharge
- Clinical Follow up at 14th day and 28th day

MANAGEMENT OF MODERATE / SEVERE CASES

SAME PARAMETERS LIKE IN MILD CASES SHOULD BE OBSERVED DURING DAILY ROUNDS BY DOCTOR / SISTER AND RECORDED AT LEAST THRICE A DAY OR ON WORSENING OF SYMPTOM

INVESTIGATIONS

All routine investigations for mild cases have to be sent.

Additional Investigations for Moderate / Severe Cases are as follows: -

1. Appropriate Cultures Blood / Urine (On Admission / on Worsening of symptoms)
2. For Diabetic patients - FBS, PPBS (as appropriate) [Laboratory/Glucometer]
3. Serum Ferritin
4. Trop-T / Quantitative Troponins (When Suggestive)
5. Procalcitonin (To rule out secondary infection) - May be normal or mildly elevated
6. LDH
7. PT / INR / APTT / D-Dimer / Fibrinogen / Platelets (To rule out DIC, on worsening of symptoms)
8. Nasopharyngeal Swab for H₁N₁ (To rule out Swine Flu)
9. CT Scan Chest (Non-contrast) - If Chest X ray inconclusive or negative and suspicion is high
10. USG Chest: Where expertise available, can be used, as it helps sparing CT scan for all

Primary Findings on CT

- Ground-glass Opacities (GGO): usually bilateral, subpleural, peripheral opacities.
- Crazy Paving Appearance (GGOs and inter-/intra-lobular septal thickening)
- Air Space Consolidation may be seen
- Broncho-vascular Thickening
- Traction Bronchiectasis may be present

Temporal CT Changes

Four stages on CT have been described

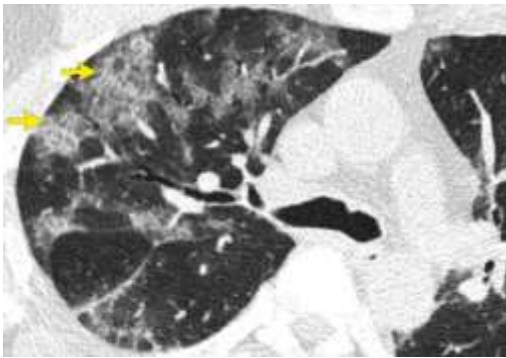
- Early / Initial Stage (0 - 4 days): Normal CT scan or GGO only
- Progressive Stage (5 - 8 days): Increased GGO and Crazy Paving Appearance
- Peak Stage (9 - 13 days): Consolidation
- Absorption Stage (>14 days): Abnormalities resolve at one month and beyond



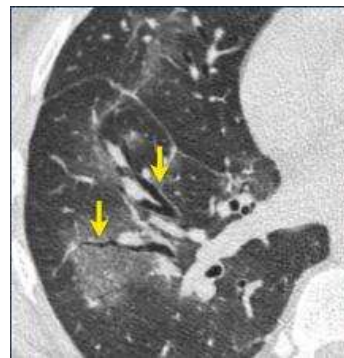
CT chest showing Bilateral Ground Glass Opacities (GGO) without Subpleural Sparing



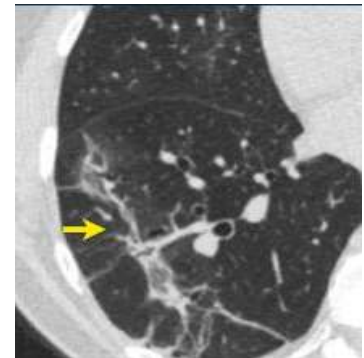
CT chest showing multifocal bilateral Ground-Glass Opacities with a posterior predominance.



CT chest showing thickened interlobular and intralobular lines with crazy paving appearance



CT chest showing bronchiectasis with a Ground Glass Opacities



CT chest showing subpleural bands and architectural distortion

INVESTIGATIONS TO PREDICT PROGRESSION

CBC

- Monitor lymphocyte count. Lymphopenia is a risk factor for progression to severe disease
- **Neutrophil Lymphocyte Ratio >3.13** is an independent risk factor for severe disease

CRP

- Elevated levels of CRP may be seen in moderate to severe disease.

Liver Function Test

- Raised Transaminases, Hyperbilirubinemia. Acute liver failure in severe cases

Renal Function Test

- Increased creatinine. Acute Kidney Injury in severe disease

LDH

- Elevated LDH levels seen in moderate to severe disease. Marker of Poor prognosis

Ferritin

- Markedly elevated Ferritin level predicts a poor outcome patients with COVID-19

D-Dimer

- D-dimer >1mcg/ml predicts poor prognosis at an early stage.
- Low Molecular Weight Heparin e.g. Enoxaparin 1mg/kg/day Subcutaneously may be considered in patients with very high D-dimer levels (> 6 times normal)

SALIENT POINTS IN MANAGEMENT

OXYGEN THERAPY

- Administer oxygen to all Severe Acute Respiratory Illness (SARI) patients and to patients with respiratory distress / hypoxemia / shock
- Start with nasal prongs @ 5L/min, or Simple Face Mask / Venturi Mask / Non-Rebreathing Mask @ 6-15L/min, as needed
- Titrate for target SpO₂ ≥ 94%
- Target SpO₂ after initial stabilization: 90-96%

INITIAL FLUID MANAGEMENT

- Conservative fluid strategy if no evidence of shock (0.9% saline / Ringer lactate)
- Cautious IV fluids
- Monitor for worsening of oxygenation during fluid therapy

SPECIFIC DRUG THERAPY FOR COVID-19

- **Tab. Hydroxychloroquine** 400mg BD on Day-1, followed by 400 mg OD on Day-2 to Day-5

Hydroxychloroquine is presently not recommended for children less than 12 years

Contraindications for Hydroxychloroquine:

1. QTc in ECG >500 mSec
2. Retinal Pathology
3. Drug Interactions
4. Myasthenia Gravis

5. Porphyria
6. Epilepsy

If initial QTc >450 mSec, perform basic biochemistry and ECG daily. Avoid Quinolones and Macrolides with Hydroxychloroquine, if possible. Monitor QTc closely if these are needed

IF THERE IS PROGRESSIVE WORSENING OF CONDITION, CONSIDER

- **Tocilizumab** (If IL-6 is more than 5 times of the Upper Limit of Normal)
- **Therapeutic Plasma Exchange**

EMPIRIC ANTIMICROBIALS

- To add antimicrobials to all patients as early as possible, preferably within the first hour
- Broad Spectrum 3rd generation Cephalosporine / Piperacillin Tazobactam / Carbapenem / with or without Aminoglycosides may be selected
- Azithromycin may be added to cover atypical organisms
- Choose drugs to cover all suspected bacteria and influenza (Oseltamivir when suspected)
- Try to send blood cultures before starting antimicrobials; do not delay antimicrobials waiting to send cultures
- De-escalate or stop based on microbiology results or clinical judgment or Procalcitonin

ANTICOAGULATION

- Routine pharmacologic venous thromboembolism (VTE) prophylaxis is warranted, preferably with Low Molecular Weight Heparin, unless there is a contraindication (e.g. bleeding, severe thrombocytopenia)
- Low Molecular Weight Heparin should be administered in presence of marked elevation of D-dimer (> 6 times normal), increased P-Time and/or increased APPT which suggest the presence of DIC.

GLUCOCORTICOIDS

- **Glucocorticoids** are not to be used routinely. For patients with progressive deterioration of oxygenation indicators, rapid worsening on imaging and excessive activation of body's inflammatory response, glucocorticoids can be used for a short period of time of 3 to 5 days. Dose not to exceed the equivalent of Methylprednisolone 1- 2mg/kg/day. Larger dose may delay the removal of coronavirus.

CONTINUATION OF CHRONIC MEDICATIONS

- ACE inhibitor /ARB: Should be continued, if there is no hypotension or any contraindication
- Statins: To be continued as same dose
- Insulin: To be continued as per blood sugar
- Immunomodulators: Decisions to be individualized for prednisolone, biologics and others

MONITORING

- Monitor vital signs, SpO₂ and/or PaO₂ at regular intervals (every 2 hourly or on worsening)
- Check whether tolerating oxygen therapy → Do not delay intubation if worsening
- If High Flow Nasal Cannula (HFNC) is available, can consider a short trial of HFNC in selected patients under close monitoring on worsening of oxygenation. Decrease flow, if possible, to restrict aerosol generation → Do not delay intubation if worsening
- If HFNC not available, can consider a short Non-invasive Positive Pressure Ventilation (NIPPV) trial in selected patients under close monitoring. (Be careful about leaks, as high flow of NIPPV increases aerosol generation. Full face mask / helmet interface preferred) → Do not delay intubation if worsening
- Airborne precautions must during HFNC / NIPPV / Endotracheal intubation
- MDI with spacer preferred to nebulizers, if possible
- CBC / LFT / RFT / portable Chest X-ray / ECG / Lactate / Procalcitonin (every day)
- ABG 6 hourly or more frequently if needed
- D dimer, LDH, Ferritin on admission and on alternate days
- Early detection of myocardial involvement by Troponins, NT-proBNP and Echocardiography
- Other investigations as decided by treating team

AEROSOL GENERATING PROCEDURES

- Intubation, Extubation, Use of T piece or any other open circuit
- HFNC, NIPPV, Bag Masking
- Open Suctioning
- Bronchoscopy, Tracheostomy
- CPR
- Nebulisation

ADDRESS COMORBIDITIES

- Tailor management according to comorbidities

MANAGEMENT IN CRITICAL CARE UNIT

CRITERIA OF CRITICAL CARE UNIT ADMISSION

1. Requiring Mechanical Ventilation
2. Hypotension Requiring Vasopressor Support
3. Worsening Mental Status
4. Multi-Organ Dysfunction Syndrome (MODS)

WHEN TO INTUBATE

1. Features of respiratory fatigue with increased work of breathing and worsening respiratory parameters indicating respiratory failure
2. Haemodynamic instability
3. Altered sensorium with a threatened airway

Although intubation decision should be individualized, keep a low threshold for intubation.

HOW TO INTUBATE

- Full complement of PPE with face shield
- Ensure scene safety & check readiness of all essential drugs & equipment prior to procedure
- Most experienced team member to intubate
- Complete airway assessment prior to procedure
- Hemodynamic evaluation & optimization, if needed, prior to procedure
- Use Heat and Moisture Exchanger (HME) filter + Bacterial-viral filter in every oxygenation interface (Face Mask, Circuit, Endotracheal Tube (ETT), Catheter Mount, Laryngeal Mask Airway (LMA))
- Use closed system suctioning
- Pre-oxygenation with 100% oxygen
- Rapid sequence intubation using induction agent (Propofol or Etomidate) and muscle relaxant (Succinylcholine or Rocuronium)
- Limit bag mask ventilation unless unavoidable
- Apply cricoid pressure only in case of ongoing regurgitation
- Use video laryngoscope with separate screen, if available
- In anticipated difficult airway, anaesthesiologist may be called to intubate
- In unanticipated difficult airway, use LMA and simultaneously call for expert help

- Clamp ETT during unavoidable disconnections
- Use end-tidal CO₂ and CXR to confirm correct position of ETT
- After intubation, appropriate cleaning and disinfection of equipment and environment is mandatory

COVID-19 AND ACUTE RESPIRATORY FAILURE : INVASIVE MECHANICAL VENTILATION

- **Initial Mode:** Volume Control (can use Pressure Control, if Tidal Volume goals are met)
- **Initial Settings**

- Tidal Volume (VT): 6ml/kg Predicted Body Weight (PBW)
- Rate: to match baseline Minute Ventilation (not > 35)

PBW= In Males: 50 + 2.3 (Height in inches – 60);

In Females: 45.5 + 2.3 (Height in inches – 60)

- **Tidal Volume Adjustment:**
 - Check Plateau Pressure (Pplat)
 - Plateau Pressure Goal ≤ 30 cm H₂O
 - If Pplat > 30: decrease VT by 1ml/kg steps to minimum 4ml / kg
 - If breath stacking (auto PEEP) or severe dyspnea occurs, may increase VT to 7-8 ml / kg, if Pplat remains ≤ 30

Set PEEP according to PEEP-FiO₂ tables to achieve Oxygenation Goal (PaO₂ 55 - 80 mmHg / preferably SpO₂ 90 - 96%)

Lower PEEP-Higher FiO₂ Combinations: (Start with minimum value for a given FiO₂)

FiO₂	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
PEEP	5	5-8	8-10	10	10-14	14	14-18	18-24

Higher PEEP- Lower FiO₂ Combinations:

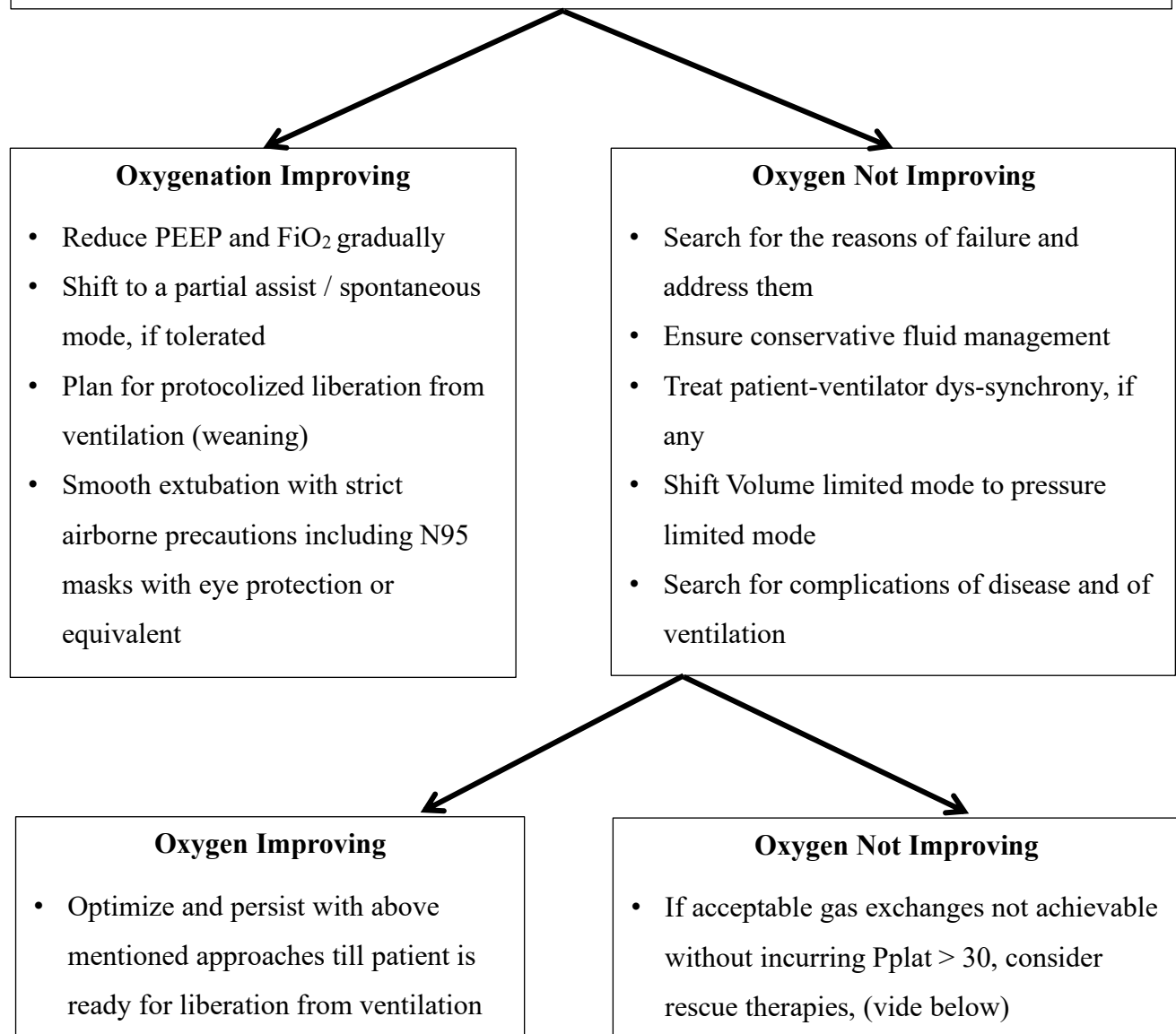
FiO₂	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5
PEEP	5	8	10	12	14	14	16	16	18
FiO₂	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.0	
PEEP	20	20	20	20	22	22	22	24	

STRATEGY

- Higher PEEP (> 10) in moderate to severe ARDS
- Lower PEEP (≤ 10) in mild ARDS and “Non-ARDS like” severe pneumonia
- Continue with higher PEEP, if PEEP responsive (Recruiters) and with lower PEEP, if PEEP non-responsive (Non-recruiters)

PEEP Responsive (Recruiters) : Keeping FiO_2 unchanged, *usually* oxygenation improves with increase in PEEP with minimal / no drop in mean arterial pressure, minimal / no rise in $PaCO_2$ and minimal / no rise in driving pressure)

- Try to keep $P_{plat} \leq 30$ and Driving Pressure ($P_{plat} - PEEP$) < 15
- **Conservative Fluid Management** in absence of tissue hypoperfusion. Avoid hypervolemia



RESCUE THERAPIES

Prone Ventilation

- Most preferred rescue therapy
- Consider in $\text{PaO}_2/\text{FiO}_2 < 150$ with a $\text{FiO}_2 \geq 0.6$ and $\text{PEEP} \geq 5$ or $\text{PaO}_2:\text{FiO}_2 \leq 100$ with a $\text{PaO}_2 \leq 60$ despite optimization of ventilator settings on FiO_2 of 1
- Consider early proning (within the first 36 hours)
- 12-16 hours / day
- Always check for contraindications and complications

Recruitment Maneuvers

- Consider in PEEP responsive patients
- Preferred method: Sustained high-pressure inflation (35-40 cm H₂O of CPAP for 40 seconds)
- Avoid staircase manoeuvres ((Incremental PEEP)
- Avoid routine use of recruitment manoeuvres

Neuromuscular Blockers

- Consider continuous infusion for up to 48 hrs in case of persistently high plateau pressures or severe dyssynchrony
- Can use intermittent boluses to facilitate lung protective ventilation, if needed

Pulmonary Vasodilators

- If available, a trial of inhaled prostacyclin or Nitric oxide may be considered, if other rescue strategies have failed

ECMO

- Consider veno-venous (VV) ECMO, if available, only in selected patients, with refractory hypoxemia despite optimizing ventilation, proning and using other rescue therapies
- Referral to ECMO Centre may be needed

Ventilator Precautions / Maintenance

- Fresh ventilator circuit for every new patient
- HME with Bacterial-Viral filter to be fitted in circuits
- Tubing and HME with Bacterial-Viral filters to change every 48 hours or when visibly soiled
- Use closed suction and avoid routine suctioning
- Avoid unnecessary disconnections. Clamp ET Tube for unavoidable disconnections
- Avoid nebulisations in intubated patients. Use inline MDI instead
- Use standby mode prior to disconnecting the ventilator from the patient to avoid mucus dispersion from the circuit

- Use an inspiratory bacterial and viral filter to assure non-contamination of the internal ventilator gas path
- Protect the expiratory valve with a hydrophobic bacterial filter
- Daily surface cleaning of ventilator during and after usage with disinfectant must.

REPRESENTATIVE STARTING VENTILATOR SETTINGS

	Volume Control	Pressure Control
Tidal Volume	4 - 8 ml / kg PBW	
Inspiratory Pressure		15 cmH ₂ O (Target VT: 4-8 ml/kg)
Rate	14 - 18	14-18 cm H ₂ O
Flow (L/min)	20 -30	
Flow Pattern	Decelerating	Decelerating (default)
Inspiratory Time (Ti)		1 - 1.5 secs
I : E Ratio		1 : 1.5 to 1:3
FiO₂	1 (decrease subsequently) Target SpO ₂ : preferably 90-96%	1 (decrease subsequently) Target SpO ₂ : preferably 90-96%
PEEP (cm H₂O)	5-10 Target SpO ₂ : preferably 90 - 96% Target PaO ₂ : 55 - 80mmHg <i>For subsequent adjustments: Follow PEEP-FiO₂ tables</i>	5-10 Target SpO ₂ : preferably 90 - 96% Target PaO ₂ : 55 - 80 mmHg <i>For subsequent adjustments: Follow PEEP-FiO₂ tables</i>
Trigger Sensitivity (Pressure/Flow)	1-4	1-4
Inspiratory Pause	0-0.3 seconds	

SAMPLE COLLECTION IN SEVERE DISEASE

- If Nasopharyngeal and Oropharyngeal samples test negative, and still there is high clinical suspicion, specially in presence of pneumonia or severe disease, send lower respiratory tract samples e.g. expectorated sputum, or tracheal aspirate/ mini BAL / BAL in intubated patients
- Bronchoscopy is an aerosol-generating procedure and should only be performed when it is extremely necessary and likely to change management.

COVID-19 AND SHOCK : HEMODYNAMIC SUPPORT

FLUID THERAPY

Strategy of Acute Resuscitation:

- Individualize, monitoring tissue perfusion
- Conservative strategy preferred to liberal
- Try to avoid hypervolemia

Choice of Fluids

- Buffered / balanced crystalloids
- Avoid Hydroxy Ethyl Starch (HES) / Dextran / Gelatine / Routine use of Albumin

Assess Fluid Responsiveness, Whenever Possible

- Use dynamic parameters, for assessing preload responsiveness (e.g. Passive Leg Raising), as feasible

VASOACTIVE AGENTS

- Vasopressor of Choice : Noradrenaline (Vasopressin / Adrenaline if Nor-Ad not available)
- Second line vasopressor: Add Vasopressin
- Mean Arterial Pressure Target : 60 - 65 mm Hg
- Add dobutamine in presence of cardiac dysfunction & persistent hypoperfusion despite fluids and noradrenaline
- Avoid dopamine
- Refractory shock despite fluids & vasopressors: Add IV Hydrocortisone (200mg/day as continuous infusion / intermittent doses)

COVID-19 AND RENAL FAILURE : RENAL REPLACEMENT THERAPY

Indications of Dialysis in Acute Kidney Injury (AKI)

- Volume overload
- Severe metabolic acidosis
- Refractory hyperkalemia
- Uremic encephalopathy
- Uremic pericarditis

STRATEGY

- All modalities of renal replacement therapy can be used depending on clinical status
- Bedside dialysis should be preferred. Portable RO water in a tank may be used, if needed.
- Acute peritoneal dialysis can be tried in selected patients where hemodialysis facility is not available.
- Use of cytokine removal therapies not recommended

COVID-19 AND VENOUS THROMBOEMBOLISM : PROPHYLAXIS

- Routine pharmacologic venous thromboembolism (VTE) prophylaxis is warranted, preferably with low molecular weight heparin, unless there is a contraindication (e.g., bleeding, severe thrombocytopenia).
- Use of more aggressive VTE prophylaxis in the form of increased intensity of a pharmacologic agent or the addition of a mechanical device may be assessed on an individual basis and can be reconsidered as additional data emerge.

COVID-19 AND CARDIAC ARREST: CARDIOPULMONARY RESUSCITATION

- In the event of a cardiac arrest, cardiopulmonary resuscitation should proceed with all members of the team wearing full PPE and N95 mask.
- Practicing a test run of a COVID-19 patient's cardiac arrest is prudent.
- Bag-mask ventilation should be avoided (if feasible) and the ventilator can be used instead to deliver a respiratory rate of 10 breaths per minute.
- "Crashes" should be avoided by close monitoring and anticipation. Aim for an elective, unhurried intubation
- Meaningful outcome in refractory critical illness and multiple organ failure is <5%: Assess futility of treatment early

COVID-19 AND OTHER ISSUES FOR INTENSIVE CARE SET UP

- Enteral nutrition
- Glycemic control
- Prevention of hospital acquired infections (VAP, CRBSI, CAUTI).
- Appropriate cultures to be sent. Care for invasive lines and change as per need.
- Early physical therapy
- Stress ulcer prophylaxis. PPI or H₂ blocker
- Protocolised light sedation
- Pressure ulcer prevention by two hourly turning
- Deep vein thrombosis prophylaxis
- Protocolised liberation from ventilation
- Caution about premature extubation (especially without facilitative HFNC / NIPPV) and subsequent reintubation
- Not to use glucocorticoid routinely (if not indicated for some other cause)
- Use point-of-care Ultrasound as much as possible to avoid transfers out of CCU for investigations (e.g. CT scans)

TEST FOR VIRAL CLEARANCE FOR DISCHARGE IN MODERATE / SEVERE CASES

- To send Nasopharyngeal and Oropharyngeal Swabs for COVID-19 rRT-PCR every 2nd day or as necessary according to the severity of the patient

DISCHARGE CRITERIA IN MODERATE / SEVERE CASES

1. Patient afebrile without Paracetamol
2. No respiratory distress
3. Vitals Stable
4. Other organ parameters normal / satisfactory
5. Chest X-ray PA view – Clear
6. Viral clearance in nasopharyngeal and oropharyngeal swabs after two tests become negative at 24 hours apart

FOLLOW UP

- All patients must follow strict Home Quarantine for 14 days after discharge
- Clinical assessment may be carried out after 14 days and 28 days

COVID-19 AND PREGNANCY

GENERAL PRINCIPLES

- Reported cases of COVID-19 pneumonia in pregnancy are milder and with good recovery. Pregnant women with heart diseases are at higher risk of severity
- There is no data suggesting any increased risk of miscarriage or loss of early pregnancy
- COVID-19 is not an indication for Medical Termination of Pregnancy
- There is no recorded case of vaginal secretions being tested positive for COVID-19
- There is no recorded case of breast milk being tested positive for COVID-19
- Vaginal delivery is recommended, if feasible, unless severely ill. If urgent delivery by Caesarean Section is needed, spinal anaesthesia is recommended to minimise the need for general anaesthesia. Always aim to keep the oxygen saturation above 94% during the procedure
- Transmission of the disease from the mother to the baby after birth via contact with infectious respiratory secretions is a major concern
- Mother has to be isolated from the new-born until the mother becomes negative two times by RT-PCR at 24 hours apart. A separate isolation room should be available for the new-born
- The new-born has to be tested by RT-PCR whenever symptomatic. If the new-born remains asymptomatic, test should be done after 14 days of two RT-PCR negative reports of the mother

BREAST FEEDING

- The risks and benefits of temporary separation should be discussed with the mother
- During temporary separation, if the mother is not seriously ill and she wishes to breastfeed the baby, breast milk can be expressed in a dedicated breast pump, after appropriate hand hygiene. Baby is fed the expressed breast milk by a healthy caregiver after disinfecting the pump
- If the new-born requires “rooming in” with the sick mother in the same room as per the wish of the mother or it becomes unavoidable due to facility limitation, due consideration should be given to implement measures to reduce the viral exposure of the new-born. The mother should always wear a three-layered medical mask
- The decision to discontinue temporary separation should be made on a case-by-case basis after proper consent and after ensuring appropriate measures to reduce exposure of the baby
- If the mother is not too sick and if the mother and baby are kept in the same room, mother can breast feed the baby, after putting on a three-layered medical mask, appropriate hand hygiene and proper cleaning of her breast and nipple before each feeding

KEY POINTS

- If we follow the management protocol for all COVID-19 patients, the recovery rate is satisfactory and the death rate is only around 3% of all the affected persons
- We should address the hypoxia or acute respiratory failure component and multi-organ involvement as early as possible in moderate to severely ill patients to save the maximum number of affected patients
- The patient should be referred to Critical Care Unit in proper time on proper indications
- During the course of treatment, we should always reassure the patient to alleviate his/her fear or panic related to the disease
- HCWs must write the appropriate treatment notes time to time in the management Top Sheet
- Appropriate and adequate self-protection of the HCWs is of paramount importance during patient care.
- Any lack in safety measures and infection prevention is extremely undesirable

TOP SHEET FOR THE MANAGEMENT OF COVID-19 PATIENTS

Name:				Regn. No.-				Date of Admission -			
Age:				Gender:				Admitted By -			
Ward :				Bed No.				Under:			
Diabetes	Hypertension	IHD	COPD	Asthma	CKD	CLD	HIV	Cancers	Cerebrovascular Dis.		
Immunosuppressive Drugs		Others		Pregnancy		LMP		EDD	Fetal Status		

Test for Covid-19	Date	Method (RT-PCR/ Other)	Result	

Date -								Day – 1st / 2nd / 3rd / 4th / 5th / 6th / 7th / 8th / 9th / 10th /							
		Morning	Evening	Night	Observations										
Temperature					Normal / 98.4°F - 100 °F / >100 °F / High										
Pulse					<100 / 100 - 120 / >120 per minute										
Respiration					<24 / 24 - 30 / >30 per minute										
BP					Syst <90, Diast <60 / Syst >100, Diast >70										
Breathlessness					Nil / Mild / Moderate / Severe										
SpO₂					>94% / 94 - 90% / <90%										
Sensorium					Conscious /Drowsy /Stupor /Coma										
Urine Output		ml	ml	ml	Total - ml in last 24 hours										
Auscultation					Breath Sound / Crepitation / Rhonchi										
Medicines Given					Home Medicines / Insulin										
Other Treatment					Antibiotic/Nor-Ad/Dopamine/Anti-Coagulant										
Blood Counts		Hb%	TC	Neutrophil	Lymphocyte			Platelet							
Biochemistry		Sugar (F/PP/R)	Urea	Creatinine	LFT	Ferritin		Na ⁺	K ⁺						
ABG								pH / PaO ₂ / PaCO ₂ / HCO ₃ / Lactate / (FIO ₂)							
Chest X-Ray								Normal / Findings, if Abnormal (with time)							
ECG								Normal / QTc / Other Findings (with time)							
Other Tests								PT / INR / aPTT / D-Dimer / Trop-T Blood Culture / Urine Culture (with time)							
Signature Staff Nurse					Appetite / Could Take Food and Medicines										
Signature Doctor on Duty					Stable / Worsening / Ventilation / Referral / Discharge / Death										