COVID-19 PREPAREDNESS DOCUMENT

AIIMS, NEW DELHI

This document is meant for internal circulation at AIIMS, New Delhi
(draft)

Note: This document is dynamic and may be modified as per progression of the disease in India and when more data are available regarding epidemiology, transmission, and treatment.
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CHAPTER 1: CASE DEFINITION

When to suspect

- All symptomatic individuals who have undertaken international travel in the last 14 days
  or
- All symptomatic contacts of laboratory confirmed cases
  or
- All symptomatic healthcare personnel (HCP)
  or
- Hospitalized patients with fever AND cough and/or shortness of breath
  or
- Asymptomatic direct and high risk contacts of a confirmed case (should be tested once between day 5 and day 14 after contact)
- In Hotspots/cluster (as per MoHFW) and in large migration gatherings/evacuees centers: All symptomatic Influenza like illness (fever, cough, sore throat, runny nose)

Symptomatic refers to fever/cough/shortness of breath.
Direct and high-risk contacts include those who live in the same household with a confirmed case and HCP who examined a confirmed case without PPE or with a breach in PPE

Confirmed case

A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms
CHAPTER 2: CLINICAL FEATURES

(Adapted from Report of the World health organization (WHO)-China Joint Mission on Coronavirus Disease 2019 based on 55,924 cases and a study on 1099 cases by Guan et al published in N Eng J Med)

- Fever (87.9%),
- Dry cough (67.7%),
- Fatigue (38.1%),
- Sputum production (33.4%),
- Shortness of breath (18.6%),
- Sore throat (13.9%),
- Headache (13.6%),
- Myalgia or arthralgia (14.8%),
- Chills (11.4%),
- Nausea or vomiting (5.0%),
- Nasal congestion (4.8%),
- Diarrhea (3.7%), and
- Hemoptysis (0.9%), and
- Conjunctival congestion (0.8%)
- ARDS (3%)
- Abnormalities on chest X-ray (59%)
- Radiological findings on chest CT scan (86%)
CHAPTER 3: LABORATORY DIAGNOSIS

As per directive from MoHFW (Ministry of health and family welfare), Government of India, all suspected cases are to be reported to district and state surveillance officers.

Sample collection:

Preferred sample: Throat and nasal swab in viral transport media (VTM) and transported on ice
Alternate: Nasopharyngeal swab, BAL or endotracheal aspirate which has to be mixed with the viral transport medium and transported on ice

General guidelines:

- Patients will be tested for COVID-19 at department of microbiology AIIMS, New Delhi
- Trained health care professionals to wear appropriate PPE with latex free purple nitrile gloves while collecting the sample from the patient. Maintain proper infection control when collecting specimens
- Restricted entry to visitors or attendants during sample collection
- Complete the requisition form for each specimen submitted
- Proper disposal of all waste generated

Respiratory specimen collection methods:

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

- Nasopharyngeal swab AND oropharyngeal swab

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

**Combined nasal & throat swab:** Tilt patient’s head back 70 degrees. While gently rotating the swab, insert swab less than one inch into nostril (until resistance is met at turbinates). Rotate the swab several times against nasal wall and repeat in other nostril using the same swab. Place tip of the swab into sterile viral transport media tube and cut off the applicator stick. For throat swab, take a second dry polyester swab, insert into mouth, and swab the posterior pharynx and tonsillar areas (avoid the tongue). Place tip of swab into the same tube and cut off the applicator tip.

**Nasopharyngeal swab:** Tilt patient’s head back 70 degrees. Insert flexible swab through the nares parallel to the palate (not upwards) until resistance is encountered or the distance is equivalent to that from the ear to the nostril of the patient. Gently, rub and roll the swab. Leave the swab in place for several seconds to absorb secretions before removing.
Figure 2: Specimen collection, packaging and transport guidelines (ICMR)
Patients suspected of having COVID-19 infection should be shifted to the isolation facility / designated COVID areas from the triage area as soon as possible. The HCP should be handling the patients after donning appropriate PPE according to their level of exposure as described in appendix IV.

**Hand hygiene**

i. HCP should perform hand hygiene using alcohol-based hand rub (minimum 20 seconds) or by washing with soap and water (minimum 40 seconds). If hands are visibly soiled, use soap and water for hand wash.

ii. Performed before and after using bathroom, before, during and after preparing food, before and after eating /drinking, after coughing, blowing or sneezing, after touching garbage, after touching mask or soiled PPE.

iii. Foot operated sanitizers should be put outside elevators, OPDs, screening areas, ICUs and wards.

![Figure 3: Hand hygiene technique (WHO)](image)
Mask etiquette

If masks are worn, appropriate use and disposal is essential to ensure they are effective and to avoid any increase in risk of transmission associated with the incorrect use and disposal of masks.

i. Place mask carefully to cover mouth and nose and tie securely to minimize any gaps between the face and the mask

ii. While in use, avoid touching the mask

iii. Remove the mask by using appropriate technique (i.e. do not touch the front but remove the lace from behind)

iv. After removal or whenever you inadvertently touch a used mask, clean hands by using an alcohol-based hand rub for 20 seconds or soap and water if visibly soiled for 40 seconds

v. Replace masks with a new clean, dry mask as soon as they become damp/humid

vi. Do not re-use single-use masks

vii. Discard single-use masks after each use and dispose-off them immediately upon removal

viii. For N95 respirators adequate fit check must be performed after wearing. CDC recommends the following hairstyles styles for male HCP suitable for wearing N-95 respirators

Figure 4: Facial hairstyles compatible with mask (CDC)
Steps of donning PPE (Steps may vary depending on the kit used):

Donning of the PPE must be performed in designated area.

1. Remove home clothes, jewelry, watches, electronic etc. and wear clean hospital scrubs
2. Wash hands with soap and water
3. Wear shoe covers – tie lace in front of the shin
4. Wear first set of gloves – should be smaller than second pair, comfortable size, can be sterile or unsterile
5. Gown – wear a clean disposable non-permeable gown, arm sleeves of gown should cover the gloves at the wrists, tie the lace behind snugly without wrapping all around the waist. Decontaminate the gown if it becomes soiled. Remove gown only in designated doffing area and discard the gown before leaving patient care area
6. Wear the N-95 respirator – cup the mask in hand, place the lower strap behind the neck passing below ears, then place the upper strap over back of head passing above ear. Check for snug fit of mask. There should be no more than minimal air leak from sides
7. Wear eye piece – adjust the strap according to required size, open the ports at upper end to prevent fogging while wearing, upper end N-95 mask should be covered by eye piece
8. Wear the hood – hood should lay over the gown without leaving any open space.
9. Wear 2nd pair of the gloves – should be of larger size than 1st pair, should cover free end of arms of gown. Change gloves if they become torn or heavily contaminated. Remove and discard gloves when leaving the patient room or care area, and immediately perform hand hygiene

Steps of doffing PPE:

Doffing to be performed only in the designated area, check for any leak or soiling in PPE before doffing. If any, disinfect the area before doffing. Doffing room should have two chairs, one labelled “dirty” and the other “clean”. All the PPE must be discarded as per routine protocol for handling biomedical waste. Hand hygiene MUST be performed after every step.

1. Disinfect the hands wearing gloves by following hand hygiene procedure.
2. Remove shoe covers only by touching the outer surface, and perform hand hygiene.
3. Remove outer gloves and perform hand hygiene.
4. Remove hood and perform hand hygiene.
5. Remove gown slowly by holding the gown at the waist and pulling. Without touching the outer surface, remove with a rolling inside out technique. Perform hand hygiene again.
6. Remove eye piece by holding the straps, and perform hand hygiene.
7. Remove inner gloves and perform hand hygiene.
8. Wear another pair of sterile/unsterile gloves.
9. Remove mask – Do not touch exposed surface of mask. First remove lower strap of mask, remove mask holding upper strap in a slow and steady pace (as to not generate aerosols)
10. Perform hand hygiene
11. Sit over clean chair and clean your shoes with alcohol swabs
12. Remove last pair of gloves and perform hand hygiene

If any leak is found in PPE while caring for infected patients, caring HCPs should self-quarantine (see appendix I).
### SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedures for putting on and removing PPE should be tailored to the specific type of PPE.

1. **GOWN**
   - Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
   - Fasten in back of neck and waist

2. **MASK OR RESPIRATOR**
   - Secure ties or elastic bands at middle of head and neck
   - Fit flexible band to nose bridge
   - Fit snug to face and below chin
   - Fit-check respirator

3. **GOGGLES OR FACE SHIELD**
   - Place over face and eyes and adjust to fit

4. **GLOVES**
   - Extend to cover wrist of isolation gown

### USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene

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*Figure 5: Sequence of donning PPE (CDC)*
Decontamination and waste management:

- Any surface or material known to be, or potentially be, contaminated by biological agents during laboratory operations must be correctly disinfected to control infectious risks.
- Proper processes for the identification and segregation of contaminated materials must be
adopted before decontamination and/or disposal.

- Where decontamination cannot be performed in the laboratory area or onsite, the contaminated waste must be packaged in an approved (that is, leak proof) manner, for transfer to another facility with decontamination capacity.
- For details of effective disinfectants, please refer to appendix V.

Practices for environmental cleaning in healthcare facilities:

Environmental cleaning is part of standard precautions, which should be applied to all patients in all healthcare facilities. Ensure that cleaning and disinfection procedures are followed consistently and correctly.

Cleaning agents and disinfectants:

1. 1% Sodium Hypochlorite can be used as a disinfectant for cleaning and disinfection
2. The solution should be prepared fresh.
3. Leaving the solution for a contact time of at least 10 minutes is recommended.
4. Alcohol (e.g. isopropyl 70% or ethyl alcohol 70%) can be used to wipe down surfaces where the use of bleach is not suitable, e.g. metals.

PPE to wear while carrying out cleaning and disinfection works:

1. Wear heavy duty/disposable gloves, disposable long-sleeved gowns, eye goggles or a face shield, and a medical mask (please see the PPE document for details)
2. Avoid touching the nose and mouth (goggles may help as they will prevent hands from touching eyes)
3. Disposable gloves should be removed and discarded if they become soiled or damaged, and a new pair worn
4. All other disposable PPE should be removed and discarded after cleaning activities are completed. Eye goggles, if used, should be disinfected after each use, according to the manufacturer’s instructions.
5. Hands should be washed with soap and water/alcohol-based hand rub immediately after each
Cleaning guidelines:

1. Where possible, seal off areas where the confirmed case has visited, before carrying out cleaning and disinfection of the contaminated environmental surfaces. This is to prevent unsuspecting persons from being exposed to those surfaces.

2. When cleaning areas where a confirmed case has been, cleaning staff should be attired in suitable PPE. Disposable gloves should be removed and discarded if they become soiled or damaged, and a new pair worn. All other disposable PPE should be removed and discarded, after cleaning activities are completed. Goggles, if used, should be disinfected after each use, according to manufacturer’s instructions. Hands should be washed with soap and water immediately after the PPE is removed.

3. Mop floor with routinely available disinfectant.

4. Wipe all frequently touched areas (e.g. lift buttons, hand rails, doorknobs, arm rests, tables, air/light controls, keyboards, switches, etc.) and toilet surfaces with chemical disinfectants and allow to air dry. 1% sodium hypochlorite solution can be used. Alcohol can be used for surfaces, where the use of bleach is not suitable.

5. Clean toilets, including the toilet bowl and accessible surfaces in the toilet with disinfectant or 1% sodium hypochlorite solution.

6. Wipe down all accessible surfaces of walls as well as blinds with disinfectant or bleach solution.

7. Remove curtains/fabrics/quilts for washing, preferably using the hot water cycle. For hot-water laundry cycles, wash with detergent or disinfectant in water at 70ºC for at least 25 minutes.

8. Discard cleaning items made of cloth and absorbent materials, e.g. mop head and wiping cloths, into biohazard bags after cleaning and disinfecting each area. Wear a new pair of gloves and fasten the double-bagged biohazard bag with a cable tie.

9. Disinfect buckets by soaking in disinfectant or bleach solution, or rinse in hot water before filling.

10. Disinfectant or 1% sodium hypochlorite solution should be applied to surfaces using a damp cloth. They should not be applied to surfaces using a spray pack, as coverage is uncertain and spraying may promote the production of aerosols. The creation of aerosols caused by splashing liquid during cleaning should be avoided. A steady sweeping motion should be used when
cleaning either floors or horizontal surfaces, to prevent the creation of aerosols or splashing. Cleaning methods that might aerosolize infectious material, such as the use of compressed air, must not be used.

11. Biohazard bags should be properly disposed-off, upon completion of the disinfection work.

Frequency of cleaning of surfaces:

1. High touch surfaces: Disinfection of high touch surfaces like (doorknobs, telephone, call bells, bedrails, stair rails, light switches, wall areas around the toilet) should be done every 3-4 hours.
2. Low-touch surfaces: For Low-touch surfaces (walls, mirrors, etc.) mopping should be done at least once daily.

Precautions to take after completing the clean-up and disinfection:

1. Staff should wash their hands with soap and water immediately after removing the PPE, and when cleaning and disinfection work is completed.
2. Discard all used PPE in a double-bagged biohazard bag, which should then be securely sealed and labelled.
3. The staff should be aware of the symptoms and should report to their occupational health service if they develop symptoms.
CHAPTER 5: CLINICAL MANAGEMENT

Indications for admission:

a) COVID Care Centers: Confirmed cases with mild disease

b) Hospital admission:

COVID Ward:

The following criteria may be applied to consider for admission (Any ONE of the following):

1. Respiratory rate > 24/min
2. SpO2 < 94% on room air
3. Those at high risk for severe disease:
   a. Age > 60 years
   b. Cardiovascular disease including hypertension
   c. Diabetes mellitus/other immunocompromised states
   d. Chronic lung/liver/kidney disease
   e. Cerebrovascular disease

COVID ICU:

1. Moderate/Severe ARDS
2. Multi-organ dysfunction
3. Shock
4. Transfer from ward to ICU if needs mechanical ventilation/closer monitoring

This is general guidance regarding which patients should be admitted. However, the final decision to admit and triage is at the discretion of the treating physician.
Management of mild cases

- Mild cases are those with low grade fever/cough/malaise/rhinorrhea/sore throat WITHOUT any shortness of breath
- Admission in COVID care centers
- Contact and droplet precautions, strict hand hygiene
- Symptomatic treatment
- Tab Hydroxychloroquine 400 mg BD for 1 day followed by 400 mg OD for 4 days in patients with high risk factors for severe disease may be considered
- Antibiotics and antivirals as per clinician’s discretion (to cover community acquired pneumonia including atypical pneumonia and Influenza)
- Low threshold for transfer of patients with high risk factor for severe disease to designated hospitals
- Discharge criteria:
  - As per guidelines

Management of hospitalized cases

General Measures:

- Symptomatic treatment
- Antibiotics and antivirals as per clinician’s discretion (to cover community acquired pneumonia including atypical pneumonia and Influenza)
- Maintain euvolemia
- Monitoring:
  Clinical:
  - Work of breathing:
    - Excessive inspiratory efforts (requiring accessory muscles of respiration, large volume tidal breaths, air hunger)
    - Esophageal pressure monitoring (if available)
  - Oxygen requirement
  - Vital signs
Laboratory:
- Routine: CBC with differentials, LFT, KFT, coagulation profile, Urine R/M
- Predictive and prognostic markers: CRP, LDH, Ferritin, D-Dimer, Troponin I

Anticoagulation
- All hospitalized patients should be started on prophylactic LMWH (e.g., Enoxaparin 1mg/kg per day Subcutaneously) if not contraindicated, and no high risk factors for bleeding are present
- Bleeding risk should be estimated with well validated risk scores (e.g. HAS-BLED score of ≥3 signifies a higher bleeding risk)
- In patient with a HAS-BLED score of 3, a risk benefit analysis should be done considering the risk of thrombosis based on level of D-dimer and SIC score (≥4 suggests high risk of thrombosis)
- In patients who are admitted to ICU, consideration should be given to therapeutic dose LMWH (e.g., enoxaparin 1mg/kg SC BD), if not at high risk of bleeding

Specific therapy:
- NO SPECIFIC ANTIVIRALS have been definitively proven to be effective as per currently available data.
- Drugs which have been tried in clinical trial settings include:
  a) Hydroxychloroquine/Chloroquine
  b) Lopinavir/ritonavir
  c) Remdesivir
  d) Nitazoxanide
  e) Ivermectin
- Steroids may be considered in a defined subgroup of patients including:
  - Patients with critical disease (admitted in the ICU)
  - Given the potential for delayed viral clearance, the duration of steroid use should be limited to 3 to 5 days (with no tapering) in low to moderate doses (1-2mg/kg/day)

**COVID-19 pneumonitis:**
Broadly, COVID-19 pneumonitis can be divided into two primary phenotypes; L-type and H-type:

**COVID-19 pneumonia, Type L**
At the beginning, COVID-19 pneumonia presents with the following characteristics:
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AIIMS, New Delhi
Version 1.1
21th April, 2020

- **Low elastance**: Nearly normal compliance
- **Low ventilation-to-perfusion (VA/Q) ratio**: Hypoxemia may be best explained by the loss of regulation of perfusion and by loss of hypoxic vasoconstriction
- **Low lung weight**: Only ground-glass densities are present on CT scan, primarily located subpleurally and along the lung fissures
- **Low lung recruitability**: The amount of non-aerated tissue is very low

**COVID-19 pneumonia, Type H (Typical ARDS like picture)**

- High elastance
- High right-to-left shunt
- High lung weight

**Note:**

- It is to be noted that these are not mutually exclusive but may represent the same disease process in **different stage of evolution**
- The combination of a negative inspiratory intrathoracic pressure and increased lung permeability due to inflammation results in interstitial lung edema (leading cause of patient **self-inflicted lung injury (P-SILI)** and is responsible for transition from L-type to H-type
- The typical imaging features in L phenotype

**Oxygen therapy in COVID-19 pneumonitis:**

a) **Non ventilatoy management (In patients with hypoxemia and low Work of Breathing):**
   
   - Target SpO₂ 92-96% (88-92% in patients with COPD)
   - Preferable devices for delivering oxygen: Non-rebreathing Face mask, Venturi-mask and High Flow Nasal Cannula (HFNC) (if available)
• **Assessment of severity of hypoxemia/shunt:** If patient achieves a SpO2 >95% at 15L/min O2 the shunt fraction is mild. Failure to achieve this indicates a moderate-severe shunt fraction.

• If the target is not achieved/maintained with the above mentioned devices, cautious trials of CPAP via oro-nasal mask/NIV via helmet interface maybe given.

• Try to achieve targets with lowest possible PEEP.

• Use of CPAP/NIV requires **intensive monitoring** for any increase in work of breathing/large tidal volume breaths [to prevent self-inflicted lung injury (SILI)] and hemodynamic instability

• **Note:**
  - NIV is associated with high failure rates, particularly in de-novo respiratory failure.
  - NIV without helmet interface is associated with greater risks of aerosolisation leading to higher exposure of health care workers (see table)
  - Placing a Surgical mask over Nasal Cannula (NC) may help in reducing dispersion

**Table showing maximum exhaled air dispersion via different oxygen administration and ventilatory support strategies:** (in a negative pressure room, with human simulator at an inclination of 45°)

<table>
<thead>
<tr>
<th>Method</th>
<th>Maximum exhaled air dispersion distance (in cm)</th>
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<tr>
<td>Oxygen via NC (5L/min)</td>
<td>100</td>
</tr>
<tr>
<td>Oxygen via simple face-mask (4L/min)</td>
<td>40</td>
</tr>
<tr>
<td>Oxygen via Venturi mask (FiO₂ 40%)</td>
<td>33</td>
</tr>
<tr>
<td>Oxygen via non rebreathing mask 12 L/min</td>
<td>&lt;10</td>
</tr>
<tr>
<td>CPAP via oro-nasal mask (20cm of H₂O)</td>
<td>Negligible</td>
</tr>
<tr>
<td>HFNC (60L/min)</td>
<td>17 (62cm sideways leakage if not</td>
</tr>
</tbody>
</table>
b) Ventilatory management:

- **Indications for intubation:**
  - Moderate to severe ARDS
  - Increased work of breathing on non-invasive respiratory support or not tolerating NIV
  - Hemodynamic Instability

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Tightly fixed</th>
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<tr>
<td>NIV via full face mask (IPAP 18cm/EPAP 5cm H(_2)O)</td>
<td>92</td>
</tr>
<tr>
<td>NIV via helmet without tight air cushion</td>
<td>27</td>
</tr>
<tr>
<td>NIV via helmet with tight air cushion (IPAP 20cm/EPAP 10cm H(_2)O)</td>
<td>Negligible air dispersion</td>
</tr>
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Pplat is measured by End inspiratory pause for 1 second

**Target:**
- PaO\(_2\) 55-80 mmHg
- PCO\(_2\) <45mmHg
- pH >7.3
- Pplat < 25-30 cm

**Initial settings:**
- Tidal volume: 6-8 ml/kg
- PEEP: 5-8 cm of H\(_2\)O

- **Check driving Pressure**
  - <15 cm H\(_2\)O: VT at 8ml/kg
  - >15 cm H\(_2\)O: VT at 6ml/kg

**Target not achieved:**
- Increase PEEP in 2cm H\(_2\)O steps up to 12cm H\(_2\)O
- Check Compliance (Crs)

**L-phenotype:**
- Continue same strategy
- Prone positioning
- Inhaled Nitric oxide (INO)

**H-phenotype/ARDS like:**
- Manage as per ARDSnet (LTV)
- Prone positioning

Compliance = Tidal volume (Vt)/Pplat-PEEP

- Do 2D TTE in all intubated patients given increased heart lung interaction
Prone positioning in COVID-19 pneumonitis:

- **Awake proning prior to intubation:**
  - May serve as an adjunct to use of non-invasive respiratory support and should only be used as a rescue therapy
  - The benefit is usually short lived and lies in redistribution of perfusion
  - Awake proning should only be considered if patient:
    - Is Able to communicate and co-operate with the procedure
    - Is Able to rotate to front and adjust position independently
    - Has no anticipated airway issue
  - If patients fulfils criteria for proning, ask the patient to switch positions every 30 min to 2 hours, while looking for improvement in oxygenation, as follows:
    - Lying on right side
    - Sitting up (30-60 degrees) by adjusting head of the bed
    - Lying on left side
    - Lying prone again

- **Proning after intubation:**
  - Conventional guidelines should be followed in such cases, with the caveat that benefit may be transient in patients with L-phenotype

How to intubate:

- Intubation trolley should be prepared and kept ready in ICU
- Intubation checklist should be displayed inside ICU
- The most skilled member of the team should be identified at the beginning of each shift for performing intubation
- Ensure proper fit of N95 mask and face shield before attempting intubation
- Pre-oxygenate with 100% FiO2 for 3-5 minutes with closed circuit (preferably)
- Try to avoid bag and mask ventilation (due to high risk of aerosol generation) but can be used if required by connecting an HME between mask and AMBU bag (or HME between
mask and the catheter mount or circuit)- use two person, two hand technique (V-shape) for BMV with low flow and low pressure

- Use video laryngoscope and endotracheal tube with stylet for intubation
- Rapid sequence intubation (RSI) to be done using available induction agents (preferably etomidate 0.3 mg/kg) and muscle relaxants (Succinylcholine 1.5mg/kg or Rocuronium 1.2mg/kg)
- Monitor for hemodynamic instability during induction
- Use visible chest rise, end-tidal CO2 and subsequently X-ray chest to confirm correct position of tube as auscultation may not be possible with PPE
- In unanticipated difficult airway when intubation is not successful in two attempts, use 2nd generation laryngeal mask airway (i-Gel or Proseal LMA) as rescue device for ventilation and call for expert help
- Insert nasogastric/orogastric tube at the same sitting to avoid repeat exposure
- Remove the outer most pair of gloves as early as possible to avoid contamination to other surfaces
- After intubation, appropriate cleaning/disinfection of equipment and environment should be done

### Initial ventilator settings

| Male = | 50 + 2.3 \([\text{height (inches)}] - 60\) OR 50 + 0.91 \([\text{height (cm)}] - 152.4\) |
| Female = | 45.5 + 2.3 \([\text{height (inches)}] - 60\) OR 45.5 + 0.91 \([\text{height (cm)}] - 152.4\) |

Set mode to volume assist-control
- Set initial tidal volume to 6 mL/kg PBW
- Set initial ventilator rate \(\leq 35\) breaths/min to match baseline minute ventilation

### Subsequent tidal volume adjustment

Plateau pressure goal: Pplat \(\leq 30\) cm \(H_2O\)

Check Inspiratory plateau pressure with 0.5 second Inspiratory pause at least every four hours and after each change in PEEP or tidal volume.

- If Pplat > 30 cm \(H_2O\), decrease tidal volume in 1 mL/kg PBW steps to 5 or if necessary to 4 mL/kg PBW.
- If Pplat < 25 cm \(H_2O\) and tidal volume < 6 mL/kg, increase tidal volume by 1 mL/kg PBW until Pplat > 25 cm \(H_2O\) or tidal volume = 6 mL/kg.
- If breath stacking (autoPEEP) or severe dyspnea occurs, tidal volume may be increased to 7 or 8 mL/kg PBW if Pplat remains \(\leq 30\) cm \(H_2O\).
Care of ventilated patient:

- Fresh ventilator circuit to be used for every new patient
- Change circuit only when visibly soiled (not routinely)
- Use two HME filters- one at the patient end close to ETT and another at the ventilator end of expiratory limb of circuit. Do not use heated humidifiers
- HME-F to be changed only when visibly soiled
- Use closed inline suction system (avoid open suctioning)
- Use the same closed suction system to collect ET aspirate sample in a mucus trap chamber for RT-PCR
- Do not disconnect the circuit- push twist all connections
- In case disconnection is unavoidable (like patient transport) use deep sedation/muscle relaxation, put the ventilator on standby mode and clamp the ET tube just before disconnection
- Avoid nebulization (use MDI instead)
- Tracheostomy should preferably be delayed by the end of two weeks- possibility of decreased viral load
- Alternative ventilation strategy like APRV (Airway pressure release ventilation) and ECMO (extracorporeal membrane oxygenation) to be considered if indicated

Supportive treatment in critically ill patients:

- Head end elevation (30 to 45 degrees)
- Oral hygiene with mouthwash
- Glycemic control to maintain blood sugar between 140 to 180 mg/dl
Ulcer prophylaxis with proton pump inhibitors
LMWH for thromboprophylaxis (as mentioned above)
Foley’s catheter and Ryle’s tube placement
Central venous catheter (CVC) insertion
Pressure ulcer prevention by position change every 2 hourly

Septic shock:

- Recognize septic shock in adults when infection is suspected or confirmed AND vasopressors are needed to maintain mean arterial pressure ≥ 65 mmHg AND lactate is ≥ 2 mmol/L in absence of hypovolemia.
- Recognize septic shock in children with any hypotension (systolic blood pressure [SBP] < 5th centile or > 2 SD below normal for age) or two or more of the following: altered mental state; bradycardia or tachycardia (Heart rate < 90/min or > 160/min in infants and < 70/min or > 150/min in children); prolonged capillary refill (> 2 sec) or feeble pulses; tachypnea; mottled or cold skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia.
- Management should be as per surviving sepsis campaign guidelines
- Choice of antibiotics: as per indication (community acquired vs hospital acquired) and local antibiogram

When to do dialysis:

- Urine output < 400 ml/24 hours
- Uremic encephalopathy
- Severe metabolic acidosis
- Uremic pericarditis
- Refractory hyperkalemia
- Fluid overload

Keep low threshold for dialysis as fluid overload and acidosis are detrimental in ARDS.
Bedside dialysis to be preferred.
Pregnant patients:
- Testing to be prioritized
- Steroids may be given for fetal indications as per obstetrician’s advice
- Obstetrician to monitor fetal well-being daily

Breastfeeding patients:
Currently there is no data suggestive of viral transmission via breast milk. However, due to close contact and risk of droplet transmission, breastfeeding should be avoided in COVID-19 confirmed mothers.

Discharge Criteria:
- Suspected case – if the laboratory results for COVID-19 are negative, discharge is to be decided as per discretion of the treating physician based on his provisional/confirmed diagnosis
- Confirmed case – resolution of symptoms, radiological improvement with a documented virological clearance in 2 samples at least 24 hours apart
APPENDIX I: HOME QUARANTINE/ISOLATION GUIDELINES FOR SUSPECTED OR CONFIRMED COVID-19 CASES

Instructions for home quarantine of COVID-19 contacts:

- Stay in a well-ventilated room separated from other people and pets
- Should preferably have attached/separate toilet
- Restrict his/her movement within the house.
- In shared spaces, maintain a distance of at least 1-2 meters and wear a medical mask when in proximity with other people
- Take special care to stay away from elderly people, pregnant women, children and persons with co-morbidities
- Do NOT attend any social/religious/public gathering e.g. wedding, condolences, etc.
- Wash hand often thoroughly with soap and water (at least 40 seconds) or with alcohol-based hand sanitizer (at least 20 seconds) especially after coughing and sneezing, and before and after eating, drinking and using the washroom
- Follow all steps of handwashing as described in chapter 4
- Avoid sharing household items with other people at home (e.g. dishes, drinking glasses, cups, eating utensils, towels, bedding etc.)
- Used three layered medical mask should be considered as potentially infected
- If symptoms appear (cough/fever/difficulty in breathing), he/she should immediately inform the nearest health center or call 011-23978046.

Instructions for the family members of person being home quarantined/isolated:

- Household members should stay in a different room and be separated from the person as much as possible
- Only an assigned family member should be tasked with taking care of the person and should help with groceries, prescriptions and other personal needs
- Avoid shaking the soiled linen or direct contact with skin
- Pets should be cared for by household members and should be kept separate from the person
Use disposable gloves when cleaning the surfaces or handling soiled linen

Stay at least 1 m away from those who are coughing

Wash hands after removing gloves and before and after eating, drinking and using the washroom with soap and water (at least 20 seconds) or with alcohol-based hand sanitizer (at least 30 seconds)

All non-essential visitors should be prohibited

In case the person being quarantined becomes symptomatic, all his close contacts will be home quarantined for 14 days and followed up for an additional 14 days or till the report of such case turns out negative on lab testing

Environmental sanitation:

Immediately remove and wash clothes and bedding that have blood, stool or other body fluids on them

Clean and disinfect frequently touched surfaces in the quarantined person’s room (e.g. bed frames, tables etc.) daily with Sodium Hypochlorite solution (1%) or ordinary bleach (5%)

Clean and disinfect toilet surfaces daily with regular household bleach solution/phenolic disinfectants

Wash laundry used by the person separately using common household detergent and dry thoroughly using the warmest temperatures recommended on the clothing label

Place all used disposable gloves, masks and other contaminated waste in a lined container before disposing of them with other household waste and wash hands with soap and water/alcohol-based hand rub as shown in the picture below

Duration of home quarantine period is for 14 days from contact with a confirmed case or earlier if a suspected case (of whom the index person is a contact) turns out negative on laboratory testing.

Duration of isolation for confirmed cases with mild disease is:

- Afebrile for 72 hours AND at least 7 days after symptom onset
  
  OR

- 2 negative samples 24 hours apart
APPENDIX II: TRANSPORT PROTOCOL

For shifting any suspected or confirmed COVID-19 patients, the following steps must be followed by the accompanying healthcare provider:

A. Decontaminate hands (alcohol-based sanitiser/soap)
B. Don PPE
C. Inform Trauma Centre control room regarding the admission/transfer of a potentially infectious patient.
D. In ambulance
   - Use single use or single patient use medical equipment where possible
   - Use disposable linen if available
   - Monitor and document vitals and medical management done in ambulance
E. Arrival at Trauma centre
   - Before the patient leaves the ambulance ensure arrangements are in place for receipt of the patient
   - Transfer patient to the care of hospital staff at Trauma Centre
   - After transfer of patient remove PPE
   - Perform hand hygiene
F. Before ambulance is used again
   - Cleaning and disinfecting (PPE as outlined above should be worn while cleaning)
   - Surfaces (stretcher, chair, door handles etc.) should be cleaned with a freshly prepared 0.5-1% hypochlorite solution or equivalent
   - Medical equipment should be cleaned as per hospital infection control protocol
APPENDIX III: PRECAUTION FOR HOSTEL RESIDENTS AT AIIMS

Precautions for residents caring for COVID-19 patients:

- To avoid meeting friends, colleagues, working staff in hostel. In case of unavoidable circumstances use face mask while meeting them
- Do not travel outside or within country unless absolutely indicated
- Food should be ordered from canteen to their room (Can order over phone)
- Hand sanitizer should be kept in room and as well as every wing in case of common bathroom
- Common bathroom to be cleaned twice daily
- Residents using common toilets can wipe seats after coming in body contact after each use
- Daily clothes used by the residents to be washed themselves and not to be given to laundry
## APPENDIX IV: GUIDANCE ON USE OF PPE BASED ON LEVEL OF EXPOSURE

<table>
<thead>
<tr>
<th>Setting</th>
<th>Target personnel or patients</th>
<th>Activity</th>
<th>PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DESIGNATED COVID AREAS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU</td>
<td>Healthcare workers</td>
<td>Aerosol Generating procedures</td>
<td>N95&lt;br&gt;Goggles or Face shield&lt;br&gt;Gown (Water resistant)&lt;br&gt;Gloves (Double)&lt;br&gt;Apron (optional)&lt;br&gt;Shoe cover&lt;br&gt;Hood</td>
</tr>
<tr>
<td></td>
<td>(Doctor/Nurses/Technician)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection</td>
<td>N95&lt;br&gt;Goggles&lt;br&gt;Gown (Water resistant)&lt;br&gt;Heavy Duty Gloves&lt;br&gt;Boots&lt;br&gt;Hood</td>
</tr>
<tr>
<td>Ward</td>
<td>Healthcare workers</td>
<td>Non-Aerosol Generating Procedure</td>
<td>N95&lt;br&gt;Goggles&lt;br&gt;Gown (Water resistant)&lt;br&gt;Gloves (Double)&lt;br&gt;Shoe cover&lt;br&gt;Hood</td>
</tr>
<tr>
<td></td>
<td>(Doctor/Nurses/Technician)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection/Patient Shifting</td>
<td>N95&lt;br&gt;Heavy Duty Gloves/&lt;br&gt;Gloves (Patient shifting)&lt;br&gt;Goggles&lt;br&gt;Gown (Water resistant)&lt;br&gt;Boots&lt;br&gt;Hood</td>
</tr>
<tr>
<td><strong>Screening</strong></td>
<td><strong>(Burns and plastic surgery)</strong></td>
<td><strong>Healthcare workers</strong></td>
<td><strong>Screening</strong></td>
</tr>
<tr>
<td>Healthcare workers (Doctor/Nurses)</td>
<td>Sampling</td>
<td>N95 Goggles Gown (Water resistant) Gloves (Double) Shoe cover Hood</td>
<td></td>
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<tr>
<td>------------------------------------</td>
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<td>-------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection/Patient Shifting</td>
<td>Triple layer mask Gloves (Patient shifting) Heavy Duty Gloves</td>
<td></td>
</tr>
</tbody>
</table>

**DESIGNATED SCREENING AREAS**

<table>
<thead>
<tr>
<th>Screening (New RAK OPD)</th>
<th>Healthcare workers (Doctor/Nurses)</th>
<th>Screening</th>
<th>N95 Gown Goggles Gloves (Double)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection</td>
<td>Triple layer mask Heavy Duty Gloves Boots</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Screening (Emergency Medicine; Pediatrics OPD)</th>
<th>Healthcare workers (Doctor/Nurses)</th>
<th>Screening</th>
<th>N95 Goggles Gown [Surgical Linen (OT Gown)] use with an apron Gloves (Double)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection</td>
<td>N95 mask Gown Goggles Heavy Duty Gloves</td>
<td></td>
</tr>
</tbody>
</table>

**TRANSPORT of COVID SUSPECT/ CONFIRMED CASE IN AMBULANCE**

<table>
<thead>
<tr>
<th>Ambulance (HCW travelling in patient compartment)</th>
<th>Healthcare workers (Doctor/Nurses)</th>
<th>Attending patient (Direct contact &gt;15 min)</th>
<th>N95 Goggles Gown (Water resistant)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NON-COVID AREA; MAIN HOSPITAL, CENTERS</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>------------------------------------------</td>
<td></td>
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<tr>
<td><strong>Emergency Medicine</strong> (New Emergency; Pediatric Emergency; Surgical Emergency)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare workers (Doctor/Nurses/Technician)</td>
<td>Non-Aerosol generating procedure</td>
<td>N95 mask</td>
<td></td>
</tr>
<tr>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection</td>
<td>Gown (In Red area only)</td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>No Direct contact</td>
<td>Gloves (Double)</td>
<td></td>
</tr>
<tr>
<td><strong>General OPD/EHS OPD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare workers (Doctor/Nurses)</td>
<td>Non-Aerosol generating procedure</td>
<td>N95 mask</td>
<td></td>
</tr>
<tr>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection</td>
<td>N95 mask</td>
<td></td>
</tr>
<tr>
<td><strong>General Ward/Private Wards</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare workers (Doctor/Nurses)</td>
<td>Non-Aerosol generating procedure</td>
<td>N95 mask</td>
<td></td>
</tr>
<tr>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection/Patient Shifting</td>
<td>N95 mask</td>
<td></td>
</tr>
<tr>
<td><strong>ICUs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare workers (Doctor/Nurses/Technician)</td>
<td>Aerosol Generating procedures in Non-COVID Area</td>
<td>N95 mask</td>
<td></td>
</tr>
<tr>
<td>Cleaner/Sweeper/HA</td>
<td>Disinfection/Patient Shifting</td>
<td>N95 mask</td>
<td></td>
</tr>
<tr>
<td>EHS Dispensary</td>
<td>Pharmacist</td>
<td>Drug Dispensing</td>
<td>mask</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>-----------------</td>
<td>------</td>
</tr>
<tr>
<td>Laboratory personnel</td>
<td>Doctor/Technician</td>
<td>Dealing with Respiratory samples</td>
<td>N95 mask, Gown (Water resistant), Gloves, Goggles</td>
</tr>
<tr>
<td>Radiodiagnosis</td>
<td>Doctor/Technician</td>
<td>Non-aerosol generating procedures</td>
<td>mask</td>
</tr>
<tr>
<td>Administrative offices</td>
<td>All staff</td>
<td>No direct/indirect patient contact</td>
<td>mask</td>
</tr>
<tr>
<td>COVID Confirmed case/Suspect</td>
<td>Patient</td>
<td>For Droplet prevention</td>
<td>mask</td>
</tr>
</tbody>
</table>
## APPENDIX V: EFFECTIVE DISINFECTANTS FOR USE

<table>
<thead>
<tr>
<th>Disinfectant</th>
<th>Composition</th>
<th>Preparation</th>
<th>Use</th>
<th>Contact period</th>
</tr>
</thead>
<tbody>
<tr>
<td>7% lysol</td>
<td>Benzalkonium chloride solution (80%), water, Laurel alcohol ethoxylate</td>
<td>15 ml in 1 litre of water</td>
<td>Toilet cleaning in non-ICU area (floor surface)</td>
<td>10 mins</td>
</tr>
<tr>
<td>Avagard</td>
<td>2-propanolol, 1-propanolol</td>
<td>Dispense 3-5 ml on hand</td>
<td>Hand rub purpose</td>
<td>20 sec</td>
</tr>
<tr>
<td>1% Hypochlorite</td>
<td>When preparing chlorine solutions note that: Discard after 24 hours</td>
<td>9 parts of water with 1 part of 10% sodium</td>
<td>Ventilator circuits, oxygen mask, nasal prongs, suction jar and</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>Avoid direct contact with skin and eyes</td>
<td>hypochlorite concentrated solution (final</td>
<td>tubes, blood and body fluid stained instruments and linens</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wear PPE</td>
<td>concentration 1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10% Hypochlorite</td>
<td>Prepare in well ventilated area</td>
<td>Decontaminate large blood spill&gt;10ml</td>
<td></td>
<td>15 mins</td>
</tr>
<tr>
<td>0.1% Hypochlorite</td>
<td>Use plastic container which is covered with lid</td>
<td>99 parts of water with 1 part of 10% sodium</td>
<td>Infected patient bed in isolation room</td>
<td>10 min</td>
</tr>
<tr>
<td>Detergent soap</td>
<td>Soap chips in hot water-dilute the concentrate daily</td>
<td>For general floor cleaning</td>
<td></td>
<td>5 min</td>
</tr>
</tbody>
</table>
COVID-19 Preparedness Document
AIIMS, New Delhi
Version 1.1 21st April, 2020

INTERIM CLINICAL GUIDANCE FOR MANAGEMENT OF COVID-19

COVID-19 Suspect
- Symptomatic (fever with cough/shortness of breath) individuals who have undertaken international travel in the last 14 days, or
- Symptomatic contacts of laboratory confirmed cases, or
- Symptomatic healthcare personnel (HCP), or
- Hospitalised patients with fever AND cough and/or shortness of breath, or
- Asymptomatic direct and high risk contacts of a confirmed case (should be tested once between day 5 and day 14 after contact)
- Influenza like illness from Hotspot regions (fever, cough, runny nose, sore throat)

Direct and high-risk contacts include those who live in the same household with a confirmed case and HCP who examined a confirmed case without a breach in PPE

Mild disease
- Symptomatic treatment

Moderate/severe disease
- Admit & test

Test positive
- Oxygen Support:
  - Target SpO2: 92-96% (88-92% in patients with COPD)
  - Preferred device for oxygenation: preferably non-rebreathing face mask (chapter 5 for details)
  - Monitor for: Work of breathing
    - Fatigue
    - Hemodynamic instability
    - Change in oxygen requirement
  - Awake proning may be used as a rescue therapy (Chapter 5 for details)
  - All patients should have daily 12-lead ECG
  - Follow CRP, D-dimer, LDH, Trop I & Ferritin every 48-72 hourly; CBC w/diff, KFT/LFT & coagulation parameters daily
  - Symptomatic and supportive treatment (antipyretics, antibiotics, etc. as per existing protocol)
  - Anticoagulation
    - Prophylactic dose of LMWH (e.g., enoxaparin 1mg/kg per day SC)

Test negative#
- Manage according to existing protocol

Test positive
- Cautious trial of CPAP with oro-nasal mask/NIV with helmet interface, if work of breathing is low
- Consider early intubation if work of breathing is high/not tolerating NIV
  - Ventilator management: Use lower PEEP(8-10cmH2O), and a tidal volume of (6-8ml/kg) initially to achieve defined targets (chapter 5 for details)
  - Maintain euvoeemia
  - Consider IV methylprednisolone 1 to 2mg/kg/day for 5-7 days (in two divided doses)
  - Therapeutic dose of LMWH (e.g., Enoxaparin 1mg/kg SC BD), if not at high risk of bleeding
  - If sepsis/septic shock: manage as per existing protocol and local antibiogram
  - Adjunctive therapy (may be considered):
    - Inj. Vit C 100mg/kg IV in 4 divided doses plus
    - Inj. Thiamine 200mg IV Q12 hourly

Any one of:
- Respiratory rate ≥ 24 /min
- SpO2 < 94% on room air

ADMIT IN WARD
- Consider Tab HCQ** (400 mg BD x 1 day f/b 400 mg OD x 4 days) **

Oxygen Support:
- Target SpO2: 92-96% (88-92% in patients with COPD)
- Preferred device for oxygenation: preferably non-rebreathing face mask (chapter 5 for details)
- Monitor for: Work of breathing
  - Fatigue
  - Hemodynamic instability
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- All patients should have daily 12-lead ECG
- Follow CRP, D-dimer, LDH, Trop I & Ferritin every 48-72 hourly; CBC w/diff, KFT/LFT & coagulation parameters daily
- Symptomatic and supportive treatment (antipyretics, antibiotics, etc. as per existing protocol)
- Anticoagulation
  - Prophylactic dose of LMWH (e.g., enoxaparin 1mg/kg per day SC)

ADMIT IN ICU
- Cautious trial of CPAP with oro-nasal mask/NIV with helmet interface, if work of breathing is low
- Consider early intubation if work of breathing is high/not tolerating NIV
- Ventilator management: Use lower PEEP(8-10cmH2O), and a tidal volume of (6-8ml/kg) initially to achieve defined targets (chapter 5 for details)
- Maintain euvoeemia
- Consider IV methylprednisolone 1 to 2mg/kg/day for 5-7 days (in two divided doses)
- Therapeutic dose of LMWH (e.g., Enoxaparin 1mg/kg SC BD), if not at high risk of bleeding
- If sepsis/septic shock: manage as per existing protocol and local antibiogram
- Adjunctive therapy (may be considered):
  - Inj. Vit C 100mg/kg IV in 4 divided doses plus
  - Inj. Thiamine 200mg IV Q12 hourly

After clinical & radiological improvement
- Discharge: If two negative samples at least 24 hours apart

Progressive worsening:
- Consider:
  - Tocilizumab (If IL-6 >5 ULN)
  - Therapeutic Plasma Exchange

Use of antivirals/other specific therapies is based on limited evidence
COVID-19 Preparedness Document
AIIMS, New Delhi
Version 1.1
21<sup>th</sup> April, 2020

Category C

1. Chloroquine – Azithromycin/Levofloxacin: QT prolongation/hypoglycemia
2. Chloroquine – Aspirin/Linezolid: QT prolongation/hypoglycemia

* X – Avoid combination  D – Consider treatment modification  C – Monitor therapy
APPENDIX VIII: MANAGEMENT OF DEAD BODY

Packing and transport of the dead body of patients of potential concern to mortuary:

- Death due to COVID-19 is a non-medicolegal case.
- The deceased must be placed in a zipped body bag immediately after death with identification tag marked ‘COVID-19’.
- Ensure that the body is fully sealed in an impermeable body bag before being removed from the isolation room or area, and before being transferred to the mortuary, to avoid leakage of body fluid.
- Transfer the body to the mortuary as soon as possible after death.
- Autopsy for medical/pathological/legal reasons must be avoided if there is no substantial reason.
- If an autopsy is being considered, the body may be kept in refrigeration in the mortuary and the autopsy conducted only when a safe environment is available in that mortuary.
- If body is to be held for less than 48 hours, storage at 6°C or below is appropriate. If longer-term storage is needed, this should be at temperatures of approximately 4°C. Carry out regular temperature checks of cold storage facilities to confirm that refrigeration units are working effectively.
- When properly packed in the body bag, the body can be safely removed for storage in the mortuary, sent to the crematorium, or placed in a coffin for burial.
- The vehicle used for transporting the body from hospital to mortuary or crematorium should be properly disinfected and decontaminated with 1% Sodium Hypochlorite.
- Ensure that mortuary staff and the burial team apply standard precautions (i.e. perform proper hand hygiene and use appropriate PPE, including long sleeved gown, gloves and facial protection if there is a risk of splashes from the patient's body fluids or secretions onto the body or face of the staff member).

If an autopsy is performed, collection of the following postmortem specimens is recommended:

- Postmortem clinical specimens for testing for SARS-CoV-2, the virus that causes COVID-19:
  - i. Upper respiratory tract swabs: nasopharyngeal swab AND oropharyngeal swab
  - ii. Lower respiratory tract swab: Lung swab from each lung
iii. Separate clinical specimens for testing of other respiratory pathogens and other postmortem testing as indicated

iv. Formalin-fixed autopsy tissues from lung, upper airway, and other major organs

General guidance for workers / employee in mortuary:

- Mortuary and death care workers who have contact with human remains known or suspected to be contaminated must be protected from exposure to infected blood and body fluids, contaminated objects, or other contaminated environmental surfaces.
- The number of people allowed in the autopsy room should be limited.
- Use of an oscillating bone saw should be avoided for confirmed or suspected cases of COVID-19. Consider using hand shears as an alternative cutting tool. If an oscillating saw is used, attach a vacuum shroud to contain aerosols.
- After handing over the body of the deceased, the mortuary must be kept cleaned using 1% Sodium Hypochlorite. All the surfaces, instruments and transport trolleys should be properly disinfected with 1% Hypochlorite solution for a minimum period of 10 minutes.

PPE for handling dead bodies:

- Wear a disposable, long-sleeved, cuffed gown; if the outside of the body is visibly contaminated with body fluids, excretions, or secretions, ensure that this gown is waterproof. If no waterproof gown is available, wear a waterproof apron in addition to the gown.
- If splashing of body fluids is anticipated, use facial protection: preferably a face shield, or if not, goggles and a medical mask to protect the eyes and mucous membranes.
- Perform hand hygiene after taking off the PPE.
- Use PPE for heavy-duty tasks (e.g. rubber gloves, rubber apron and resistant closed shoes) in addition to regular PPE.

Personal protective equipment during autopsy:

- Engage a minimum number of staff in the procedure, and perform only if an adequately ventilated room suitable for the procedure is available;
- Scrub suit – tops and trousers, or equivalent garments;
- Single-use, fluid-resistant, long-sleeved gown;
- Surgical mask or certified N95, EU FFP2 or equivalent;
- Either autopsy gloves (cut-proof synthetic mesh gloves) or two pairs.
- Knee-high boots.
- Avoid splashes when removing, handling or washing organs, especially lung tissue and the intestines
- Clean surfaces that have become contaminated with tissues or body fluids and decontaminate by removing most of the tissue or body substance with absorbent materials; cleaning surfaces with water and detergent; applying the disinfectant standardized by the health-care facility – if sodium hypochlorite solution is used wet the surface with the solution and allow at least 10 minutes contact time; rinsing thoroughly.
- Remove PPE before leaving the autopsy suite and follow appropriate disposal requirements. After removing PPE, always perform good hand hygiene practices.

Waste disposal:
- All waste generated from the mortuary or embalming room is potentially infectious and should be dealt with as risk waste.
- Staff that generate risk waste have a duty of care to ensure that it is correctly segregated, sealed and stored and disposed of appropriately, through a licensed agent. Anything that has been contaminated by body fluids should be sealed as risk waste.
- Body fluids and other contaminated liquids may be discharged into the drainage system.
- Liquid products from the management of human remains should not be allowed to drain into surface water, and working sinks in the mortuary and embalming room should be connected to the sewerage system.
- Extreme care must be exercised during the use and disposal of sharps. The use of disposable blades and needles is recommended and should be disposed of by the person who uses them.

Once the COVID-19 patient succumbs expires, the medical professionals should hand over the body of the deceased to relatives and friends for last rites assuring that the there is no spread of the infection preferably in a fluid proof coffin. The methodology to be adopted to make sure that no spread of infection to people who are dealing with the dead body are enlisted below:
- Handling staff should be appropriately dressed in PPE i.e. gloves, water resistant gown/ plastic apron over water repellent gown, and surgical mask. Use goggles or face shield to protect eyes, if there may be splashes.
- All tubes, drains and catheters attached to the dead body should be removed before handing over to the relatives.

- Wound drainage and needle puncture holes should be disinfected, surgically closed and dressed with impermeable material. Secretions in oral and nasal orifices can be cleared by gentle suction if needed.

- Oral, nasal and rectal orifices of the dead body have to be plugged to prevent leakage of body fluids.

- Before packing the dead body, it should be cleaned and disinfected using sterilizing agent based on 70% alcohol or 1% Sodium Hypochlorite.

- Transfer the body to mortuary at the earliest with body covered in a robust, leak proof zipped transparent plastic body bag which is locked properly using nylon cable zip ties to avoid spillage of any fluids. The plastic body bag should not be less than 150 μm thick.

- The bagged body should be either wrapped with a mortuary sheet or placed in an opaque body bag.

- The body bag packing should again be disinfected using sterilizing agent.

- Embalming of such bodies should be avoided.

- Relatives are allowed to view the deceased one last time before last rites after followed standard precautionary measures and unzipping the face end of the body bag.

- For the purpose of last rites, cremation should be preferred for complete elimination of chances of infection in either electric or gas crematorium in situ in zipped body bag. However keeping in mind the religious views of the family, if the burial of the body is requested, then it should be assured that the body is buried in a thick, air tight coffin and placed at normal depth of burial (4 to 6 feet). It is recommended that the area above and adjacent to the grave should be cemented immediately as an additional precautionary measure and the space should be marked and required precautions should be taken to avoid scavenging by animals.

- As a precautionary measure large gathering at the crematorium/ burial ground should be avoided to maintain a healthy distancing.

- The remains of the last rites like ashes do not pose any risk of infection and can be collected for religious immersion.

- Remove personal protective equipment after handling of the dead body. Then, perform hand hygiene immediately.
References: