



2019 -n COV (SARS - COV-2) Infection Prevention Control (IPC) and Management in Healthcare Facilities

Third Version

Endorsed by
Ministry of Health and Family Welfare and DGHS

Prepared by
 **Bangladesh Society of Medicine**



COVID-19 Adult Clinical Evaluation Guide

Consider COVID-19 in a patient with any of the following:

- Fever
- Cough
- Shortness of breath
- High risk travel/exposure

Clinical Signs/Symptoms

- Fever seen in >75% of hospitalized cases at some point *but almost 50% are afebrile on admission*
- Cough 60-80% (dry or productive)
- SOB 20-40%
- URI symptoms (HA, sore throat, rhinorrhea) in <15%
- GI symptoms (diarrhea, N/V) in <10%

Labs

- Check CBC with diff, BMP, LFTs, procalcitonin
- **Clues to COVID-19: leukopenia, lymphopenia**

Labs and biomarkers

- Median WBC 4.7, with leukopenia in 30-45% (leukocytosis in <5%)
- Lymphopenia in 33-85%
- Median platelets normal, but slight decrease in 35%
- AST/ALT increase in 4-22%
- CRP increased in 61-86%, LDH increased in 27-75%
- PCT: ≥ 0.5 in 5.5% overall (14% if severe, 24% if ICU)

Microbiology

- Check rapid flu/RSV, RVP
- Consider blood cultures, sputum culture
- **Clues to COVID-19: absence of other pathogens**

Microbiology

- Coinfection rate with viruses and bacteria is unknown but is low in published studies to date
- The presence of an alternative viral etiology (eg influenza) makes COVID-10 less likely (exception: rhinovirus since this is a common co-pathogen)
- Bacterial coinfection might increase with severity of illness so *bacterial infection in a severely ill patient does not exclude COVID-19*

Imaging

- CXR in all patients
- If CXR (-), consider CT for better sensitivity for PNA and to exclude alternative dx
- **Clues to COVID-19: bilateral, GGO, peripheral distribution**

Imaging

- CXR abnormal in 60% (77% if severe), chest CT abnormal in 86% (95% if severe)
- Unilateral findings on CXR or CT in 14-25% (especially if mild or early in disease)
- Most common findings: GGO and patchy consolidations (>50%), peripheral distribution >50%
- Nodules, LAN, cystic changes, effusion in <10%

Infection prevention and control in healthcare facilities to prevent Novel Corona Virus

PURPOSE: To prevent spread of COVID 19 DISEASE in healthcare facilities.

FOR: HEALTHCARE FACILITY MANAGEMENT

Strategies to prevent or limit transmission in healthcare settings include the following:

- Ensuring triage, early recognition, and source control (isolating patients with suspected nCoV infection)
- Applying standard precautions for all patients
- Implementing empiric additional precautions (droplet and contact and, whenever applicable, airborne precautions) for suspected cases of nCoV infection
- Implementing administrative controls
- Using environmental and engineering controls.

To facilitate the early identification of cases of suspected nCoV infection, healthcare facilities should:

- Encourage HCWs to have a high level of clinical suspicion
- Establish a well-equipped triage station at the entrance of health care facility, supported by trained staff
- Institute the use of screening questionnaires according to the updated case definition
- Post signs in public areas reminding symptomatic patients to alert HCWs

Personal Protective Equipment for Health Care Worker

- The rational, correct, and consistent use of PPE also helps to reduce the spread of pathogens
- The use of PPE effectiveness strongly depends on adequate and regular supplies, adequate staff training, appropriate hand hygiene and specifically appropriate human behavior

Environmental cleaning & Disinfection:

- Environmental cleaning and disinfection procedures are followed consistently and correctly. Thoroughly cleaning environmental surfaces with water and detergent and applying commonly used hospital-level disinfectants (such as sodium hypochlorite) are effective and sufficient procedures.
- Medical devices and equipment, laundry, food service utensils and medical waste should be managed in accordance with safe routine procedures.

Clinical triage:

A system for assessing all patients at admission allowing early recognition of possible COVID-19 patients and immediate isolation of patients with suspected COVID-19 infection in an area separate from other patients (source control).

Objectives:

- To facilitate the early identification of cases of suspected COVID-19
- Separation of suspected COVID-19 from general patients to limit the transmission of infection

Target population

- COVID 19 suspected case (fever, cough with or without respiratory distress and travel/exposure history)

Manpower

- Nurse/SACMO/outdoor staff/ward boy

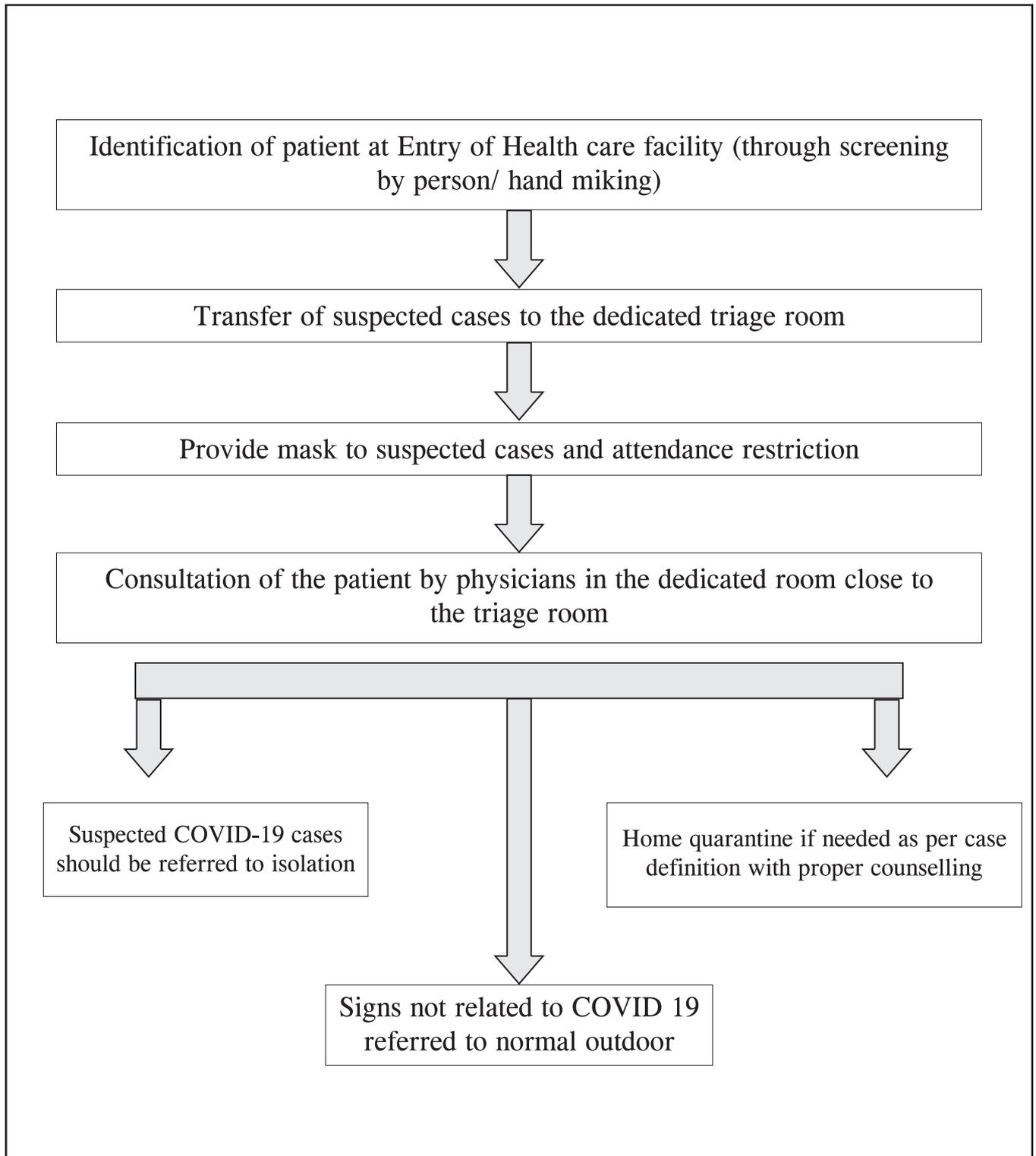
Logistics required

- Thermometer
- Masks for suspected Covid19 cases
- Tissues
- Disposal bags with bin
- Personal protective equipment for health care staffs according to IPC guideline (gloves, masks and/or respirators, gowns)
- Hand hygiene supplies (Soap and running water; hand sanitizer).

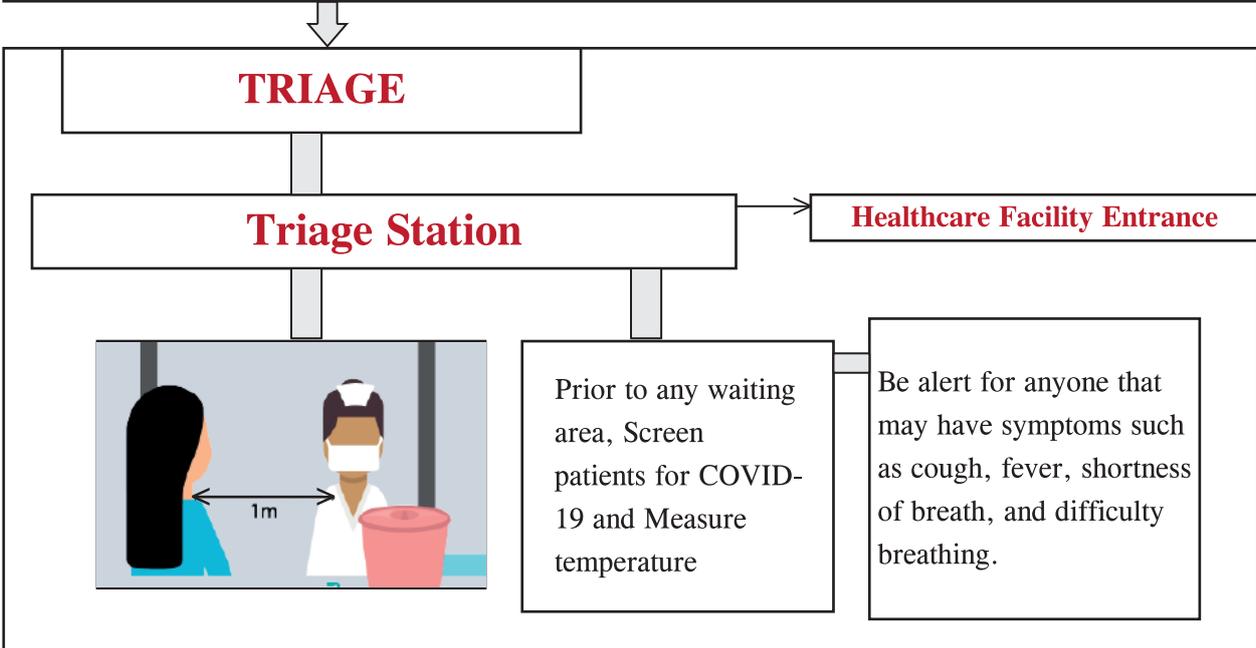
Infrastructure

- A well ventilated separate triage room
 - Sitting arrangement (preferably at least 1 meter distance)
 - Dedicated wash room with hand wash facilities
- One way entrance and exits
- Dedicated out door with assigned HCPs and ticket counter
- Citizen chartered

Total Flow Chart of Triage of COVID 19



Preparation at Healthcare Facility



Personal Protection at the Triage station

<p>Staff should wear appropriate personal protective equipment at the triage station.</p>	<p>Provide medical masks to all patients presenting with flulike symptoms or reporting possible COVID-19 infection</p>	<p>Remind all patients to use good respiratory and hand hygiene</p>	<p>Have alcohol-based hand rub or soap and water, hand washing stations readily available for the use of healthcare workers, patients and visitors.</p>
---	--	---	---

Waiting Area

Prepare a well-defined and separate waiting area for suspected covid 19 infection cases.

- Ensure that all patients cover their nose and mouth with a tissue or elbow when coughing or sneezing;
- Offer a medical mask to patients with suspected 2019-nCoV infection while they are in waiting/public areas or in cohorting rooms;
- Perform hand hygiene after contact with respiratory secretions

Clinical Management and Admission criteria

- Patients with a mild clinical presentation may not initially require hospitalization.
- However, clinical signs and symptoms may worsen with progression to lower respiratory tract disease in the second week of illness.
- All patients should be monitored closely.
- Possible risk factors for progressing to severe illness may include, but are not limited to, older age, and underlying chronic medical conditions such as lung disease, cancer, heart failure, cerebrovascular disease, renal disease, liver disease, diabetes, immunocompromising conditions, and pregnancy.
- The decision to monitor a patient in the inpatient or outpatient setting should be made on a case-by-case basis.
- This decision will depend not only on the clinical presentation, but also on the patient's ability to engage in monitoring, home isolation, and the risk of transmission in the patient's home environment.

Discontinuation of transmission based precaution/Discharge Criteria

The decision to discontinue for hospitalized patients with COVID-19 should be made on a case-by-case basis in consultation with clinicians, infection prevention and control specialists, and public health officials. This decision should consider disease severity, illness signs and symptoms, and results of laboratory testing for COVID-19 in respiratory specimens. Decision will be taken by clinicians

Considerations to discontinue Transmission-Based Precautions include all of the following:

- Resolution of fever, without use of antipyretic medication - for at least 2 days.
- Improvement in illness signs and symptoms.

Protecting yourself from COVID 19 (Personal protective equipment PPE)

When entering a room with a suspected or confirmed COVID-19 patient, put on:

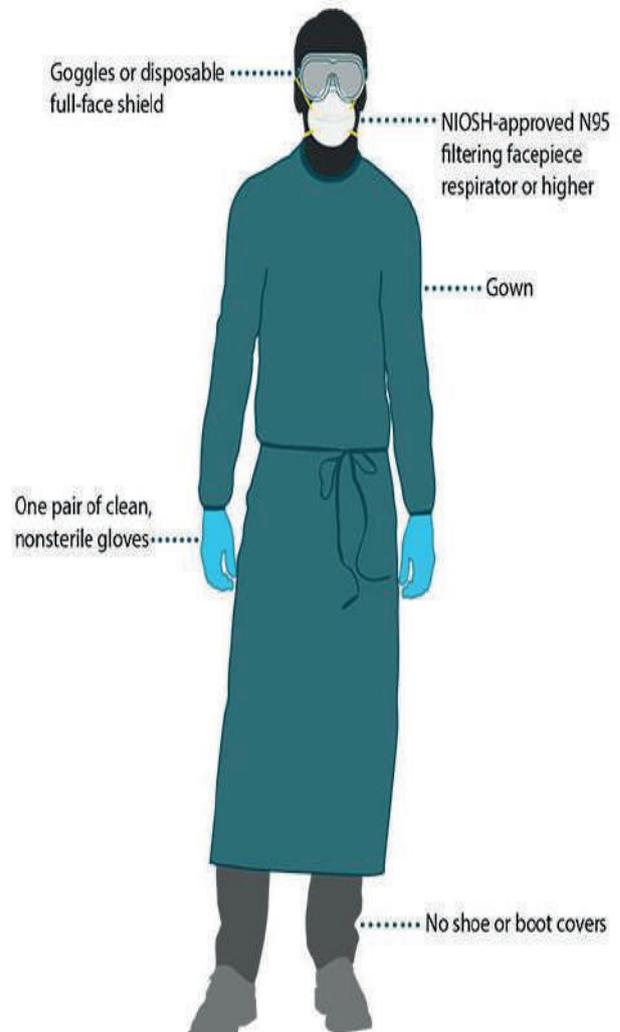
- Disposable gloves
- A clean, long-sleeve gown
- Medical mask that covers your mouth and nose
- Eye protection such as goggles
- The use of boots, coverall and apron is not required during routine care;

If performing an aerosol generating procedure, such as intubation, use a **Fit tested** particulate respirator such as an **N95** – **do a seal check!**

- A new set of PPE's is needed, when care is given to a different patient
- Equipment should be either single-use and disposable or dedicated equipment (e.g., stethoscopes, blood pressure cuffs and thermometers), should not be reused
- If equipment needs to be shared among patients, clean and disinfect it between use for each individual patient (e.g., by using ethyl alcohol 70%)

Note:

Don't touch your eyes, nose or mouth with gloves or bare hands until proper hand hygiene has been performed.



Attention!

- If utilizing single-use personal protective equipment (e.g. single-use masks, gloves, face shields) dispose in a waste bin with a lid and wash your hands thoroughly.
- Manage laundry, food service utensils and medical waste in accordance with safe routine procedures.

My 5 Moments for Hand Hygiene

Use alcohol-based hand rub or wash hands with soap and water:

1. Before touching a patient
2. Before engaging in clean/aseptic procedures
3. After body fluid exposure risk
4. After touching a patient
5. After touching patient surroundings

Correct use of medical masks derives from the practices in healthcare settings

- a. Place mask carefully to cover mouth and nose and tie securely to minimize any gaps between the face and the mask;
- b. While in use, avoid touching the mask;
- c. Remove the mask by using appropriate technique (i.e. do not touch the front but remove the lace from behind);
- d. After removal or whenever you inadvertently touch a used mask, clean hands by using an alcohol-based hand rub or soap and water if visibly soiled
- e. Replace masks with a new clean, dry mask as soon as they become damp/humid;
- f. Do not re-use single-use masks
- g. Discard single-use masks after removal each use and dispose-off them immediately upon

Donning and Doffing PPE

Donning (putting on) PPE: Donning in the following order is recommended:

1. Gown

A clean, nonsterile, disposable, isolation gown must be worn. Ensure that gown is tied in back and provides full coverage.

2. N-95 respirator

- a. All staff must wear approved respiratory protection (N-95 respirator).
- b. Before using an N-95 respirator, staff must be medically cleared and trained in how to wear /use each device.
- c. For N-95 respirators, staff must have been fit-tested within the past year to ensure proper size and fit.
- d. A “seal check” should be performed before each N-95 respirator use.
- e. The N-95 respirator must be discarded after each use.

3. Goggles/Face shield

All staff must wear goggles or face shield to protect mucous membranes from exposure due to splash or potential for hand contamination of eyes, nose or mouth.

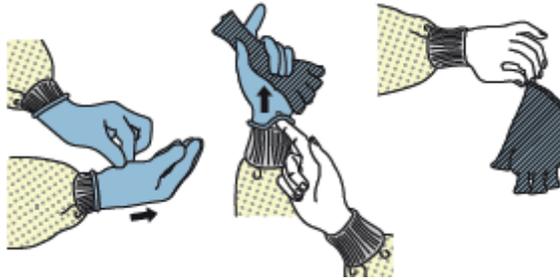
4. Gloves

All staff must wear clean, nonsterile gloves. Gloves must be pulled over the sleeves/cuffs of gown.

- Doffing (Removal) PPE: Remove PPE without contaminating your clothing, skin or mucous membrane with potentially infectious material. Remove PPE in the following sequences: If your hand got contaminated during any of the step of PPE removal, immediately wash your hands with soap or use alcohol based hand sanitizers after that step before continuing removal.

1. Gloves :

- Outside of the gloves are contaminated
- If your hand got contaminated during gloves removal, wash your hands with soap or use hand sanitizers.
- Using a gloved hand, grasp the palm area of the other gloved hand and peel off 1st gloves.
- Slide fingers of ungloved hand under remaining glove at wrist and peel off 2nd glove over 1st glove.



2. Goggles or Face shield :

- Outside of goggles or face shield are contaminated.
- Remove goggles or face shield from the back by lifting head band or ear pieces.
- If the item is reusable, place for sterilization or discard in a waste container.



3. Gown :

- Gown front and sleeves are contaminated.
- Unfasten gown ties, taking care that sleeves won't contact your body, when reaching for ties.
- Pull gown away from neck and shoulders, touching inside of gown only.
- Turn gown inside out.
- Fold and roll and discard in a waste container.



4. Mask or Respirator:

- Front of mask or respirator is contaminated- DO NOT TOUCH
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in a waste container.



- #### 5. Wash Hands or use hand sanitizer (alcohol based) immediately after removing all PPE.

Removal System:

- For Airborne Infection Isolation (AII) room with anteroom:

Remove all PPE in anteroom.

Make sure the door from the anteroom into the patient room is closed and negative airflow into patient room has been confirmed.

- For AII room without anteroom

Except for respiratory protection, remove and discard PPE (gloves, gown, face shield or goggles) just inside doorway before exiting to hall.

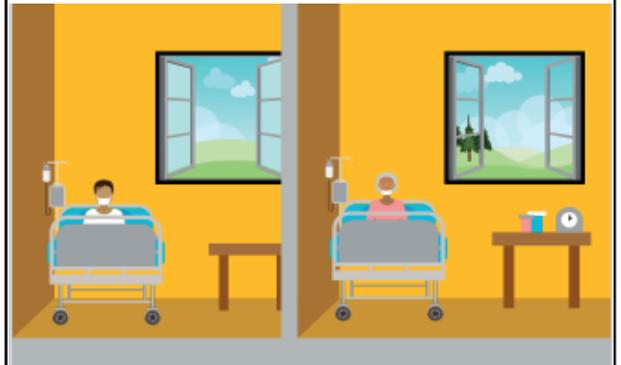
- Remove respiratory protection (N-95) after leaving the patient room and closing door
- Avoid touching face

Protecting yourself from COVID 19 (Personal protective equipment PPE)

Staff should wear appropriate personal protective equipment

Immediately isolate suspected and confirmed cases

- To reduce stress and anxiety, explain to patients what you do and why you do it
- If possible, place patients in single rooms
- When single rooms are not available, patients suspected of being infected with nCoV should be grouped together
- Patients' beds should be placed at least 1 m apart if they are suspected to have nCov infection
- Suspected and confirmed cases should be kept separate
- Do not put more than one patient in a single hospital bed



Manage Placement

Limit the movement of patients within the health center to reduce potential infection throughout the healthcare facility

- Avoid movement of patients or transport
- If a patient needs to be moved, plan the move ahead: all staff and visitors who come into direct contact with the patient should wear personal protective equipment
- Notify the area receiving the patient of any necessary precautions as early as possible before the patient's arrival; Perform regular environmental cleaning and disinfection which the patient is in contact
- Maintain good ventilation –Open doors and windows. Adequate ventilation is considered to be at least 160 L/s per patient or in negative pressure rooms with at least 12 air changes per hour and controlled direction of air flow when using mechanical ventilation.



Manage Environment

Limit the number of visitors, HCW per patient

- All visitors should wear the required personal protective equipment and their visits should be recorded
- Maintain a record of all persons entering the patient's room, including all staff and visitors.



Manage Visitors

Personal Protective Equipment (PPE) During Healthcare Activities

Triage / points of entry screening personnel	<ul style="list-style-type: none"> • Medical Mask
Collecting respiratory specimen	<ul style="list-style-type: none"> • Goggles OR face shield • Respirator (N95 or FFP2)- Fit tested • Gown • Gloves
Caring for a suspected/confirmed case of COVID-19 with NO aerosol-generating procedure (AGP)	<ul style="list-style-type: none"> • Goggles OR face shield • Gown • Medical mask • Gloves
Caring for a suspected/confirmed case of COVID-19 WITH aerosol-generating procedure	<ul style="list-style-type: none"> • Goggles OR face shield • Respirator (N95 or FFP2)- Fit tested • Gown • Gloves
Transport of suspected/confirmed case of COVID-19, including direct care	<ul style="list-style-type: none"> • Goggles OR face shield • Medical mask • Gown • Gloves

Things to do:

- Wash your hands frequently
- If possible, keep a distance of 1-metre between yourself and patient who is suspected.
- Avoid touching your eyes, nose and mouth
- If you start coughing, sneezing or develop fever after you have provided care, report your illness immediately to the concerned authority and follow their advice
- If equipment needs to be shared among patients, clean and disinfect between each patient use.
- Avoid contaminating environmental surfaces that are not directly related to patient care (e.g. door handles and light switches).

Communicating with patients with suspected or confirmed COVID-19

- Be respectful, polite and empathetic
- Be aware that suspected and confirmed cases, and any visitors accompanying them, may be stressed or afraid
- The most important thing you can do is to listen carefully to questions and concerns
- Use local language and speak slowly
- Answer any questions and provide correct information about COVID-19
- You may not have an answer for every question: a lot is still unknown about COVID-19 and it is okay to admit that
- If available, share information pamphlets or handouts with your patients
- It is okay to touch, or comfort suspected and confirmed patients when wearing PPE
- Gather accurate information from the patient: their name, date of birth, travel history, list of symptoms...
- Explain the healthcare facility's procedure for COVID-19, such as isolation and limited visitors and the next steps
- If the patient is a child, admit a family member or guardian to accompany them –The guardian should be provided and use appropriate personal protective equipment
- Provide updates to visitors and family when possible

Collecting and handling laboratory specimens from patients with suspected 2019-nCoV infection

All specimens collected for laboratory investigations should be regarded as potentially infectious. HCWs who collect, handle or transport any clinical specimens should adhere rigorously to the following standard precaution measures and biosafety practices to minimize the possibility of exposure to pathogens.

- Ensure that HCWs who collect specimens use appropriate PPE (i.e., eye protection, a medical mask, a long-sleeved gown, gloves). If the specimen is collected with an aerosolgenerating procedure, personnel should wear a particulate respirator at least as protective as a NIOSH-certified N95, an EU standard FFP2, or the equivalent;
- Ensure that all personnel who transport specimens are trained in safe handling practices and spill decontamination procedures;⁷
- Place specimens for transport in leak-proof specimen bags (i.e., secondary containers) that have a separate sealable pocket for the specimen (i.e., a plastic biohazard specimen bag), with the patient's label on the specimen container (i.e., the primary container), and a clearly written laboratory request form;
- Ensure that laboratories in health care facilities adhere to appropriate biosafety practices and transport requirements, according to the type of organism being handled;
- Deliver all specimens by hand whenever possible. DO NOT use pneumatic-tube systems to transport specimens;
- Document clearly each patient's full name, date of birth and suspected nCoV of potential concern on the laboratory request form. Notify the laboratory as soon as possible that the specimen is being transported.

Implementing administrative controls

- Establishing sustainable IPC infrastructures and activities
- Educating patients' caregivers
- Developing policies on the early recognition of acute respiratory infection potentially caused by 2019-nCoV
- Ensuring access to prompt laboratory testing for identification of the etiologic agent
- Preventing overcrowding, especially in the emergency department
- Providing dedicated waiting areas for symptomatic patients
- Appropriately isolating hospitalized patients
- Ensuring adequate supplies of PPE

Epidemiological Characteristics

1. Source of infection

Now, the novel coronavirus infection patients are the main source of infection although asymptomatic infected people can also be an infectious source.

2. Transmission

Transmission of the virus happens mainly through respiratory droplets and contact transmission while aerosol, digestive routes and other routes remain to be determined.

3. Susceptible groups: People are generally susceptible.

Pathophysiology

1. ARDS

■ The primary pathology is ARDS, characterized by diffuse alveolar damage (e.g. including hyaline membranes). Pneumocytes with viral cytopathic effect are seen, implying direct virus damage (rather than a purely hyper-inflammatory injury; Xu et al 2/17).

2. Cytokine storm

■ Emerging evidence suggests that some patients may respond to COVID-19 with an exuberant “cytokine storm” reaction (with features of bacterial sepsis or hemophagocytic lymphohistiocytosis).

■ Clinical markers of this may include elevations of C-reactive protein and ferritin, which appear to track with disease severity and mortality (Ruan 3/3/20).

Stages of illness

■ There seem to be different stages of illness that patients may move through.

(#1) Replicative stage – Viral replication occurs over a period of several days. An innate immune response occurs, but this response fails to contain the virus. Relatively mild symptoms may occur due to direct viral cytopathic effect and innate immune responses.

(#2) Adaptive immunity stage – An adaptive immune response eventually kicks into gear. This leads to falling titres of virus. However, it may also increase levels of inflammatory cytokines and lead to tissue damage–causing clinical deterioration.

• This progression may explain the clinical phenomenon wherein patients are relatively OK for several days, but then suddenly deteriorate when they enter the adaptive immunity stage (e.g. Young et al. 3/3/2020).

• This has potentially important clinical implications:

• Initial clinical symptoms aren't necessarily predictive of future deterioration. Sophisticated strategies may be required to guide risk-stratification and disposition (see below section on prognosis).

• Anti-viral therapies might need to be deployed early to work optimally (during the replicative stage).

Investigation

White blood count

- WBC count tends to be normal.
- Lymphopenia is common, seen in ~80% of patients (Guan et al 2/28, Yang et al 2/21).
- Mild thrombocytopenia is common (but platelets are rarely <100). Lower platelet count is a poor prognostic sign (Ruan et al 3/3).

Coagulation studies

• Coagulation labs are generally fairly normal upon admission, although elevated D-dimer is commonly seen (table above).

• Disseminated intravascular coagulation may evolve over time, correlating with poor prognosis (figure below) (Tang et al. 2020).

Inflammatory markers

• **Procalcitonin**

• COVID-19 does not appear to increase the procalcitonin. For example, the largest series found that

procalcitonin levels were <0.5 in 95% of patients (Guan et al 2/28).

- Elevated procalcitonin may suggest an alternative diagnosis (e.g. pure bacterial pneumonia). For patients who have been admitted with COVID-19, procalcitonin elevation may suggest a superimposed bacterial infection.

- **C-reactive protein (CRP)**

- COVID-19 increases CRP. This seems to track with disease severity and prognosis. In a patient with severe respiratory failure and a normal CRP, consider non-COVID etiologies (such as heart failure).

- Young et al. 3/3 found low CRP levels in patients not requiring oxygen (mean 11 mg/L, interquartile range 1-20 mg/L) compared to patients who became hypoxemic (mean 66 mg/L, interquartile range 48-98 mg/L).

- Ruan et al 3/3 found CRP levels to track with mortality risk (surviving patients had a median CRP of ~ 40 mg/L with an interquartile range of $\sim 10-60$ mg/L, whereas patients who died had a median of 125 mg/L with an interquartile range of $\sim 60-160$ mg/L) (figure below in the section on prognosis).

Evaluation for competing diagnoses

- PCR for influenza and other respiratory viruses (e.g. RSV) may be helpful. Detection of other respiratory viruses doesn't prove that the patient isn't co-infected with COVID-19. However, an alternative explanation for the patient's symptoms might reduce the index of suspicion for COVID-19 substantially.

- Conventional viral panels available in some hospitals will test for "coronavirus."

- This test does not work for COVID-19!

- This PCR test for "coronavirus" is designed to evaluate for four coronaviruses which usually cause mild illness.

- Ironically, a positive conventional test for "coronavirus" actually makes it less likely that the patient has COVID-19.

- Blood cultures should be performed as per usual indications.

Sensitivity of investigations

- Sensitivity compared to CT scans

- In a case series diagnosed on the basis of clinical criteria and CT scans, the sensitivity of RT-PCR was only $\sim 70\%$ (Kanne 2/28).

- Sensitivity varies depending on assumptions made about patients with conflicting data (e.g. between 66-80%; figure above)(Ai et al.).

- Among patients with suspected COVID-19 and a negative initial PCR, repeat PCR was positive in 15/64 patients (23%). This suggests a PCR sensitivity of $<80\%$. Conversion from negative to positive PCR seemed to take a period of days, with CT scan often showing evidence of disease well before PCR positivity (Ai et al.).

- Bottom line?

- PCR seems to have a sensitivity somewhere on the order of $\sim 75\%$.

- A single negative RT-PCR doesn't exclude COVID-19 (especially if obtained from a nasopharyngeal source or if taken relatively early in the disease course).

- If the RT-PCR is negative but suspicion for COVID-19 remains, then ongoing isolation and re-sampling several days later should be considered.

Chest X-Ray and CT Thorax

General description of imaging findings on chest x-ray and CT scan

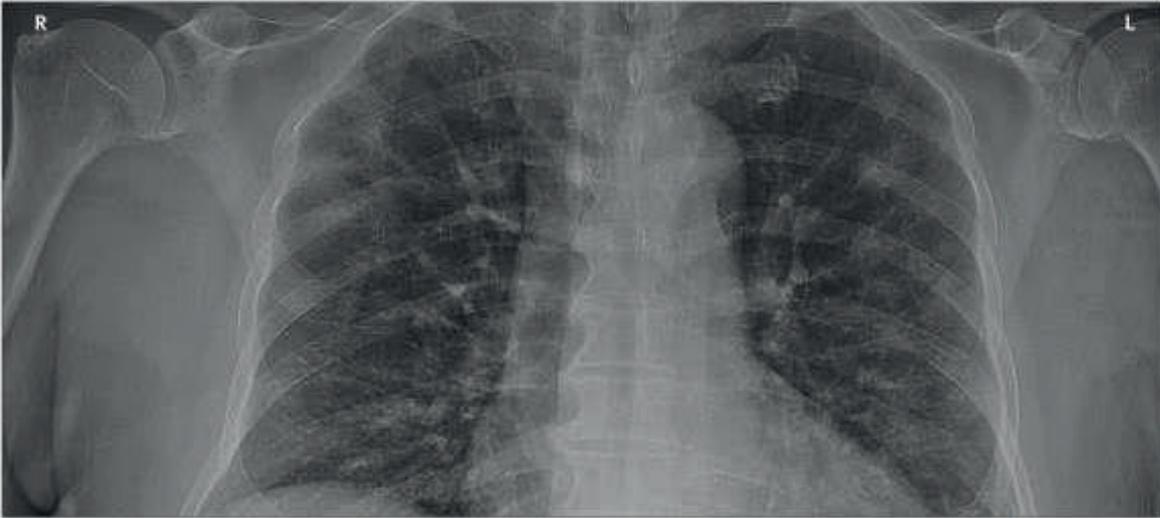
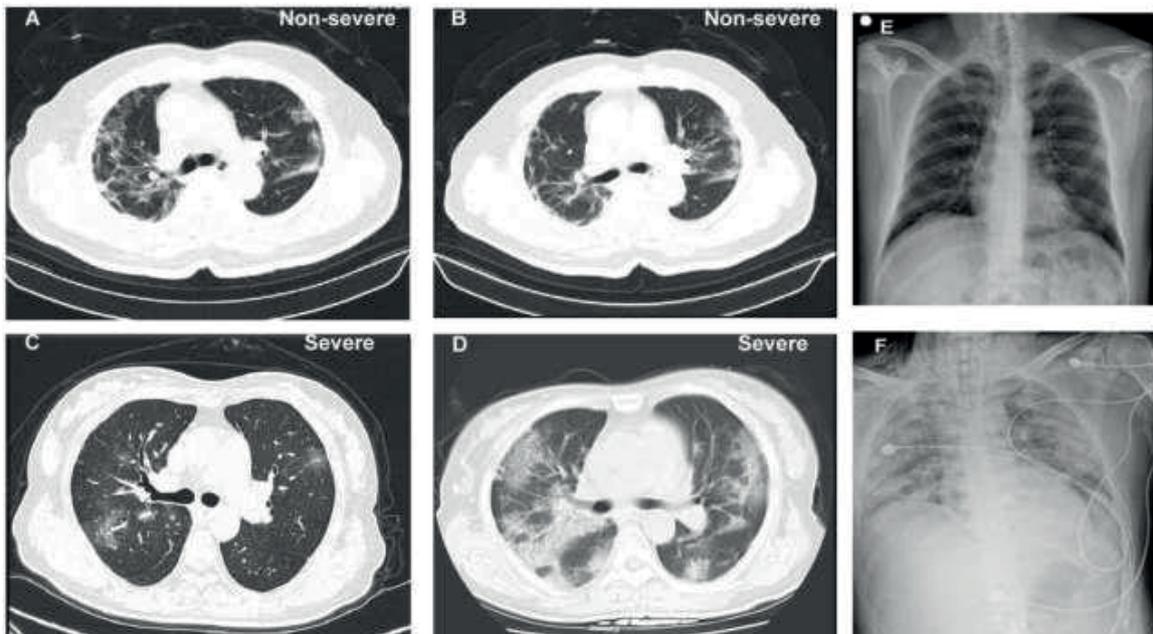


Figure: First case of 2019 novel coronavirus in Canada

Chest x-ray shows bilateral, peribronchovascular, ill-defined opacities in all lung zones.

- The typical finding is patchy ground glass opacities, which tend to be predominantly peripheral and basal (Shi et al 2/24). The number of involved lung segments increases with more severe disease. Over time, patchy ground glass opacities may coalesce into more dense consolidation.
- Infiltrates may be subtle on chest X-ray (example above from Silverstein et al).
- Findings which aren't commonly seen, and might argue for an alternative or superimposed diagnosis:
- Pleural effusion is uncommon (seen in only ~5%).
- COVID-19 doesn't appear to cause masses, cavitation, or lymphadenopathy

Figure: Representative chest radiographic manifestation in non-severe and a severe case with COVID - 19



Transverse chest computed tomography imaging from a 50-year-old male with non-severe COVID-19, at 8 days after hospital admission (Panel A) and at 15 days after hospital admission (following the receipt of supportive treatment) (Panel B) showing multilobar and subpleural ground-glass opacity and consolidation. The transverse chest computed tomography imaging from a 60-year-old female with severe COVID-19 at 1 day after hospital admission (Panel C) showing multilobar ground-glass opacity and consolidation and at 4 days after hospital admission (following the receipt of supportive treatment) showing rapid radiology progression, evidenced by multilobar subsegmental consolidation (Panel D)

Chest X-ray imaging from a 39-year-old male with non-severe COVID-19 after hospital admission demonstration minor infiltrates in the right lower lobe (Panel E) and from 49-year-old male with severe COVID-19 after admission demonstration diffuse patchy shadowing and consolidation (Panel F)

Sensitivity and time delay

- Limitations in the data
- Data from different studies conflict to a certain extent. This probably reflects varying levels of exposure intensity and illness severity (cohorts with higher exposure intensity and disease severity will be more likely to have radiologic changes).
- Sensitivity of CT scanning?
- Sensitivity among patients with positive RT-PCR is high. Exact numbers vary, likely reflecting variability in how scans are interpreted (there currently doesn't seem to be any precise definition of what constitutes a "positive" CT scan).
- Sensitivity of 86% (840/975) in Guan et al.
- Sensitivity of 97% (580/601) in Ai et al.
- Among patients with constitutional symptoms only (but not respiratory symptoms), CT scan may be less sensitive (e.g., perhaps ~50%)(Kanne 2/27).
- CT scan abnormalities might emerge before symptoms?
- Shi et al. performed CT scanning in 15 healthcare workers who were exposed to COVID-19 before they became symptomatic.
- Ground glass opacification on CT scan was seen in 14/15 patients! 9/15 patients had peripheral lung involvement (some bilateral, some unilateral).
- Emergence of CT abnormality before symptoms could be consistent with the existence of an asymptomatic carrier state (discussed above).
- Chest X-ray
- Sensitivity of chest X-ray is lower than CT scan for subtle opacities. In Guan et al., the sensitivity of chest x-ray was 59%, compared to 86% for CT scan.

Bronchoscopy

- Risks of bronchoscopy:
- May cause some deterioration in clinical condition (due to instillation of saline and sedation).
- Enormous risk of transmission to providers.
- Considerable resource allocation (requires N95 respirators, physicians, respiratory therapists) – all resources which will be in slim supply during an epidemic.
- Benefits of bronchoscopy:
- Benefit of diagnosing COVID-19 is dubious at this point (given that treatment is primarily supportive).
- Bottom line on bronchoscopy?
- Bronchoscopy might be considered in situations where it would otherwise be performed (e.g. patient with immunosuppression with concerns for Pneumocystis pneumonia or fungal pneumonia).
- Bronchoscopy should not be done for the purpose of ruling COVID-19 in or out (as this entails risk with no definite benefits)(Bouadma et al.).

Clinical Characteristics

1. Clinical manifestations

Based on the current epidemiological investigation, the incubation period is one to 14 days, mostly three to seven days.

1. Main manifestations include fever, fatigue and dry cough.

2. Nasal congestion, runny nose, sore throat and diarrhea are found in a few cases.

3. Severe cases mostly developed dyspnea and/or hypoxemia after one week. Patients progress rapidly to acute respiratory distress syndrome, septic shock, metabolic acidosis difficult to correct, and coagulopathy. For severe and critically ill patients, fever could be moderate to low, or even barely noticeable.

4. The patients with mild symptoms do not develop pneumonia but only low fever and mild fatigue.

From current situations, most patients have good prognosis and a small number of patients are critically ill. The prognosis for the elderly and patients with chronic underlying disease is poor. Children's symptoms are relatively mild.

Case Definitions

Suspect case

A. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease (e.g., cough, shortness of breath), AND with no other etiology that fully explains the clinical presentation AND a history of travel to or residence in a country/area or territory reporting local transmission (See situation report) of COVID-19 disease during the 14 days prior to symptom onset.

OR

B. A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case (see definition of contact) in the last 14 days prior to onset of symptoms;

OR

C. A patient with severe acute respiratory infection (fever and at least one sign/symptom of respiratory disease (e.g., cough, shortness of breath) AND requiring hospitalization AND with no other etiology that fully explains the clinical presentation.

Probable case

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

Confirmed case

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

Clinical Classification

1. Mild cases

The clinical symptoms were mild, and there was no sign of pneumonia on imaging.

2. Moderate cases

Showing fever and respiratory symptoms with radiological findings of pneumonia.

3. Severe cases

Cases meeting any of the following criteria:

- Respiratory distress (≥ 30 breaths/ min);
- Finger oxygen saturation $\leq 93\%$ at rest;
- Arterial partial pressure of oxygen (PaO₂)/ fraction of inspired oxygen (FiO₂) ≥ 300 mmHg (1 mmHg = 0.133 kPa);

4. Critical cases

Cases meeting any of the following criteria:

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

Differential Diagnosis

- Major candidate diseases to be distinguished
- Viral pneumonia, for example, pneumonia caused by influenza virus, parainfluenza virus, adenovirus, respiratory syncytial virus, rhinovirus, human metapneumovirus, SARS coronavirus;
- Mycoplasma pneumoniae and chlamydia pneumonia (Atypical Pneumonia)
- Bacterial pneumonia. In addition,

■ Non-infectious diseases such as vasculitis, dermatomyositis and organizing pneumonia are also candidate diseases to be distinguished from.

Treatment

1. Treatment venue determined by the severity of the disease

1.1 Suspected and confirmed cases should be isolated and treated at designated hospitals with effective isolation, protection and prevention conditions in place. A suspected case should be treated in isolation in a single room. Confirmed cases can be treated in the same room.

1.2 Critical cases should be admitted to ICU as soon as possible.

2. General treatment

2.1 Letting patients rest in bed and strengthening support therapy; ensuring sufficient caloric intake for patients; monitoring their water and electrolyte balance to maintain internal environment stability; closely monitoring vital signs and oxygen saturation.

2.2 Monitoring

- Blood routine result,
- Urine routine result,
- C-reactive protein (CRP),
- Biochemical indicators (liver enzyme, myocardial enzyme,
- Renal function etc.),
- Coagulation function according to patients' conditions,
- Arterial blood gas analysis,
- Chest imaging and cytokines texts if necessary.

2.3 Timely providing effective oxygen therapy, including nasal catheter and mask oxygenation, and if necessary, nasal high-flow oxygen therapy.

■ Trial with Alpha-interferon inhalation (5 million U each time for an adult, add 2 ml of sterilized water for injection twice daily);

■ Lopinavir/ Ritonavir (200mg/50mg for each pill), 2 capsules/tablets a time and twice a day; or add Ribavirin (Recommended in combination with interferon or lopinavir/ritonavir, adult: 500mg twice or three times daily via IV route, the length of treatment should not exceed 10 days), Chloroquine Phosphate (adult 18 to 16 years old weighting more than 50 kg: 500 mg twice daily for 7 days , body weight less than 50 kg: 500mg twice daily for initial two days, 500 mg once daily for next 4 days ; Umifenovir (adult: 200 mg three times daily ; not more than 10 days). Remdesivir (200 mg IV loading and after 24 hrs 100 mg IV once daily for 10 Days) (NIH USA). Tocilizumab (IL-6 receptor inhibitor) is under trail against COVID-19 with promising outcome.

3. Treatment of severe and critical cases

3.1 Treatment principle: On the basis of symptomatic treatment,

- ◆ Complications should be proactively prevented,
- ◆ Underlying diseases should be treated,
- ◆ Secondary infections also be prevented, and
- ◆ Organ function support should be provided timely.

3.2 Respiratory support:

3.2.1 Oxygen therapy: Patients with severe symptoms should receive nasal cannulas or masks for oxygen inhalation and timely assessment of respiratory distress and/or hypoxemia should be performed.

3.2.2 High-flow nasal-catheter oxygenation or noninvasive mechanical ventilation: When respiratory distress and/or hypoxemia of the patient cannot be alleviated after receiving standard oxygen therapy, high-flow nasal cannula oxygen therapy or non-invasive ventilation can be considered. If conditions do not improve or even get worse within a short time (1-2 hours), tracheal intubation and invasive mechanical ventilation should be used in a timely manner.

3.2.3 Invasive mechanical ventilation: Lung protective ventilation strategy, namely low tidal volume (4-8ml/kg of ideal body weight) and low inspiratory pressure (platform pressure <30cmH₂O) should be used to perform mechanical ventilation to reduce ventilator-related lung injury. There are many cases of human-machine asynchronization, therefore sedation and muscle relaxants should be used in a timely manner.

3.3 Circulatory support:

- Patients rarely are shocked on admission (even among critically ill patients, admission blood pressure is generally normal and lactate elevations are mild-moderate)(Yang et al 2/21).

- Overall, the rate of reported “sepsis” is generally low (<5%). The virus doesn't seem to generally cause a septic shock picture (but of course, patients may always suffer from superimposed bacterial septic shock).

- The cause of death from COVID-19 is nearly always ARDS – which may be exacerbated by fluid administration.

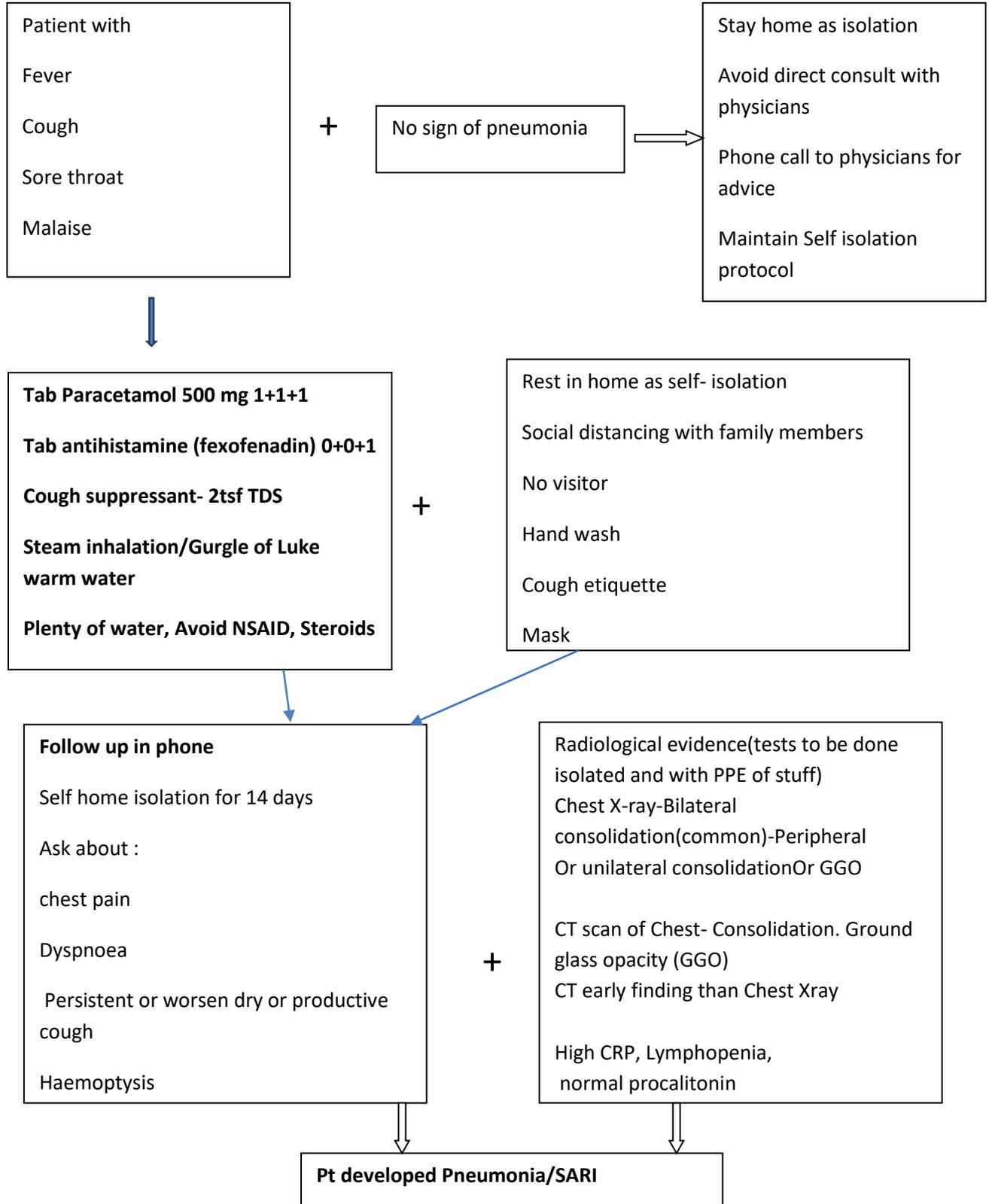
- Gentle fluid administration could be considered for patients with evidence of hypoperfusion and a history suggestive of total body hypovolemia (e.g. prolonged nausea/vomiting and diarrhea).

- Hospitals should improve microcirculation, use vasoactive drugs, and perform hemodynamic monitoring when necessary.

3.4 Other therapeutic measures

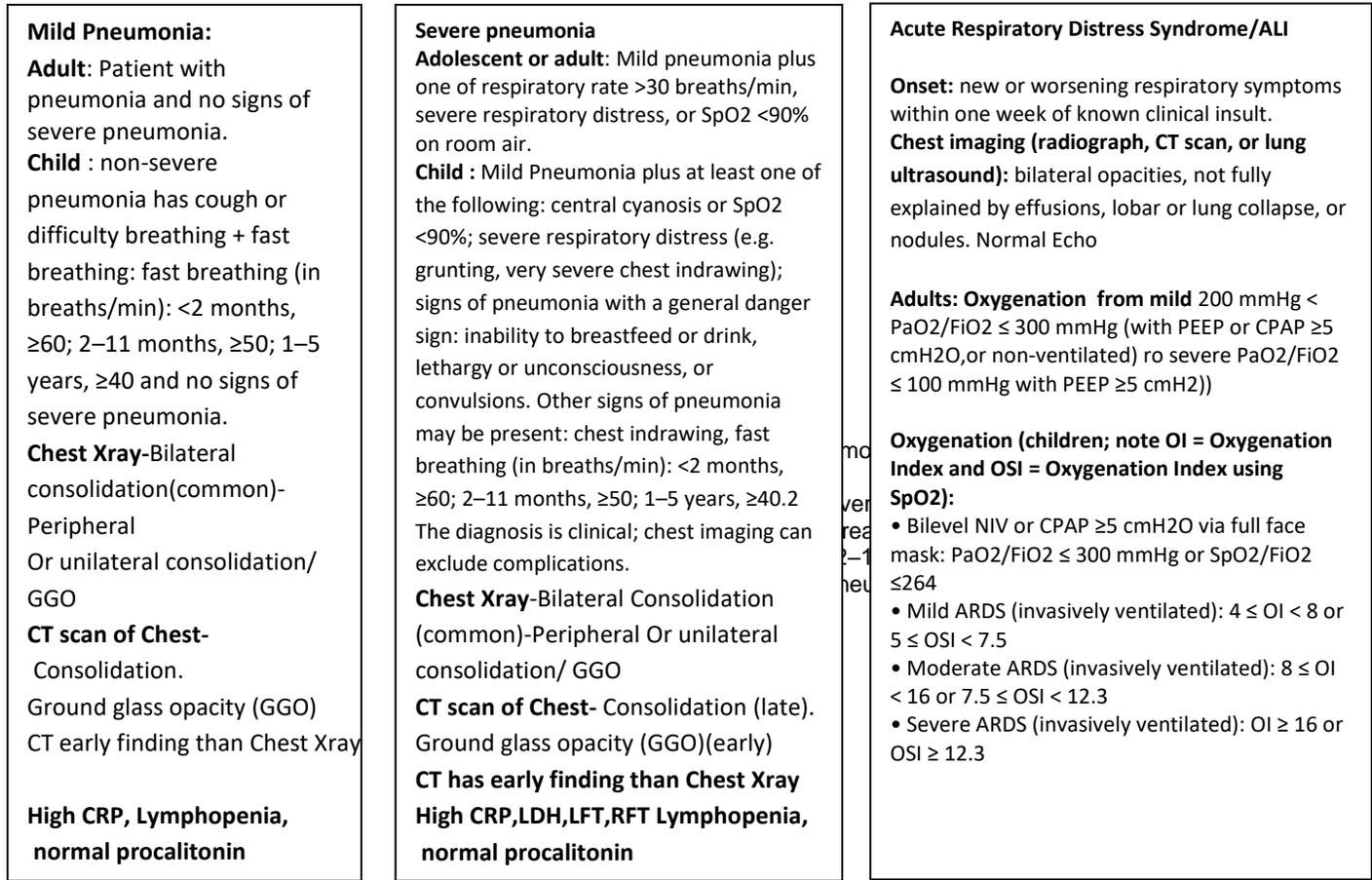
Glucocorticoids can be used in a short period of time (three to five days) according to the degree of respiratory distress and the progress of chest imaging. It is recommended dose should not exceed the equivalent of methylprednisolone 1-2 mg/kg/day. Note that a larger dose of glucocorticoid will delay the removal of coronavirus due to immunosuppressive effects.

**Treatment Protocol of COVID 19 infection in Bangladesh:
Influenza Like Illness (ILI)**



SARI (Severe Acute respiratory Syndrome): An ARI with history of fever or measured temperature $\geq 38\text{ C}^\circ$ and cough; onset within the last ~ 10 days; and requiring hospitalization. However, the absence of fever does NOT exclude viral infection. Commonly SARI cases develop pneumonia. All SARI cases should be diagnosed by RT-PCR for COVID 19 or rapid test, serology

SARI due to COVID-19



Mild Pneumonia:

Adult: Patient with pneumonia and no signs of severe pneumonia.
Child : non-severe pneumonia has cough or difficulty breathing + fast breathing: fast breathing (in breaths/min): <2 months, ≥ 60 ; 2–11 months, ≥ 50 ; 1–5 years, ≥ 40 and no signs of severe pneumonia.
Chest Xray-Bilateral consolidation(common)-Peripheral Or unilateral consolidation/ GGO
CT scan of Chest- Consolidation. Ground glass opacity (GGO) CT early finding than Chest Xray
High CRP, Lymphopenia, normal procalcitonin

Severe pneumonia

Adolescent or adult: Mild pneumonia plus one of respiratory rate >30 breaths/min, severe respiratory distress, or $\text{SpO}_2 < 90\%$ on room air.
Child : Mild Pneumonia plus at least one of the following: central cyanosis or $\text{SpO}_2 < 90\%$; severe respiratory distress (e.g. grunting, very severe chest indrawing); signs of pneumonia with a general danger sign: inability to breastfeed or drink, lethargy or unconsciousness, or convulsions. Other signs of pneumonia may be present: chest indrawing, fast breathing (in breaths/min): <2 months, ≥ 60 ; 2–11 months, ≥ 50 ; 1–5 years, ≥ 40 .
 The diagnosis is clinical; chest imaging can exclude complications.
Chest Xray-Bilateral Consolidation (common)-Peripheral Or unilateral consolidation/ GGO
CT scan of Chest- Consolidation (late). Ground glass opacity (GGO)(early)
CT has early finding than Chest Xray
High CRP,LDH,LFT,RFT Lymphopenia, normal procalcitonin

Acute Respiratory Distress Syndrome/ALI

Onset: new or worsening respiratory symptoms within one week of known clinical insult.
Chest imaging (radiograph, CT scan, or lung ultrasound): bilateral opacities, not fully explained by effusions, lobar or lung collapse, or nodules. Normal Echo
Adults: Oxygenation from mild 200 mmHg < $\text{PaO}_2/\text{FiO}_2 \leq 300$ mmHg (with PEEP or CPAP ≥ 5 cmH₂O, or non-ventilated) ro severe $\text{PaO}_2/\text{FiO}_2 \leq 100$ mmHg with PEEP ≥ 5 cmH₂)
Oxygenation (children; note OI = Oxygenation Index and OSI = Oxygenation Index using SpO₂):
 • Bilevel NIV or CPAP ≥ 5 cmH₂O via full face mask: $\text{PaO}_2/\text{FiO}_2 \leq 300$ mmHg or $\text{SpO}_2/\text{FiO}_2 \leq 264$
 • Mild ARDS (invasively ventilated): $4 \leq \text{OI} < 8$ or $5 \leq \text{OSI} < 7.5$
 • Moderate ARDS (invasively ventilated): $8 \leq \text{OI} < 16$ or $7.5 \leq \text{OSI} < 12.3$
 • Severe ARDS (invasively ventilated): $\text{OI} \geq 16$ or $\text{OSI} \geq 12.3$

Sepsis: Adults: life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection, with organ dysfunction*. Signs of organ dysfunction include: altered mental status, difficult or fast breathing, low oxygen saturation, reduced urine output, fast heart rate, weak pulse, cold extremities or low blood pressure, skin mottling, or laboratory evidence of coagulopathy, thrombocytopenia, acidosis, high lactate or hyperbilirubinemia.
Children: suspected or proven infection and ≥ 2 SIRS criteria, of which one must be abnormal temperature or white blood cell count

Septic shock: Adults: persisting hypotension despite volume resuscitation, requiring vasopressors to maintain MAP ≥ 65 mmHg and serum lactate level > 2 mmol/L.
Children (based on [12]): any hypotension (SBP < 5 th centile or > 2 SD below normal for age) or 2-3 of the following: altered mental state; tachycardia or bradycardia (HR < 90 bpm or > 160 bpm in infants and HR < 70 bpm or > 150 bpm in children); prolonged capillary refill (> 2 sec) or warm vasodilation with bounding pulses; tachypnea; mottled skin or petechial or purpuric rash; increased lactate; oliguria; hyperthermia or hypothermia.

Drug treatment for SARI (COVID-19) in Bangladesh

SARI Tx due to COVID-19

Mild Pneumonia:

Adult:

1st line:

Hydroxychloroquine:

400mg-BID-D1

200 mg –BID-D2-D6

Or Chlorquine:

500mg BID for 7 days

+

Darunavir 80 mg/ Covicistat

150 mg-once daily –two weeks

2nd line:

Atazanavir 400mg twice daily 2

weeks

+

Oseltamivir 150 mg twice

daily-5 days

or

favipiravir (starting dose of

1600 mg followed by 600 mg

tid)

Avoid steroids, NSAID, ARB

Strongly suggest for Flu Shot,

ZINC, Melatonin,Vit C

Empirical antibiotics when

Procalcitonin is high,

Neutrophilic leukocytosis

Severe pneumonia

Adolescent or adult:

1st line:

Remdesavir:

2nd line:

Lopinavir/ritonavir(200mg/50 mg for each pill, 2 cap stat and BID 14 days

+

Ribavain: IV 4 gm –Stat and then every 8

hourly 8mg/kg IV for 14 days

Oxygen (high flow), Nebulization

Avoid steroids, NSAID, ARB

Strongly suggest for Flu Shot, ZINC,

Melatonin,Vit C

Empirical antibiotics when

Procalcitonin is high, Neutrophilic

leukocytosis

Acute Respiratory Distress Syndrome/ALI

•Give supplemental oxygen therapy

High-flow nasal oxygen (HFNO) or non-

invasive ventilation (NIV) should only be used

in selected patients with hypoxemic

respiratory failure

•Conservative intravenous fluid strategies

• Empirical early antibiotics for possible

bacterial pneumonia

• Consideration for early invasive ventilation.

Implement mechanical ventilation using lower

tidal volumes (4–8 ml/kg predicted body

weight, PBW) and lower inspiratory pressures

(plateau pressure <30 cmH2O).

Usual critical care:

• Lung-protective ventilation strategies

• Periodic prone positioning during

mechanical ventilation>12 hrs/day

• Consideration of extracorporeal

membrane oxygenation(ECMO)

Higher PEEP, Avoid N-M blocker

Antiviral or immunomodulatory therapies

are not yet proven effective in ARDS cases. P

Pt- ask for clinical trials

Toclizumab:

Interleukin: Interferon nebulization is

recommended in COVID-19. It should be

performed in negative-pressure wards

Steroids: Initial routine methylprednisolone at a

dose of 0.75-1.5 mg/kg intravenously once a

day(nearly 40 mg once or twice a day).

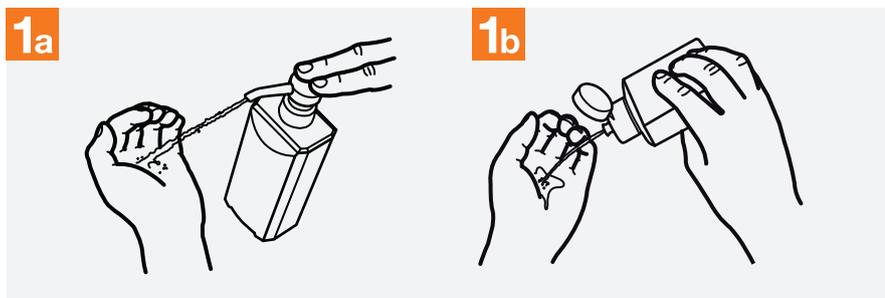
Sepsis and shock:

- Give at least 30 ml/kg of isotonic crystalloid (normal saline and Ringers lactate) in adults in the first 3 hours. In resuscitation from septic shock in children in well-resourced settings, give 20 ml/kg as a rapid bolus and up to 40-60 ml/kg in the first 1 hr. **Do not use hypotonic crystalloids, starches, or gelatins for resuscitation.**
- Administer vasopressors when shock persists during or after fluid resuscitation. The initial blood pressure target is MAP \geq 65 mmHg in adults and age-appropriate targets in children.
- If signs of poor perfusion and cardiac dysfunction persist despite achieving MAP target with fluids and vasopressors, consider an inotrope such as dobutamine.
- Vasopressors (i.e. norepinephrine, epinephrine, vasopressin, and dopamine) are most safely given through a central venous catheter at a strictly controlled rate. Choice: Norepinephrine- Adult ; Epinephrine-Children
- Antibiotics-1st hour (empirical)-Initially combination followed by narrowing to single agent.Check procalcitonin to stop antibiotics
- Best marker will be Sr lactate(if more than 6 mmol/l-prognosis worst

How to Handrub?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

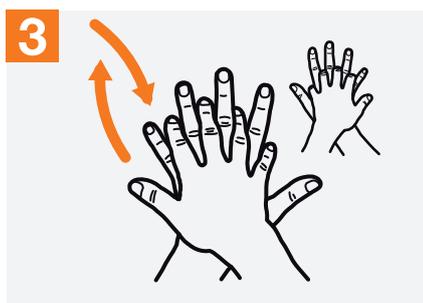
 **Duration of the entire procedure: 20-30 seconds**



Apply a palmful of the product in a cupped hand, covering all surfaces;



Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;



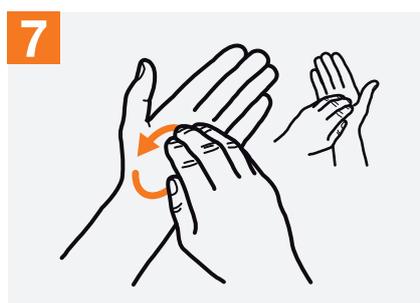
Palm to palm with fingers interlaced;



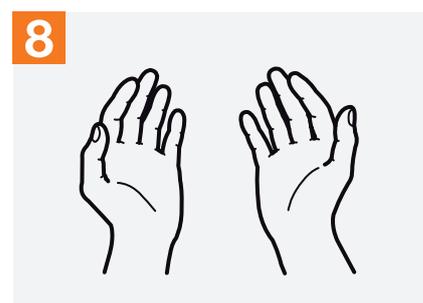
Backs of fingers to opposing palms with fingers interlocked;



Rotational rubbing of left thumb clapsed in right palm and vice versa;



Rotational rubbing, backwards and forwards with clapsed fingers of right hand in left palm and vice versa;



Once dry, your hands are safe.



World Health Organization

Patient Safety

A World Alliance for Safer Health Care

SAVE LIVES
Clean Your Hands

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

Acronym / Abbreviation

CBC - Complete Blood Count

BMP - Basic Metabolic Panel

LFT - Liver Function Tests

RVP - Respiratory Virus Panel

RSV - Respiratory Syncytial Virus

COVID -19- Coronavirus Disease 2019

PNA - Pulmonary Nodular Amyloidosis

GGO - Ground-glass Opacity

LDH - Lactate Dehydrogenase

CRP - C-Reactive Protein

AST/ALT - Aspartate Aminotransferase/ Aspartate Aminotransferase

LAN - Lymphadenopathy

HCW - Health Care Worker

HCP - Health Care Personnel

AGP - Aerosol Generating Procedure

Universal Precaution for Public

Reduce your risk of coronavirus infection:



Clean hands with soap and water or alcohol-based hand rub

Cover nose and mouth when coughing and sneezing with tissue or flexed elbow



Avoid close contact with anyone with cold or flu-like symptoms

Thoroughly cook meat and eggs



Avoid unprotected contact with live wild or farm animals

Protect yourself and others from getting sick

Wash your hands



- after coughing or sneezing
- when caring for the sick
- before, during and after you prepare food
- before eating
- after toilet use
- when hands are visibly dirty
- after handling animals

Wash your hands

Wash your hands with soap and running water when hands are visibly dirty



If your hands are not visibly dirty, wash them with soap and water or use an alcohol-based hand cleanser



Protect others from getting sick

Cover mouth and nose with tissue, sleeve or elbow when coughing or sneezing



Throw tissue into closed bin after use

Clean hands after coughing or sneezing and when caring for the sick



Protect yourself from getting sick

Avoid unprotected contact with sick people (including touching one's eyes, nose or mouth) and with live farm or wild animals



Practise food safety

Use different chopping boards and knives for raw meat and cooked foods



Wash your hands between handling raw and cooked food.

Practise food safety

Sick animals and animals that have died of diseases should not be eaten



Practise food safety

Even in areas experiencing outbreaks, meat products can be safely consumed if these items are cooked thoroughly and properly handled during food preparation.



Shopping in wet markets? Stay healthy!

Wash hands with soap and water after touching animals and animal products



Avoid touching eyes, nose and mouth

Avoid contact with sick animals and spoiled meat



Avoid contact with stray animals, waste and fluids in market

Working in wet markets? Stay healthy!

Frequently wash your hands with soap and water after touching animals and animal products



Disinfect equipment and working area at least once a day



Working in wet markets? Stay healthy!

Wear protective gowns, gloves and facial protection while handling animals and animal products



Remove protective clothing after work, wash daily and leave at the work site



Avoid exposing family members to soiled work clothing and shoes



STAY HEALTHY WHILE TRAVELLING

Avoid travel if you have a fever and cough



If you have a fever, cough and difficulty breathing seek medical care early and share previous travel history with your health care provider



STAY HEALTHY WHILE TRAVELLING

Avoid close contact with people suffering from a fever and cough



Frequently clean hands by using alcohol-based hand rub or soap and water



Avoid touching eyes, nose or mouth



STAY HEALTHY WHILE TRAVELLING

When coughing and sneezing cover mouth and nose with flexed elbow or tissue - throw tissue away immediately and wash hands



If you choose to wear a face mask, be sure to cover mouth and nose - avoid touching mask once it's on



Immediately discard single-use mask after each use and wash hands after removing mask

STAY HEALTHY WHILE TRAVELLING

If you become sick while travelling, inform crew and seek medical care early



If you seek medical attention, share travel history with your health care provider



STAY HEALTHY WHILE TRAVELLING

Eat only well-cooked food



Avoid spitting in public



Avoid close contact and travel with animals that are sick



Fig 8-23: Universal Precaution: Respiratory Hygiene and cough etiquette and Hand hygiene, Travel

N.B: All universal precaution figures are from WHO Advice for public section