INTERIM GUIDANCE ON CLINICAL CARE FOR PATIENTS WITH COVID-19 IN LIBERIA

(Version One)

Ministry of Health and National Public Health Institute of Liberia (NPHIL)

June 1, 2020

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PREFACE

This is the first interim guidance for the management of COVID-19 in Liberia. The document is intended for use by all clinicians involved in the care of patients when COVID-19 is suspected or confirmed. The recommendations in this guidance are derived from three main sources:

- Review of clinical guidance from the World Health Organization (WHO), the United States Centers for Disease Control (USCDC), US Expert Panel COVID-19 Treatment Guidelines, and experiences from other countries (e.g. China, Nigeria, Ghana, etc.)
- Review of data in peer-reviewed journals obtained from PubMed and Medline.
- Experiences of experts and clinicians who have treated a number of COVID-19 patients.

Inappropriate prescribing is unethical and can cause harm for patients. It occurs when medicines are not prescribed in accordance with guidelines that are based on scientific evidence to ensure safe, effective, and economic use. This interim guidance addresses a critical gap and will undergo frequent revisions and updated as new evidence becomes available and the country enhances capabilities for critical care. Clinicians are advised to reference the below sources to address clinical issues where no recommendation was provided in this guidance:

a. WHO Interim Guidance for Clinical Management of COVID-19, May 27, 2020.
b. US Expert Panel COVID-19 Treatment Guidelines.
c. Second Edition Liberia National Therapeutic Guidelines, 2017
d. Liberia National IPC Guidelines, 2020
e. Other clinical guidelines where relevant [e.g. WHO Hospital Care for Children, Liberian Guidelines (HIV, TB, Malaria, etc.), WHO Oxygen therapy for children (2016), WHO Management of complications of pregnancy, labor and delivery, etc.].
f. WHO: Addressing Mental Health Psychosocial Aspects of COVID-19 version 1.5.
g. mhGAP Humanitarian Intervention Guide.

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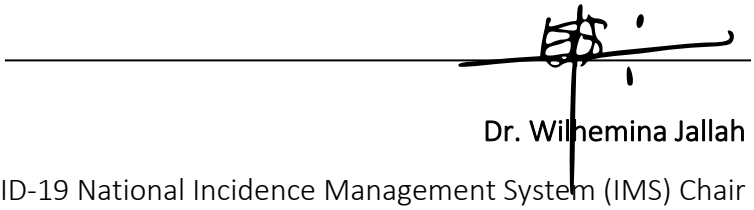

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ABBREVIATIONS

AFEM: African Federation of Emergency Medicine
AIDS: Acquired Immunodeficiency Syndrome
ARDS: Acute Respiratory Distress Syndrome
AVPU: Alert, Voice, Pain, Unresponsive
Bid: twice daily
BiPAP: Bilevel Positive Airway Pressure
BP: Blood pressure
CBC: Complete Blood Count
CDC: US Center for Disease Control & Prevention
CITU: COVID-19 Isolation & Treatment Unit
CM: Case Management Pillar
CoV: Coronavirus
COVID-19: Coronavirus Disease 2019
COPD: Chronic obstructive pulmonary disease
CPAP: Continues Positive Airway Pressure
Cpm: Cycles per minute
CRP: C-reactive Protein
CS: Caesarean section
CXR: Chest X-ray
ECG: Electrocardiogram
EMS: Emergency Medical Service
FFP2: Fine Filtration Particulate
FiO_2: Fraction of Inspired oxygen
GI: Gastrointestinal
Hb: Hemoglobin
HBA_1C: Hemoglobin A_1C or Glycated Hb
HBV: Hepatitis B Virus
HCW: Health care workers.
HCV: Hepatitis C Virus
HDU: High dependency unit
HFNO: High Flow Nasal Oxygen
HIV: Human Immunodeficiency virus
HR: Heart rate
ICU: Intensive Care Unit
IL-6: Interleukin 6
IMS: Incidence Management System
INR: International Normalized Ratio
IPC: Infection Prevention and Control
LDH: Lactate dehydrogenase
MAP: Mean Arterial Pressure
MERS: Middle Easter Respiratory Syndrome
NIV: Non-Invasive ventilation
NPHIL: National Public Health Institute of Liberia
NSAID: Non-steroidal anti-inflammatory drugs
O_2: Oxygen
PEEP: Positive End Expiratory pressure
PHEIC: Public Health Emergency of International Concern
POC: Precautionary Observation Center
POE: Port of Entry
PPE: Personal Protective Equipment
PREVAIL: Partnership for Research on Vaccines & Infectious Diseases in Liberia
RR: Respiratory Rate
SARS: Severe Acute Respiratory Syndrome
SARS-CoV-2: 2019 Coronavirus Type 2
SOB: Shortness of breath
SOPs: Standard Operating Procedures
SPO_2: Oxygen saturation in arterial blood
Tid: Three times a day
TB: Tuberculosis
WHO: World Health Organization

1 OVERVIEW OF COVID-19

COVID-19 is predominantly a respiratory illness transmitted through contact with infectious respiratory droplets or direct physical contact with an infectious person or contaminated surface. An infected person who is asymptomatic can transmit the virus.

There is no cure and the treatment depend on supportive care. Early detection, isolation, and diagnosis of infected persons and quarantine of their close contacts is key. This requires active community engagement and participation; screening at health facilities, ports of entry, and in communities; and testing of suspected and probable cases, high risk contacts, and vulnerable/special populations.

To prevent COVID-19 the following interventions must be implemented: Social distancing, frequent hand hygiene with soap and water or sanitizer using the WHO My five moments approach, correct use of mask, respiratory hygiene, and eye protection when in public or in proximity to other people.

COVID-19 (Coronavirus disease or SARS-CoV-2 infection) is a respiratory tract infection caused by a newly emergent coronavirus, SARS-CoV-2, that was first recognized in Wuhan, China, in December 2019. The disease quickly spread across the world and on March 11, 2020, the World Health Organization (WHO) declared the public health emergency of international concern (PHEIC) a pandemic. Genetic sequencing of the virus suggests that SARS-CoV-2 belongs to the β-coronavirus genus, which includes two epidemic-causing viruses: Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-1) and Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV). SARS-COV-1 causes epidemics in Asia and the SARS pandemic of 2002-2004 which infected 8,000 people and 224 deaths in 29 countries. MERS was first reported in Saudi Arabia in 2012 and causes epidemics of Asia and the Middle East.

SARS-CoV-2 is transmitted through infectious respiratory droplets and contact with contaminated fomites or symptomatic and asymptomatic cases [1]. The virus remains viable on inanimate objects for a variable duration of time and can be introduced onto the mucous membranes (e.g. mouth, eyes, etc.) through contaminated hands [2]. Infected persons are contagious as early as two days before symptoms develop [3].

People of all ages are susceptible to COVID-19. While most people with COVID-19 develop mild or uncomplicated illness, approximately 15-20% develop severe disease requiring hospitalization and oxygen support. Five percent of patients with COVID-19 require critical care [1]. Some clinical markers of severe disease include hypoxemia, elevated lactate dehydrogenase, elevated C-reactive protein, neutrophilia, and coagulation dysfunction [4]. Severe cases of COVID-19 can be complicated by multiorgan failure - acute respiratory distress syndrome (ARDS), sepsis and septic shock. The case fatality varies from country to country depending on a number of factors but typically ranges from 0.1-6% of all confirmed cases. Older persons (≥50 years old), individuals with co-morbid diseases, and males are reported to be at higher risk of severe disease [5]. The most common causes of death are respiratory failure from acute respiratory distress syndrome (ARDS), kidney failure and cardiac failure [4, 5]. Death can occur as late as 28 days after infection. In order to avert death, prompt clinical decision for acute care management is required. In one study, the median time from admission to ARDS was two days (1-4 days) [4]. The median duration of viral RNA detection was 20.0 days (IQR 17.0–24.0) in survivors, but SARS-CoV-2 virus was detectable until death in non-survivors. The longest observed duration of viral shedding in survivors was 37 days [6]. COVID-19 patients should be assessed to rule out influenza virus, respiratory syncytial virus, rhinovirus and other viral respiratory infections. Bacterial infections such as Mycoplasma pneumoniae, Legionella, meningitis, tuberculosis and Pneumocystis jirovecii [7] may also have similar presentation to COVID-19. Other differentials include ARDS, sepsis, congestive heart failure and meningitis. Sparse data exists on the clinical presentation of COVID-19 in specific populations, such as children and pregnant women but clinical presentation appears similar. In children with COVID-19 the symptoms are usually less severe than adults. They usually present mainly with cough and fever, and co-infection has been observed.

Currently, there is no specific drug treatment for COVID-19. Treatment strategies focus on supportive care. Although touted as effective, patients who received chloroquine and hydroxychloroquine had a higher mortality and more complications [8]. COVID-19 is an emerging disease and the current evidence is evolving and may change as more is learned about the disease. This interim guidance serves as a foundation for optimized supportive care to enhance the chances for survival for people who develop life threatening complications.

2 LABORATORY INVESTIGATION OF PATIENTS WITH COVID-19

- All suspected and probable cases and high-risk contacts including travelers arriving from areas where COVID-19 outbreak is ongoing must be tested for SARS-CoV-2 using their nasopharyngeal samples collected according to the defined schedule and tested on standard RT PCR.
- Low risk contacts (i.e. community members) and special populations (e.g. health workers and other frontline responders, orphanages, disabled communities, police, persons with mental illness, etc.) should have access to voluntary test for SARS-CoV-2.
- All suspected, probable and confirmed patients with moderate, severe, or critical COVID-19 should be screened and tested for common co-morbidities (e.g. HIV, Malaria, Typhoid, Hepatitis B, diabetes mellitus (blood glucose), heart, lung, liver, & kidney disease, hypertension, CBC, blood chemistry, coagulation profile, chest x-ray, urine dipstick and pregnancy test for females of reproductive potential.

2.1 Recommended samples for diagnosis

Respiratory samples should be collected, including nasopharyngeal and throat swabs. Lower respiratory samples have higher yield, but collection generates aerosols. The positivity rate is lower for other samples such as blood and urine. Induction of sputum should be avoided due to the increased risk of aerosol transmission.

Special attention is needed to ensure that the swab is obtained from the nasopharyngeal posterior wall. The patient should be educated on the procedure and what to expect and their concerns should be addressed. The throat swab sample collection is associated with minor discomfort and can induce vomiting in some people. Anal swab sampling can induce defecation.

Laboratory staff should implement infection prevention and control measures and don risk-appropriate PPE before sample collection, processing and testing.

2.2 Laboratory confirmation of COVID-19 Diagnosis

Laboratory diagnosis is based on a positive virus test for SARS-CoV-2.

A single negative test of a nasopharyngeal or blood sample cannot rule out the diagnosis.

- For probable and suspected cases who initially tests negative the second test should be done after three or more days of infection to establish the diagnosis [9, 10].
- Antibody test for COVID-19 is not approved at this time to establish a reliable diagnosis COVID-19 in Liberia. Antibodies may not show if one has a current infection because it takes 1–3 weeks after infection for antibodies to be present in the blood.

2.3 Who should get tested?

All suspected and probable cases of COVID-19 should have nasopharyngeal samples collected and tested and the results provided within 24 hours of detection and isolation. In addition:

a. All high-risk contacts should have nasopharyngeal samples collected on day 7 and 12 of quarantine.
b. All low risk contacts and other members of the public should be encouraged to visit community-based voluntary sample collection sites or mobile teams and request sample collection and testing.
c. All health workers should be provided opportunity for periodic voluntary testing and after risky exposure.
d. Special and vulnerable groups of populations (e.g. disable communities, orphanages, persons in correction facilities, mental health facilities, etc.), and public officers (e.g. police officers and soldiers) should be provided opportunity for periodic voluntary testing.

2.4 Supplementary Laboratory testing

Where resources exist, patients isolated for moderate and severe COVID-19 should undergo the following baseline laboratory screening:

a) Rapid test for malaria and Typhoid test
b) HIV screening. If positive, document the WHO HIV stage, CD4+ Count & Viral load
c) Hepatitis B virus
d) Dipstick Urinalysis and Urine pregnancy test (women of reproductive age)

e) Full blood count or Hemoglobin and total WBC

f) Blood glucose (BG): If hyperglycemia (RBS>225mg FBS>125mg/dL) do a fasting BG and glycated hemoglobin (HBA1C).

g) Blood chemistry: Electrolytes, creatinine, BUN, Liver enzymes, etc.

h) Coagulation profile – PTT or INR

i) Markers of inflammation: D-dimer, IL-6, and CRP.

j) Chest X-ray (CXR) –Bilateral infiltrates with interstitial changes which can progress to bilateral multiple ground-glass opacity/infiltrating shadows in severe disease.

3 CLINICAL MANAGEMENT

The principle of management of COVID-19 are **Early detection** (screening), **Early Isolation** of cases and **quarantine** of contacts, **Early Diagnosis** (RT-PCR for SARS-CoV-2) and **Early Treatment**.

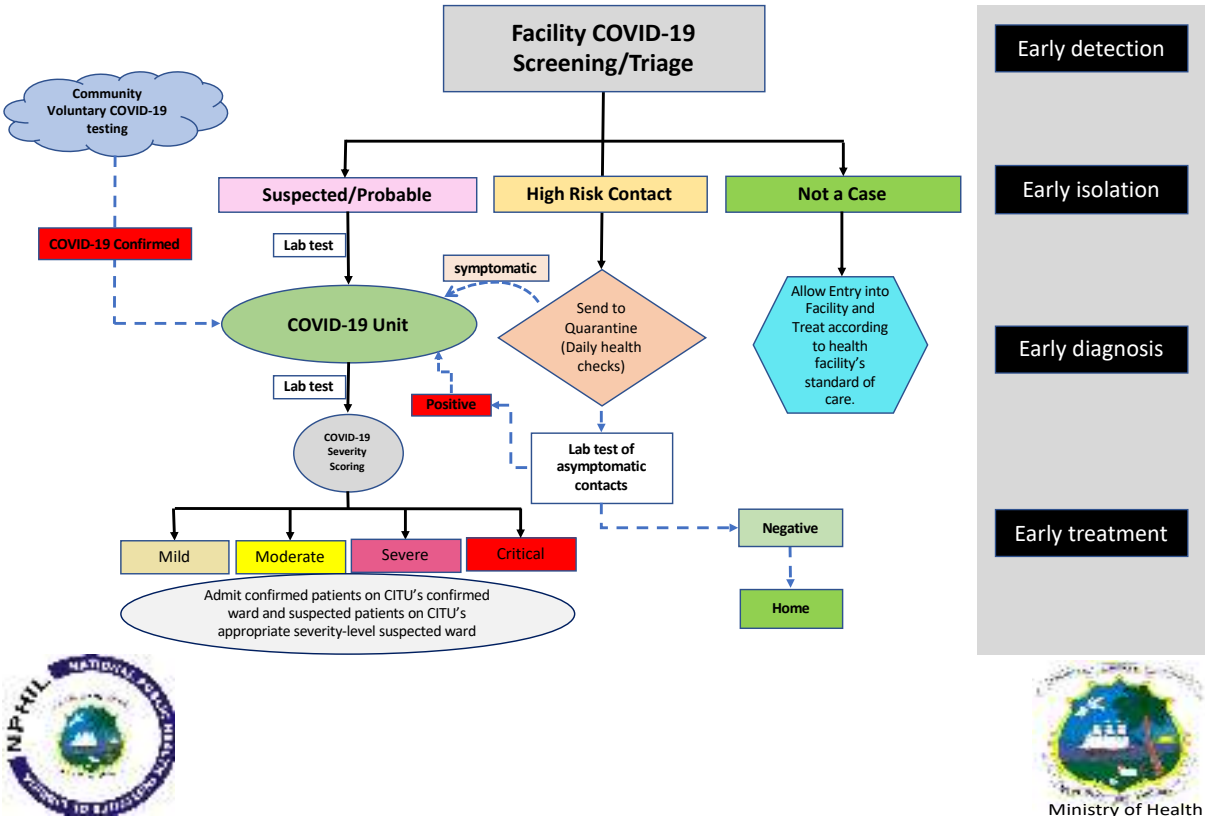
- Everyone who presents at a health facility, port of entry (travelers), in community screening centers should be checked for symptoms of COVID-19, history of travel or contact with a case of COVID-19. to identify suspected, probable and confirmed cases and high-risk contacts.
- All patients must be isolated, monitored frequently and provided appropriate and timely symptomatic treatment, psychosocial support and essential needs.
- All persons in isolation and quarantine must be assessed for the following: oxygen saturation on room air, respiratory rate, other vital signs, medical history and medical exam.
- Supplementary labs should be done for patients with moderate and severe illness.
- Use the AFEM scoring to categorize disease severity: MILD DISEASE-no/mild symptoms, MODERATE DISEASE-non-severe pneumonia and SPO_2>94%; SEVERE DISEASE-severe pneumonia PLUS SPO_2<94%; CRITICAL DISEASE: SPO_2<90%Severe pneumonia PLUS organ dysfunction/failure].
- Patients with severe and critical illness should be administered Oxygen, treated for pneumonia, and other underlying treatable conditions detected during clinical assessment.

3.1 Principles of Clinical Management

Emphasis is on four basic (early) principles: **Early Identification-Early Isolation** and **Quarantine-Early Diagnosis-Early treatment.**

Early identification depends on screening using standard case definition followed by isolation of persons who meet the case definition and clinical assessment to determine the disease severity and laboratory diagnosis followed by optima treatment. Patients with asymptomatic and mild disease require monitoring, bed rest and feeding. All patients with moderate, severe and critical COVID-19 disease will require some form of treatment. Early diagnosis and treatment mitigate risk of complications (Figure 1 summarizes the flow of patients through the clinical care continuum.

Figure 1: COVID-19 Patient Flow Through the Health Continuum



3.2 CLINICAL ASSESSMENT

3.2.1 COVID-19 screening at facilities

All patients that present to the health facility should be screened for COVID-19 using the standard case definitions (Figure 2). Clinicians are advised to retain a high index of suspicion throughout the entire continuum of care. Under the best-case assumption,

more than half of infected people are asymptomatic and unaware of their exposure and therefore fundamentally undetectable [11]. When accessible, point-of-care COVID-19 testing should be considered as part of screening. All adult patients should be screened for the following symptoms:

- Fever
- Fatigue or weakness
- Cough
- Sore throat
- Difficulty in breathing or shortness of breath
- Anosmia and loss of taste
- Sneezing or stuffy nose
- Anorexia
- Headache and myalgia
- Diarrhea

3.2.2 Outbreak Case definition:

A. **Suspected Case:** A patient is a suspected case of COVID-19 who presents with two or more of the above symptoms AND:
   - DID NOT within 14 days immediately before their arrival been in a country or region where an outbreak of COVID-19 is ongoing; AND
   - DID NOT have contact with a suspected or confirmed case of COVID-19 within 14 days before this screening; AND
   - DID NOT work (without appropriate precautions) in a facility where a case of COVID-19 was detected within 14 days before this screening.

B. **Probable Case:** A person is a probable case of COVID-19 when any one or more of the above symptoms are present PLUS at least one of the below:
   - Travel to a region or worked in or attended a health facility where a patient with COVID-19 was detected or treated within 14 days before this screening, OR

- Made physical or close contact with a probable or confirmed case of COVID-19 or a patient with severe respiratory infection within 14 days.

C. **High Risk Contact:** A person is a high-risk contact who arrived in Liberia from an area or region where an outbreak of COVID-19 was ongoing and less than 14 days have elapsed since their departure from that area; OR had contact with a suspected, probable or confirmed case of COVID-19 within the 14 days of the case detection **AND** reports NO symptom of COVID-19.

3.2.3 Initial management at the facility of a suspected, probable or confirmed case

If a patient meets the case definition of a suspected, probable or confirmed case of COVID-19, the designated staff should:

- Provide a mask [if not already wearing one or the one in use is physically damaged/soiled] and isolate in the designated holding/isolation area.
- Call the case investigation team on 4455 to initiate epi-surveillance and transfer the patient to the appropriate ward or COVID-19 Isolation and Treatment Unit (CITU).
- Inform the health facility IPC person to assess the facility IPC risk.
- Staff are required to wear risk-appropriate PPE to provide emergency care to the patient and adhere to standard IPC precautions. All contacts with the patient should be restricted to staff assigned in the isolation.
- Record vital signs and provide emergency care as required. All supplies including vital signs equipment used in this holding or isolation area should be restricted and NOT used for patients in the other areas of the facility. Reusable equipment should be disinfected before and after each patient. If the patient is stable, allow the patient to rest/wait in the isolation area.

3.2.4 Initial management of a high-risk contact at the health facility

If the patient fits the case definition of a high -risk contact, the patient will be quarantined (either at a precautionary observation center, lodging, or home) according to the quarantine guidelines in effect.

- Provide a mask [if not already wearing one or the one in use is physically damaged/soiled], offer a seat in a separate area of the triage/designated space and explain that he/she will be quarantined, the importance of quarantine and address their questions. Do NOT admit high-risk contacts in the holding/isolation area for suspected, probable or confirmed cases.

- Call 4455 to initiate epi-surveillance and transfer the high-risk contact to the appropriate POC.

3.2.5 Transfer of suspected, probable and confirmed patients to the CITU

The patient will be evaluated further by a case investigator or designated facility staff who will obtain additional demographic and contact information, their symptoms, medial history, and contacts and travel history.

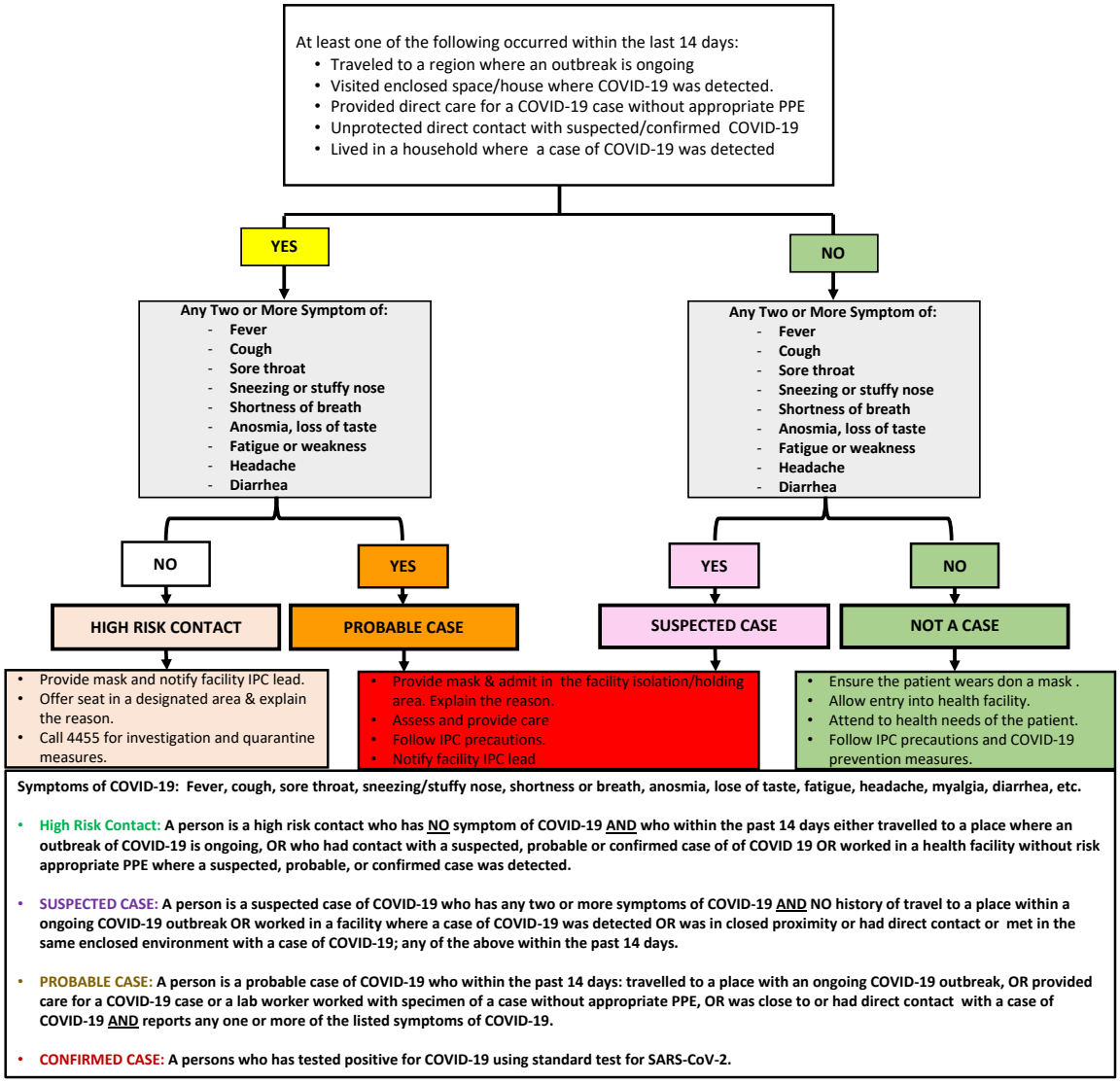
- After the case investigation is completed, a referral process is triggered to move suspected, probable, and confirmed patients to the CITU.

- The case investigator or designated facility staff will contact the call center to arrange transfer of the patient to the CITU if a CITU is not available at the health facility. A health facility that has a CITU will admit suspected, probable and confirmed patients.

- Patients who have means of private transport available at the point of screening and have only mild symptoms or are asymptomatic can use their private vehicle if this option is preferred by the patient, the patient can safely drive himself/herself to the CITU and it poses only minimal risk of transmission . In the absence of these, patients should be transferred by the Emergency Medical Service (EMS). Family members should not ride in the ambulance. If another person, such as a parent,

guardian, or medical aide, is needed in the ambulance, he/she should wear a mask, face protection, gown and shoe protection.

Figure 2: Screening Algorithm for COVID-19 in Adults



- The EMS and/or case investigator should communicate with the receiving facility immediately regarding suspected COVID-19 patients

in order for the facility to prepare infection-control measures and arrange for the admission process.

3.2.6 CITU Triage and Severity Scoring

Upon arrival at the CITU, the patient should be assessed to:

- Define/score the severity of disease (mild, moderate, severe, or critical)
- Define the level of care required based on the disease severity.
- Determine the appropriate ward to admit the patient.

3.2.6.1 Clinical Severity Scoring

- Identification of patients with severe disease is critical to save life but also challenging due to scarcity of critical care resources with limitation in oxygen and providers. The African Federation of Emergency Medicine (AFEM) severity scoring tool is a useful tool for clinical decision making [12]. The first priority is to rapidly identify patients who require critical care and respiratory support to save their life. Patients are graded into four categories based on oxygen need – mild, moderate, severe and critical:
    - Mild patients are asymptomatic or have mild symptoms.
    - Moderate patients have signs of pneumonia but do not require respiratory support (oxygen saturation is above 94%).
    - Severe patients have signs of severe pneumonia and require O_2.
    - Critical patients have severe disease and end organ dysfunction/ failure.

3.3 MANAGEMENT OF MILD CASES

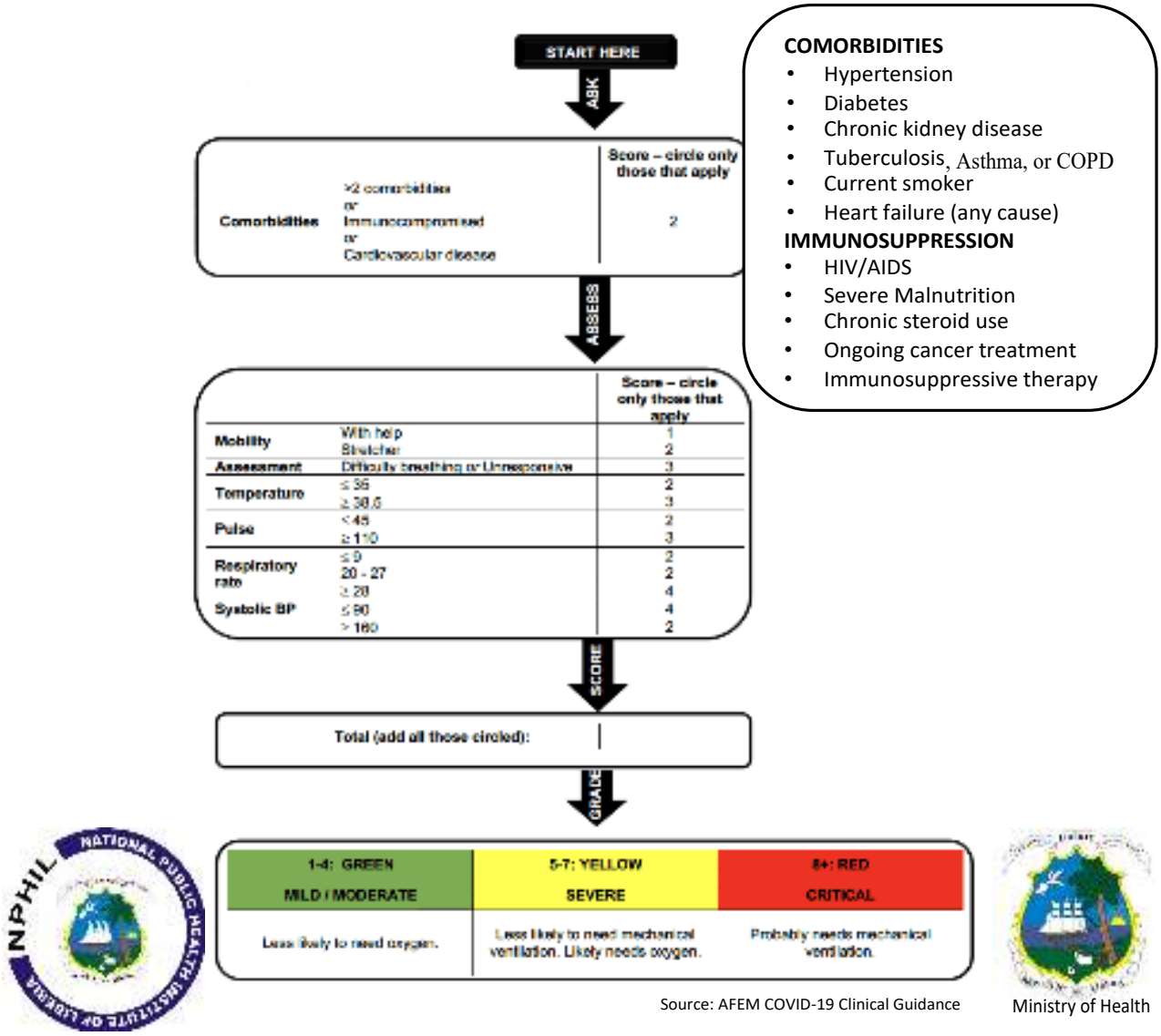
3.3.1 Clinical features

Patients with mild COVID-19 are asymptomatic or have mild symptoms of the upper respiratory tract and/or gastrointestinal tract:

- Dry cough, mild fever, sore throat, nasal congestion, headache, etc.
- GI symptoms (e.g. fatigue, diarrhea, discomfort, anorexia, etc.),
- SPO_2 >94% on room air AND normal respiration (RR<22 c/min),

- Normal blood pressure,
- Feeding adequately,
- Absence of signs of moderate disease.

Figure 3: Emergency care of COVID-19 in Adults in Low Resource Setting



Source: AFEM COVID-19 Clinical Guidance

Ministry of Health

3.3.2 Treatment

a) Conduct physical and laboratory assessment:
   - Oxygen saturation, vital signs, AFEM scoring, review symptoms & signs.
   - Assess for co-morbidities: e.g. hypertension cardiovascular diseases, malaria, HIV, typhoid fever, hepatitis B virus, tuberculosis, etc. and other risk factors (e.g. substance abuse, smoking, etc.)
   - Standard labs as outlined under supplementary lab assessment.

b) Symptomatic support:
   - Give anti-pyretic if fever:
     - Paracetamol 1000mg po 2 to 3 times daily until afebrile; CHILDREN: 10-15mg/kg po bid-tid; OR
     - Ibuprofen 400mg bid-tid until afebrile; CHILDREN 5-10mg/kg po 2-3.
     - If the fever persists, reassess and treat specific symptoms and co-morbidities.

c) Psychosocial support and bed rest.

d) Reassess once daily including SPO_2, vital signs and symptoms check. If new symptoms or escalation, estimate and document the severity score.

e) Nutritional support: Balanced diet and high intake of fruits and water.

f) Supplements (optional): Vitamin A, B and C, and Zinc Oxide, Selenium, etc.

3.4 MANAGEMENT OF MODERATE DISEASE

3.4.1 Clinical Features

High clinical suspicion for pneumonia or evidence of non-severe pneumonia without signs of severe respiratory disease:

- Cough
- SPO_2>94% on room air and no need for artificial oxygen [13].
- Mild dyspnea (RR 22-25 cycles per minute)
- AFEM score <5
- Chest findings of pneumonia (e.g. crackles) with normal chest x-ray.

3.4.2 Management

a) Conduct physical and laboratory assessment:

- Oxygen saturation, vital signs, AFEM scoring, review symptoms & signs.
- Assess for co-morbidities and other behavioral risk (e.g. smoking, substance use disorder, etc.)
- Standard labs as outlined under supplementary lab assessment.

b) Symptomatic support. In children, all drug doses should be calculated based on body weight according to the Liberia National Therapeutic guidelines. This statement applies to all medications in this guidance [14]:

- Give antipyretic if fever or pain as paracetamol or ibuprofen as above:
    - Paracetamol 1000mg po 2 to 3 times daily until afebrile. CHILDREN: 10-15mg/kg po q4-8 h /day; OR
    - Ibuprofen 400mg bid-tid until afebrile. CHILDREN: 5-10mg/kg po bid-tid

c) Psychosocial support

d) Give empiric oral antibiotics to treat non-severe pneumonia where indicated:

- Amoxicillin 500-1000mg po 2-3 times per day x 7 days. CHILDREN: 20-25mg/kg po BID x 5-7 days.
- Amoxicillin/Clavulanate 625-1250mg po bid x 7 days. CHILDREN: 25mg/kg po bid 5-7 days.
- Azithromycin 500mg po once day 1 then 250mg qd x 4 days [OR 500mg po qd x 3-5 days]. CHILDREN: 10mg/kg (max 500mg) on day 1 then 5mg/kg qd x 3-5 days.

e) Reassess daily. Review the AFEM scoring and manage symptom as required.

f) TREAT co-morbidities according to national standard guidelines.

g) Nutritional support: Balanced diet, high intake of fruits and drinking water.

h) Supplement (optional): Vitamin C, A, B, Selenium, Zinc Oxide.

3.5 MANAGEMENT OF SEVERE CASES

3.5.1 Overview

An estimated 15-20% of patients with COVID-19 progress to severe disease. The disease can progress to severe disease within two days of admission. Optimum care support can mitigate the risk of death. However, some patients may develop severe complications requiring long term care over several weeks. The AFEM scoring should be used to identify early and provide appropriate treatment for patients with severe disease. Special attention should be paid on patients with unique risks: age >50 years, male, cardiovascular disease, hypertension, diabetes or another lung or immunocompromising condition, smoker, etc.

3.5.2 Clinical features

A patient with COVID-19 is considered severe who presents with any one or more of the following occurring alone or in combination with fever:

- SPO_2 <93% on room air [13].
- Labored breathing or shortness of breath.
- Respiratory rate 26-29 cycles per minute.
- AFEM score of 5-7.
- Uncomfortable at rest.

3.5.3 Management

a) Clinical assessment:

- Oxygen saturation, vital signs,
- Review symptoms and signs (ABC).
- Assess for co-morbidities (e.g. cardiovascular disease, hypertension, diabetes mellitus, HIV, another type of immunosuppression, HBV, HCV,
- Standard labs as outlined under supplementary lab assessment.
- AFEM severity scoring.
- Three to four times daily assessment by the clinician.

b) Oxygen management

Provide supplemental oxygen to achieve SPO_2 ≥94%, unless the patient is at risk of hypercapnia [15, 16]. Going higher promote formation of atelectasis, fibrosis and uses up supplies without any added benefit.

- Oxygen should be administered by staff who are trained in oxygen administration. The staff should use an appropriate device and flow rate in order to achieve target saturation range (SPO_2>94%). In patients with adequate respiratory movements:
  - Nasal cannula: O_2 1-5L/min (20-40% oxygen) [children 1-3L/min] from an oxygen concentrator or cylinder and titrate flow rate to reach above target (SPO_2≥94%). In severe patients, oxygen delivered from cylinders and facemask is preferred if available. This allows delivery of a higher concentration and flow of oxygen. When used for long periods, nasal cannulas can produce mucosal drying.
  - Simple facemask: 6-10L/min (40-60% oxygen) [children 2-3L/min]. Patients with higher oxygen need or who cannot achieve target saturation using nasal cannula should be switched to simple face mask or yellow/red venturi mask connected to oxygen cylinder.
  - Oxygen delivered from a cylinder should be passed through a humidifier to avoid drying and injury to the airways mucosal. Under exceptional situation where higher concentration of oxygen is required and cylinders are not available, two oxygen concentrators can be combined using a "Y" connector.
  - Reassess every 2-4 hours. Patients unable to achieve target saturation of SPO_2≥93% or show signs of deterioration (SPO_2<90%, increasing respiratory rate, unstable vital signs) have critical disease:
    - Heated, humidified high flow nasal cannula oxygen at 10-15L/min. Each 10L/min provides a PEEP (positive end expiratory pressure) of 0.35-0.69 cm H_2O.This may not be suitable for patients who are hyperventilating.
    - Transfer to a critical care unit or higher level of care available in the CITU or a nearby facility with capabilities for critical care

support. The designated staff in the receiving facility should be contacted to arrange the referral before moving the patient. The patient should remain on oxygen and have an emergency responder with the patient during transport.

c) Treat pneumonia

i. Assess and score the severity of pneumonia using CRB-65 and treat with combination antibiotics according to standard guidelines:

- Ceftriaxone 1g IV BID PLUS Azithromycin 500mg po qd x 7 days. CHILDREN: Ceftriaxone 50mg/kg q 12 h]. If the patient is unconscious, crush the azithromycin tablet, dissolve in safe water and serve in nasogastric tube (NG tube). If Azithromycin is not available, serve Doxycycline 100mg po bid x 7 days [Do not administer Doxycycline to children<8 years old]; OR

- Ampicillin 1g IV q6 h x 7 days [CHILDREN 50mg/kg] PLUS Gentamicin 120mg IV qd x 7 days [CHILDREN 5-7mg/kg qd]. [Exercise caution in patients with renal impairment]; OR

- Amoxicillin/Clavulanate: 1200mg po/iv 2-3 times per day x 7 days PLUS Azithromycin or Doxycycline as above.

d) Malaria

Patients with severe/complicated malaria (positive malaria test PLUS one/more signs of complicated malaria – hyperparasitemia, impaired consciousness/coma, seizures, shock, pulmonary edema/ARDS, acidosis, acute kidney injury, abnormal bleeding, jaundice, severe anemia, etc.) should be treated according to the standard national guidelines for severe malaria:

- Artesunate 2.4mg/kg IV at 0, 12, and 24 h. If patients can tolerate oral treatment after these doses, switch to Coartem or athemeter/lumefantrine fixed dose combination adult dose (80mg Athemeter/400mg Lumefantrine PO BIX x 3 days). CHILDREN: Athemeter:

2mg/kg | Lumefantrine: 12mg/kg bid. If the patient cannot tolerate oral treatment, continue IV Artesunate to complete six days of treatment; OR

- Athemeter: 160mg IM on day 1 and 80mg IM qd on day 2 and 3. CHILDREN: 3.2mg IM day 1 then 1.6mg/kg on day 2 & 3. If patients can tolerate oral treatment after these doses, switch to Coartem as above; OR

- Quinine 10mg/kg IV q 8 h dissolve in 500ml IV fluids (5% dextrose in water or normal saline) and titrate to flow over 4 hours [CHILDREN: dissolve quinine in 20ml/kg of D5W or normal saline]. Serve q8 hours for 3 doses. If patient tolerates oral, switch to oral Quinine 10mg/kg po q8h to complete 7 days [ADULTS: 600mg po q8h]. Alternatively, use Coartem (use doses as above) if tolerated. If oral regimen is not tolerated, continue intravenous quinine until oral treatment is possible or patient completes 7 days of treatment, whichever occurs first. Patients on quinine should be closely monitored for hypoglycemia, arrhythmia, acute hemolysis (i.e. hematuria or black water fever), and tinnitus.

If the malaria test is not accessible, treat all patients with signs of complicated/severe malaria because patients with severe COVID-19 patients are difficult to distinguish clinically from severe malaria.

e) Pulmonary edema:

For patients with evidence of chest congestion or pulmonary edema (e.g. anxiety, SOB, feeling of drowning, tachypnea, diffuse crackles, hypoxemia, etc.)

- Furosemide: 60-120mg IV 6-8 h [CHILDREN 1mg/kg]. The patient should be reassessed frequently to prevent dehydration or hypotension.
- Respiratory support as described in subsection b above.
- Consider thromboprophylaxis (see sub-section h below)

- Treat other underlying causes of pulmonary edema (e.g. cardiogenic or pulmonary)

f) Anemia

A full blood count (CBC) or [at a minimum] hemoglobin. CBC is useful in the assessment for disease severity. If the patient is anemic (hemoglobin<12g/dL male or 11g/dL in pregnant female], assess for the cause of anemia. In general, treatment is based on cause/type and severity of anemia:

- Mild/moderate microcytic anemia: Hb 9-11g/dL:
  - Ferrous sulfate 1 tablet po qd for 14-21 days
  - In children, consider DEWORMING also if not dewormed in last 3 months: Mebendazole 100mg bid x 3 days.
  - Assess for the underlying source/cause of microcytic anemia (e.g. malaria, helminthiasis, etc.).

- Megaloblastic anemia:
  - Moderate: Vit B_{12} and/or Folate 1 tablet po qd x 14 days.
  - Assess for and treat the underlying cause.
- For other causes of anemia (e.g. bleeding, DIC, hemolysis, sepsis, aplastic anemia, etc.) treat according to national standard of care.

- Severe anemia: Hb <7.5g/dl; transfuse irrespective of cause:
  - Adults: Transfuse packed red cells, each unit over 2-3 hours. Each unit transfused raises the hemoglobin to at least 1 gram/dL. Target for transfusion is Hb of 8.0 g/dL. Followed by ferrous sulfate as above.
  - If Pack RBC is not possible, consider a loading dose of Furosemide 40mg IV stat at the onset of transfusion.
  - Monitor for transfusion reaction and manage according to national guidelines
  - Arrest bleeding treat sepsis or DIC.
  - Assess for and treat underlying source of severe anemia.

- Children:
    - Transfuse if Hb is <6g/dL
    - Packed RBC 10ml/kg [if whole blood 20ml/kg] over 3-4 h.
    - If Pack RBC is not possible, consider a loading dose of Furosemide 40mg IV stat at the onset of transfusion.
    - Monitor for transfusion reaction and manage according to national guidelines.
    - Arrest bleeding treat sepsis or DIC.
    - Assess for and treat underlying source of severe anemia.

g) Nutritional Support
- Encourage adequate drinking to prevent dehydration.
- Nutritional support as for moderate disease. For patients who cannot tolerate oral feeds, fruit and vegetables, consider enteral/parenteral feeding calculating the quantity based on daily fluid requirement:
- CHILDREN: 100ml/kg for the first 10kg body weight, then 50ml/kg for the next 10kg, thereafter 25ml/kg for each subsequent kg. In adults, use the 4-2-1 rule.

3.6 MANAGEMENT OF CRITICAL CASES

3.6.1 Overview

Estimated 5% of patients require admission to an intensive care. These cases have evidence of end organ dysfunction or failure such as disseminated intravascular coagulation (DIC) of a thrombotic type, acute respiratory distress syndrome (ARDS), sepsis and septic shock, or multiorgan failure, including acute kidney injury and cardiac injury. The risk is higher in patients older than 50 years old and patients with co-morbid diseases [5]. The most common causes of death are respiratory failure from ARDS, kidney failure and cardiac failure [4, 5]. Death can occur as late as 28 days after infection. Time

from admission to ARDS can be only two days (1-4 days) [4]. Hence, clinical decision for acute care management must be made quickly to advert death. This requires frequent reassessment and re-scoring of the patient's condition [4].

3.6.2 Clinical features

A suspected or confirmed case of COVID-19 is considered critical which presents with signs of end organ dysfunction or failure. Assess for any one or more of the following:

- AFEM score ≥8
- Respiratory rate ≥30 cycles per minute or SPO_2<90%
- Severe respiratory distress or SOB (e.g. gasping, grunting, etc.) or ARDS.
- Hypercapnic respiratory acidosis.
- Other signs of respiratory congestion or pulmonary edema.
- Altered mental status or coma
- Convulsions
- Low (BP<90/60mmHg) or elevated blood pressure (>BP 150/90mmHg) in a patient without hypertension.
- Reduced urine output
- Markedly elevated inflammatory markers and coagulation dysfunction.

3.6.3 Principles of Clinical Management

Admit/transfer the patient to an ICU or highest level of care available or refer.

a) Conduct physical and laboratory assessment:
    - Oxygen saturation, vital signs every 1-2 hours;
    - Review symptoms and signs (physical exam every 2-4 hours).
    - Assess for co-morbidities.
    - Standard labs as outlined under supplementary lab assessment and ECG if accessible.
    - AFEM scoring,
    - Insert large bore intravenous catheter and a urethral catheter and monitor and document urine output.

b) Supplemental oxygen therapy:

- Provide supplemental oxygen starting at 10-15L/min [CHILDREN: 3-6L/min] titrate to achieve target of SPO_2 >93%, unless the patient is at risk of hypercapnia [15, 16]. Going higher promote formation of atelectasis/fibrosis and increases cost without any added benefit.
- Oxygen should be administered by staff who are trained in oxygen administration. The staff should use appropriate devices and flow rates in order to achieve target saturation range. These patients require acute monitoring. Oxygen should be given by:
    - Green venturi mask can deliver up to 10-15L/min (40-60% oxygen) [CHILDREN 3-5L/min]. Avoid if unable to prevent aerosol spread.

    - Non-rebreather mask delivers 85-90% oxygen at 15L flow rate from oxygen cylinder or liquid oxygen source. Saturations should be maintained between 93-96%.

- Monitor closely for any deterioration. Patients deteriorating or not improving require positive pressure non-invasive ventilation (NIV) through a variety of interfaces (e.g. orofacial mask, full face mask, nasal mask or helmet mask):

i. CPAP (continuous positive airways pressure) provides high pressure oxygen with a tight-fitting mask and maintain positive pressure all the time to help keep the airways open. Patients with pulmonary edema may require CPAP and other treatment of edema (see above).

ii. BiPAP (bilevel positive airways pressure) ensures high positive pressure on inspiration and lower positive pressure on expiration. BiPAP is especially useful in patients with ARDS and those presenting with COPD exacerbation.

iii. Adequate ventilation and oxygenation, correction of respiratory failure and the patient's tolerance and comfort are the main goals of

NIV. The initial setting should focus on achieving adequate tidal volumes (5-7 mL/kg) and additional support to reduce the respiratory rate to less than 26 cpm and achieve a pulse oximetry goal of >90% or room air. Where available, serial arterial gas measurements are essential to monitor response to therapy and guide further adjustments of the ventilator. Initial settings starting at 10cm H_2O/5cm H_2O) and adjustments based on level of improvement in patient status.

iv. Proper fitting of the mask is key for successful NIV. NIV should be provided by trained staff. Orofacial mask is suited for less cooperative patients, patients with higher severity and provides more effective ventilation. Nasal mask is suited for patients who are cooperative, have aspiration risk with emesis, less severe disease and patients who are not claustrophobic.

v. NIV is only suited for patients who have inspiratory effort. NIV is contraindicated in patients with coma (Glasgow Coma Score <7), cardiac arrest, respiratory arrest, gasping for air, shock (SBP<90 mm Hg), increase in encephalopathy, inability to protect the airway (e.g. impaired swallowing or cough, depressed sensorium, status epilepticus, etc.) or another condition that requires immediate intubation.

vi. Invasive ventilation:

- Patients with critical disease NOT improving on NIV require invasive ventilation (i.e. A ventilation bag or machine is attached to an artificial airway [i.e. endotracheal tube or tracheostomy tube] to ventilate the lungs.
- Invasive ventilation allows for fully controlled delivery of 100% oxygen. It is required for critically ill patients who are not improving with lower oxygen support. A trained staff with skill

is required. These patients require 24-hour monitoring. In the absence of skilled staff and mechanical ventilation, patients in this category should continue oxygen therapy with non-rebreather mask combined prone position if not contraindicated.

c) Thromboprophylaxis:

- COVID-19 can be complicated with disseminated intravascular coagulation of a pro-thrombotic character [17, 18]. Anticoagulation therapy can lower the risk of mortality especially in patients with sepsis and/or ARDS. Elevation in D-dimer helps in early recognition of patients at higher risk and predicts outcome. In the absence of D-dimer measurement, consider low dose thromboprophylaxis with low molecular weight heparin (LMWH) [13]:
  - Enoxaparin: 30mg SC q12h x 5 days [CHILDREN: 0.5mg/kg sc q12h] OR
  - Dalteparin Sodium 100 units/kg (max 18000 units) SC daily until oral anti-coagulation possible.
- The patients on anticoagulants should be assessed frequently for hypokalemia, thrombocytopenia and for new signs of bleeding (e.g. petechiae, GI hemorrhage, new onset SOB, sudden increased/onset of vaginal bleeding, etc.) and cautious use is advised in patients with end stage renal disease and morbid obesity. When available, coagulation profile (e.g. INR) and d-dimer should be done. Thromboprophylaxis should be done under the guidance of an experienced physician.

d) Maintenance fluid if patient is not drinking.

- Fluid support should not exceed output in a patient not in shock. Estimate fluid dose to replace output by all routes.
- In patients in shock cautious use of intravenous fluid is required to prevent pulmonary congestion and worsening respiratory functions.

- If not possible to measure volume output, consider total daily fluid infusion not more than 2000ml.
- Maintenance fluid requirement in children:
    - 100ml/kg for the first 10kg,
    - Then 50ml/kg for the next 10kg,
    - Thereafter 25ml/kg for each subsequent kg.

- The preferred fluid is lactated ringers. When not available, normal saline can be used. Change to oral hydration if patient can tolerate oral fluids.

- Urine output, oxygen saturation and vital signs should be monitored every four hours in patients with intravenous fluid administration to detect signs of volume overload early and intervene dose of furosemide IV (see above).

- Patients meeting the criteria of sepsis-induced coagulopathy or with markedly elevated d-dimer should be considered for full therapeutic-intensity anticoagulation if such an indication is present.

e) Awake Prone positioning

- Awake Proning should be considered in all patients with severe and critical disease in the absence of contraindication. Prone positioning improves oxygenation in patients who require mechanical ventilatory support especially for the management of ARDS [19]. This is especially useful in places without mechanical ventilation and to avoid intubation. It reduces ventilation/perfusion mismatch and promote recruitment of the dorsal regions of the lungs. Proning is not without risk. It can mask deterioration and if the effects are not properly monitored with a pathway in place the decision to intubate can be delayed, potentially causing more harm to the patient. A turn can trigger a drop on saturation. Staff needs to ensure acute monitoring.
- Frequency: 2-4 hours repeated twice daily as long as is tolerated. If the patient deteriorates and requires assistance to get out of the prone position

it is recommended the arm over which they will roll is either tucked under the chest and shoulder as it was when they got into prone or is flat against the leg, palm against the thigh.

- Requirement: The patient is able to demonstrate a range of movement in their neck and shoulders compatible with prone lying. The patient is able to find a tolerable prone position with guidance and positioning aids, in order to trial proning. The patient is able to move themselves into that prone position with one person to assist them with positioning aids.

- A staff member with appropriate clinical skills should be available to remain with the patient for at least the first 30 minutes and frequently after.

- Contraindication: Cardiovascular instability, severe hypoxemia, agonal breathing, cardiac arrest, impaired level of consciousness/coma, acute head or spinal injury, uncontrolled seizure, second/third trimester pregnancy, etc.

Figure 4: Self Prone Position

Full prone, with head turn, both arms tucked under chest/shoulders. Consider a pillow under shins to off load hamstrings and pressure on the toes.

Full prone with pillow under one leg to support pelvis. Bilateral arms abducted and externally rotated. Arms can be placed anywhere comfortable.

Side lie with partial prone. Pillow between knees and under shoulder/trunk to support rotated torso forward towards prone.

f) Corticosteroids:

- Routine use of corticosteroids is not recommended. In children, corticosteroid use is not recommended because they are not beneficial [20]. They suppress lung inflammation which occurs in COVID-19 but also inhibit

immune responses and pathogen clearance. In a trial, patients who were given corticosteroids were more likely to need mechanical ventilation, vasopressors and renal injury and did not reduce risk of mortality [20]. Life threatening ARDS, diabetes and avascular necrosis can also occur from steroid use. It can be considered on a case by case basis in critically sick patients with septic shock and myocardial insufficiency [21, 22]. Criteria to start corticosteroids:

- Septic shock AND not improving after >24 hours of appropriate treatment (see section on sepsis and septic shock) and ventilation.
- Worsening mental status or new onset cerebral or pulmonary edema after 24 hours in critical care.
- These changes suggest that patients with lung lesions are in the stage of progression. Decision to use corticosteroids should be individualized. If the decision is made to administer corticosteroid, its use should be for a short course (should not exceed five days).
- Recommendation:
    - Hydrocortisone 50mg iv q6 h for 5 day [CHILDREN 4mg/kg iv q6h; OR
    - Methylprednisolone: 25mg po on day 1 and decrease by 5mg daily over 5 days [CHILDREN 1mg/kg qd x 5 days]; OR
    - Treatment should not exceed five days.
    - Higher doses should not be used in sepsis without shock or to treat pneumonia.

- Patients who are already taking corticosteroids for another cause (e.g. COPD and Asthma) should continue their steroid treatment unless it is contraindicated, or the risk of harm exceeds any anticipated benefit.

g) Other treatment of Critical Disease is as for severe diseases:

- Empiric combination broad spectrum antibiotics for severe pneumonia.
- In patients with pulmonary edema, reassess for ARDS and septic shock and manage accordingly. Administer IV furosemide as described.

- Fluid management as for severe disease.

3.7 CRITICAL COVID-19: MANAGEMENT OF COMPLICATIONS

3.7.1 Hypoxemic Respiratory Failure and Acute Respiratory Distress Syndrome (ARDS)

3.7.1.1 Overview

Acute hypoxemic respiratory failure is defined as severe arterial hypoxemia that is refractory to supplemental oxygen which is caused by intrapulmonary shunting of blood resulting from airspace filling or collapse. ARDS is a new or worsening respiratory symptoms with onset within one week of known clinical insult with infiltrates on chest x-ray after excluding pulmonary edema of cardiac origin. The worsening respiratory distress is evidenced by failure of response to standard oxygen therapy (continuous increased work of breathing hypoxemia despite oxygen delivery via a face mask with reservoir bag).

3.7.1.2 Management

Where arterial blood gas analyzer is not available, pulse oximeter should be used and ARDS is diagnosed using the Kigali modification of the Berlin definition of ARDS i.e. $SPO_2/FiO_2 < 315$ [23].

a) A patient with hypoxemic respiratory failure/ARDS should be transferred to and managed in an intensive care unit (ICU) or high dependency unit (HDU).

b) Assessment:
   - Acute monitoring of Vital signs: Oxygen saturation, respiration, temperature, pulse, BP, and level of consciousness. Acute electronic monitoring where available.
   - Examination: Level of consciousness, and respiratory and cardiovascular examination. Assess hydration status.
   - Labs: Arterial blood gases and appropriate labs as described (See above).

c) Oxygen:

Commence High-Flow Nasal Oxygen (HFNO) or Non-Invasive Ventilation (NIV) at 10-15L/minutes using face mask with reservoir (non-rebreather).

- Titrate oxygen to target SPO_2> 90%
- Avoid high flow oxygen in hypercapnia from suspected chronic obstructive pulmonary disease (COPD).
- Monitor closely for 1 hour for clinical improvement/deterioration and adjust oxygen accordingly.
- If no improvement, CPAP can provide the greatest amount of mean airway pressure, and thus most effective in recruitment of alveoli [24].
- Increase the CPAP pressure to 10-15cm H_2O if tolerated.
- Titrate FiO_2 against oxygen saturation. Falling FiO_2 requirements indicate effective recruitment, whereas rising FiO_2 requirements suggest CPAP failure.
- If status deteriorates, pre oxygenate with 100% FiO_2 for 5 minutes, via a face mask with reservoir bag/bag-valve mask/HFNO/NIV
- Institute mechanical ventilation (endotracheal intubation) while maintaining strict IPC practices (refer to IPC section) by a trained and experienced provider (A rapid sequence intubation is appropriate after an airway assessment that identifies no signs of difficult intubation).
- Implement lung protective ventilation (LPV) using lower tidal volumes (6ml/kg predicted body weight) and lower inspiratory pressures (plateau pressure <30cmH_2O), respiratory rate of 35 cycles per minute, PEEP < 10 mmH_20 and FiO_2 of 100% in ARDS (Deep sedation may be required to control respiratory drive and achieve tidal volume targets) [25].
- If ARDS worsens, safely commence prone ventilation for >12hrs per day.
- In patients with moderate or severe ARDS, give higher PEEP.

  Use weaning protocols that include daily assessment for readiness to breath spontaneously and transiting to light sedation.

d) Awake proning

- This involves a non-intubated patient on oxygen therapy who prone themselves by lying on their belly. For patients with difficult lying in a prone position, alternating between lying on different sides might also be beneficial.
- Proning can be combined with simultaneous use of any other noninvasive support device (e.g. low-flow nasal cannula, high-flow nasal cannula, or CPAP).
- Proning requires a cooperative patient with intact mentation
- Commence conservative fluid management strategy (for ARDS patients without tissue hypoperfusion) to reduce the duration of ventilation. [CHILDREN: use maintenance regimen].

e) Acute monitoring: Ensure close monitoring of vital signs (heart rate, respiratory rate, blood pressure, pulse, oxygen saturation)

f) Supportive therapy:

- Give supportive therapy as the need arises. This is to ensure adequate fluid and electrolyte balance. Maintain nutrition support (enteral or parental) as indicated.

g) Observe strict IPC using standard PPEs and N95 respirator in critical care setting or during aerosol generating procedures

3.7.2 SEPSIS AND SEPTIC SHOCK

3.7.2.1 Overview

Sepsis in adults is a life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection; while in children, it is defined as suspected or proven infection with quick sequential organ failure assessment score (Qsofa)≥2 [24, 26].

Septic shock on the other hand in adults, is defined as persisting hypotension despite volume resuscitation, requiring vasopressors to maintain mean arterial pressure (MAP) ≥65 mmHg and serum lactate level >2 mmol/L [26].

3.7.2.2 Management of Sepsis and Septic Shock

a) Resuscitation of adult patients with Sepsis and shock

Early goal-directed therapy remains the mainstay of the resuscitation bundle in the management of severe sepsis and septic shock once clinical signs/laboratory evidence of severe organ dysfunction is recognized.

Within 1 hour of recognition of sepsis, following sample collection, commence:

- Antimicrobial therapy
- Intravenous fluid
- Vasopressors for hypotension, and
- Deliver resuscitation bundle within 6 hours

b) Assess for signs of shock [27].

- Fast, weak pulse
- Pallor or cold extremities and mottling of skin
- Prolonged capillary refill (>3 seconds)
- Dizziness or inability to stand
- Decreased urine output (<30 ml/hour)
- Difficulty breathing
- Impaired consciousness, lethargy, agitation, confusion
- Low blood pressure – systolic blood pressure (SBP) <90mmHg

c) Laboratory investigation:

- Order appropriate laboratory investigations as above AND complete septic workup (e.g. blood cultures, sputum culture, chest X-ray, examination of line sites etc.) to guide antibiotic selection.

d) Antibiotic Therapy

- Secure IV access and commence combination IV antibiotics (see antibiotic management in severe COVID-19.
- Place IV catheter (aim for 18G or larger) in largest available peripheral vein within 5 minutes. Avoid antecubital fossa (elbow crease) if another site is available due to frequent interruption of flow with bending of elbow.
- Use of central venous and arterial catheters should be based on resource availability and individual patient needs.

e) Fluid of choice

- Crystalloids:
  - Lactated Ringers solution is the fluid of choice.
  - Normal saline may be used but is associated with hyperchloremic acidosis.
  - Avoid hypotonic solutions.
  - Administer Fluid bolus
    - Give 20 ml/kg approx. 1 liter IV over 30 to 60 mins
    - Reassess as soon as the liter has run in. Look for signs of dehydration and shock.
    - If signs of shock persist following initial fluid bolus, repeat crystalloid bolus 250 to 500mls up to 60ml/kg over first 2 hours.

f) Monitor and assess vital signs - Resuscitation targets

- Capillary refill <3 seconds
- Absence of skin mottling; easily palpable peripheral pulses; warm, dry extremities; improved mental status
- Heart rate < 100/min
- Urine output > 30 ml/hour
- SPB > 90 mmHg or MAP > 65 mmHg
  - Start maintenance fluid therapy if SBP > 90 mmHg and other signs of poor perfusion resolve. Many severely ill adults will require 2 - 3 liters of fluid per day for maintenance

- Watch carefully for signs of fluid overload (increased jugular venous pressure, increasing crepitations on auscultation) If present, decrease the rate of fluid administration

g) Start oxygen therapy to maintain SPO_2 > 90%

- If MAP remains < 65mmHg after fluid resuscitation and reassessment at 1 hour, administer vasopressors (e.g. norepinephrine, epinephrine, vasopressin, and dopamine) through central venous (CV) line. Watch out for extravasation necrosis if peripheral line is used.

h) Vasopressors

- Maintain a minimum perfusion pressure and adequate flow during life-threatening hypotension
- Norepinephrine is drug of choice - potent vasoconstrictor with less increase in HR (COVID 19/surviving sepsis guideline)
- Titrate vasopressors to improve markers of perfusion: i.e. mental status, urine output, normalization of lactate and skin examination.

i) Steroids

- Consider low dose IV hydrocortisone (see above) if fluid resuscitation and vasopressors fail to restore hemodynamic stability
- Caution – do not use high doses, do not use in sepsis without shock or to treat pneumonia alone

3.8 MANAGEMENT OF OTHER SYMPTOMS

Table 1: Management of Symptoms

#	Symptom	Recommendation	Other comment
1	Sore throat	Vitamin C 1 tablet suck bid x 7 days Drink water and keep throat moist.	Consider oral antibiotic (see management of mild/moderate disease above) if an infection is

#	Symptom	Recommendation	Other comment
			suspected. E.g. Red, swollen tonsils with exudates.
2	Fever	Cold bath/tepid sponging Paracetamol 1g po bid-tid until afebrile.	Assess disease progression and rule out underlying cause.
3	Headache	Bed rest, Paracetamol, drinking sufficient amount of water and eat well.	Assess disease progression and rule out underlying cause.
4	SOB	Assessment: vital signs, oxygen saturation, exam, AFEM scoring. Respiratory support as required (see oxygen therapy for severe and critical disease above).	Pulse oximeter should be available to assess for hypoxemia.
5	Cough	Manage dry cough as sore throat (Vitamin C, drink water and keep throat moist).	Patients suspected of pneumonia should be treated with antibiotics as recommended.
6	Diarrhea	Oral rehydration if tolerated or conservative IV fluid administration (lactated ringers), Zinc sulfate 20mg po qd x 14 days. Paracetamol (if abdominal pain). Antibiotic if indicated: (doxycycline 100mg bid x 7 days, take after meals OR Metronidazole 500mg po tid x 5 days take after meals)	Consider antibiotic treatment if an infection is suspected. Doxycycline or Ciprofloxacin with/without Metronidazole.
7	Fatigue/weakness	Nutritional support, oral hydration and bed rest.	Reassess and treat any comorbidity/underlying cause.
8	Myalgia/body pain	Bed rest, Paracetamol, drinking sufficient amount of water and eat well.	Assess disease progression and rule out co-existing illness.
9	Convulsions	Rapid assessment (ABC). Assess vital signs: SPO_2, RR, BP, other exams Clear airway: e.g. remove debris/fluid, neck position, oxygen, etc. Place patient in position to keep airway and make comfortable with less risk of injury. Consider diazepam if convulsion last > one minute.	Diazepam causes respiratory depression. Exercise precaution stay with patient and reassess. Prepare to provide respiratory support to patients with respiratory depression or arrest.
10	Signs of airway obstruction	Assessment: vital signs, oxygen saturation, physical examination.	Provide respiratory support as required. Pulse oximeter should

#	Symptom	Recommendation	Other comment
		Perform airway maneuver and clear obstruction Albuterol nebulization or meter dose inhalation (MDI) if bronchoconstriction. Treat pulmonary edema: Furosemide 20-80mg 2-4 times a day if indicated.	be available to assess for hypoxemia.
11	Pulmonary congestions	Consider critical disease, reassess to identify cause (e.g. rule out cardiogenic causes), and provide respiratory support. Assessment: vital signs, oxygen saturation, physical examination, standard labs. Treat pulmonary edema: Furosemide 20-80mg 2-4 times a day if indicated.	Patients with pulmonary congestion should be categorized as critical and managed as such. Assess for underlying cause (e.g. respiratory, cardiovascular or COVID-19).
12	Hypoglycemia	Offer juice and/or food if tolerated. If not, administer appropriate dose of 50% dextrose and food when the patient can tolerate. Insert nasogastric tube for patients who cannot be feed otherwise.	Patients who are unable to feed (e.g. coma or altered mental status) should benefit from enteral/parenteral feeding.
13	DVT prophylaxis	SC Low molecular weight heparin or fractionated heparin (see thromboprophylaxis above).	In the absence of INR or coagulation profile measurement, caution is advised.
14	Hyperglycemia	Assessment: vital signs, oxygen saturation, physical examination. Assess for diabetes mellitus (DM) (e.g. medical history, FBS, HBA_1C, etc.) Insulin therapy if stress hyperglycemia is excluded	Transfer patients manifesting acute complications of DM (e.g. DKA) or hyperglycemic hyperosmolar state to the ICU.
15	Prevention of pressure ulcers in unconscious patients	Turn patients 2 hourly. Place pillow or inflated balloon below pressure points. Use compression wear, try in-bed/wheelchair mobilization if doable without negative effect on patient's condition.	Patients with chronic comorbidities may require referral for further care after discharge from the CITU.
16	Lack of sleep	Find out why patient can't sleep. Advice on maintaining sleep routine.	Avoid benzodiazepines because of inherent risk of respiratory depression. Refer the patient to

#	Symptom	Recommendation	Other comment
			a mental health clinician (MHC) for more evaluation.

3.9 MANAGEMENT OF CO-MORBIDITIES

Assess all patients for co-morbidities (e.g. cardiovascular diseases, HIV and other immunocompromising diseases, chronic lung disease, etc.), other biological and behavioral risk (e.g. age, smoking, substance use disorder, etc.) & provide appropriate and prompt treatment according to the national standard of care.

All patients should be the assessed for existing co-morbidities. Older age and comorbid diseases have been reported with consistency as risk factors for severe disease and death [6, 28].

a) During baseline screening at the CITU, the medical history of all patients should be assessed.
b) Assess for hypertension, cardiovascular diseases, diabetes mellitus, chronic kidney disease, tuberculosis, COPD and other chronic lung diseases, chronic liver disease, malnutrition, HIV and immunocompromising conditions.
c) Lab assessment of patients with moderate and severe disease as described above.
d) All treatable comorbidities should be managed according to national guidelines [29].
e) Patients should be encouraged to continue their routine medicines unless the risk of harm in the setting of COVID-19 outweighs any benefit a drug provides. (e.g. hold antihypertensive drug if patient in shock).
f) All doses of all drugs taken by the patient should be monitored and charted.
g) Multidisciplinary collaboration among physicians, nurses, pharmacists and all relevant health workers should be encouraged for the management of comorbidities and associated complications.

3.10 MANAGEMENT OF SPECIAL POPULATIONS

1. PREGNANT WOMEN and BREASTFEEDING MOTHERS
2. CHILDREN
3. ELDERLY

4. PEOPLE LIVING WITH HIV

3.10.1 PREGNANT WOMEN

- Prioritize rapid lab turnaround time for pregnant women who are suspected, probable and confirmed cases or high-risk contacts of COVID-19.
- Establish a maternal-friendly ward in the treatment unit for pregnant women.
- Maintain a low threshold for oxygen support (SPO_2<95%).
- Establish a clear referral pathway for management of obstetric and neonatal emergencies.
- Management of pregnancy in COVID-19 is based on national standard of care. However, spinal anesthesia is preferred if surgery is indicated and NSAIDS combined with paracetamol are preferred for pain control. Caution should be exercised on the use of opioid analgesics.

3.10.1.1 Overview

Currently, there is no evidence of pregnancy-specific clinical signs, consequences, and adverse maternal outcomes in COVID-19. However, other coronaviruses (i.e. SARS-CoV and MERS-COV) are known to cause severe disease and complications in pregnant women such as miscarriage, preterm birth, end organ complications and death. Data on nine pregnant women with COVID-19 showed that the presentation of COVID-19 in pregnant women is similar to that observed in other patients. Test on amniotic fluid, cord blood, and breast milk did not find evidence of the presence of SARS-CoV-2 in the product of conception or neonates [30].

3.10.1.2 Antenatal and postpartum follow up

During antenatal follow-up, all pregnant women should be screened for COVID-19 and educated about its prevention, labor, and delivery, etc. All regular maternal and fetal monitoring and treatment package should be continued uninterrupted while admitted in the CITU or quarantine. A safe maternal and childcare ward should be established on the CITU with a designated team to work in this area on each shift.

- Maintain a lower index (SPO_2 <95%) to initiate oxygen support to protect fetal wellbeing.

- Patients with pre-eclampsia, eclampsia and other coexisting obstetric and non-obstetric conditions should be managed according to national standard of care.
- Maintain a high index of suspicion and acute monitoring to detect and treat respiratory depression for patients who are administered $MgSO_4$.
- Laboratory assessment: Standard laboratory assessment as described above to identify and manage complications and comorbidities.

3.10.1.3 Labor and delivery

COVID-19 is not an indication for caesarean delivery (CS). Clinicians should maintain a lower threshold (SPO_2<95%) for oxygen support. Where CS is indicated the safest route of anesthesia is spinal. Postoperative management of pain:

- First option: NSAID (e.g. Diclofenac 50mg IM/PO bid when needed PLUS paracetamol)
- Second option: Low dose Tramadol: 50mg IM/IV when needed (but not less than q6h).
- Third option: Pentazocine 30mg IM when needed. Switch to oral NSAID when pain control can be achieved by this option.
- Monitor for early signs indicating respiratory depression and intervene (e.g. stop/change analgesic to multimodal pain treatment-first option, assess for drug interaction, avoid using two or more sedatives at same time, etc.).

- Inform labor and delivery team about the pregnant patients who have suspected or confirmed COVID-19 so that appropriate IPC precautions and preparations can be made (e.g., identifying the most appropriate room for labor and delivery, identify essential supplies and kits, plan in advance for possible emergency CS in case the need arises. If the facility lacks capability to manage obstetric emergency (e.g. no capability for emergency CS), a functional ambulance should remain on site throughout labor and delivery and referral plan prearranged with a nearby facility with such capability.

- The pediatric team should also be informed to prepare for the neonate.

- Place mother on Contact, Droplet, and Eye Protection Precautions.

- If the woman has fever (≥100 ^{0}C) OR unable to control her respiratory symptoms, then immediately after delivery (no delayed cord clamping or skin to skin), the neonate should be warmed, dried, assessed, and taken to a designated neonatal area. If fever, treated with combination antibiotics and paracetamol as described above.

- Document APGAR at 1, 5, and 15 minutes.

- If mother is afebrile (<100 ^{0}C) and able to control her respiratory symptoms and able to use surgical mask, then immediately after delivery (no delayed cord clamping), neonate should be taken to designated area to be dried and assessed until mother's face/chest can be cleaned and clean mask and clean gown applied. Infant then can immediately breastfeed while mother wearing PPE.

3.10.1.4 Post-partum care and breastfeeding

- Routine postpartum care should be provided to mothers with suspected or confirmed COVID-19.

- Pregnant women, new mothers and their newborn may require extended follow-up and care even after discharge from the CITU. However, no further quarantine after meeting conditions for discharge.

- Pregnant and postpartum mothers require reassessment for depression, mood swings, trouble sleeping, anxiety, etc. During the time of isolation, new mothers and pregnant women may find it difficult without the aid of partner and family support. The care team should consider allowing the partner access if safe to do

so. Encourage family members to remain in constant contact through phone calls, social media chats, and send gift cards, extra fruits, meals and other requests by the woman.

3.10.1.5 Breast feeding:

- Currently, there is no evidence of COVID-19 transmission via breastmilk. Maternal breast milk may be provided to infant and supply should be protected with early (within first hour) and frequent (q 3 h) pumping if mom and baby require separation.

- If a mother who can control respiratory symptoms wish to breastfeed, she should wear a mask, clean gown and perform hand and chest hygiene before feeding. When infant not breastfeeding, infant should be returned to incubator.

- If a mother does not plan to breastfeed or is unable to due to their health status, infants should receive formula through bottle feeding with expressed breastmilk or formula by another caregiver. Infant caregiver should perform hand and breast hygiene and wear PPE (gown, gloves, mask, and eye protection).

- Pumping: Prior to expressing breast milk, mothers should wear mask and perform breast and hand hygiene. After each pumping session, the entire pump should be appropriately disinfected per the manufacturer's instructions.

3.10.2 COVID-19 IN CHILDREN

- Children under five should be screened using the screening algorithm for children under five.
- Establish a child-friendly ward with minimum risk in the treatment unit for children.
- Management of COVID-19 in children is similar to adults. However, doses of all medication should be based on each child's body weight.

3.10.2.1 Overview

For children under five years, transmission is more commonly by a caregiver or someone in the child's environment. If not controlled, an explosion can occur through transmission within nurseries and schools (from droplets and inanimate objects such as toys) mixed with wider community spread. At this stage, children can become important spreaders [31]. Postnatal infection can occur during vaginal delivery of a pregnant woman with COVID-19 through droplet transmission due to close physical and social contact. There was no documented report of vertical transmission of COVID-19 from the mother to the baby at the time of this publication [30, 32].

Most cases of COVID-19 in children have mild symptoms similar to those observed in adult patients. In neonates, diarrhea is common [33]. Although the incidence of critical disease in childhood is low, some children develop severe illness requiring hospitalization and intensive care. A rare syndrome of multisystem inflammatory disorder in children and adolescents with features of Kawasaki disease and toxic shock syndrome have been observed [34].

Children with underlying disease such as chronic lung disease including asthma, congenital heart disease, kidney disease, severe acute malnutrition, severe pneumonia, bronchiolitis, tuberculosis, and other severe immunosuppression are at risk of severe disease [33]. These children can quickly progress to ARDS, shock, encephalopathy, myocardial injury, heart failure, coagulopathy and other dysfunction and death [35].

3.10.2.2 Screening of COVID-19 in Children Under Five Years

Acute respiratory infections are the most frequent reasons for health facility visit in children under five years old. Therefore, experienced clinicians should be involved in the screening of children for COVID-19 and caution must be exercised to prevent unnecessary exposure of children to potential nosocomial infections. At the same time, early identification and isolation of children with COVID-19 mitigates risk of transmission and optimizes care.

a. Alert Case

A child with symptoms of respiratory illness and/or CXR findings (peribronchial/interstitial infiltrates or consolidation) AND NO confirmed case in the home, caregiver or community AND NO history of travel/contact. These children should be admitted on the designated ward in the routine facility and closely monitored, assessed and treated for the underlying disease and tested for COVID-19 if the clinical team deem it necessary. Standard and additional precautions should be used in providing care.

b. Suspected Case

A child under five years old is a Suspected case who reported no symptom within the past 14 days AND whose primary caregiver, or another close contact is a suspected or confirmed case of COVID-19. Consider moving the child to isolation [36].

c. Probable case

i. A child under five years old is a probable case who is a newborn of a suspected or confirmed case **OR** a close contact of a suspected or confirmed case; **OR** traveled to **OR** living in the immediate household or community where a COVID-19 outbreak is ongoing **AND** any one or more of the following symptoms within 14 days of the contact:

- Fever, cough, sore throat, shortness of breath, diarrhea, anosmia, loss of taste, fatigue, headache, myalgia.
- Cold clammy skin, altered mental status, refusing all meals, convulsion, central cyanosis, hypoxemia.

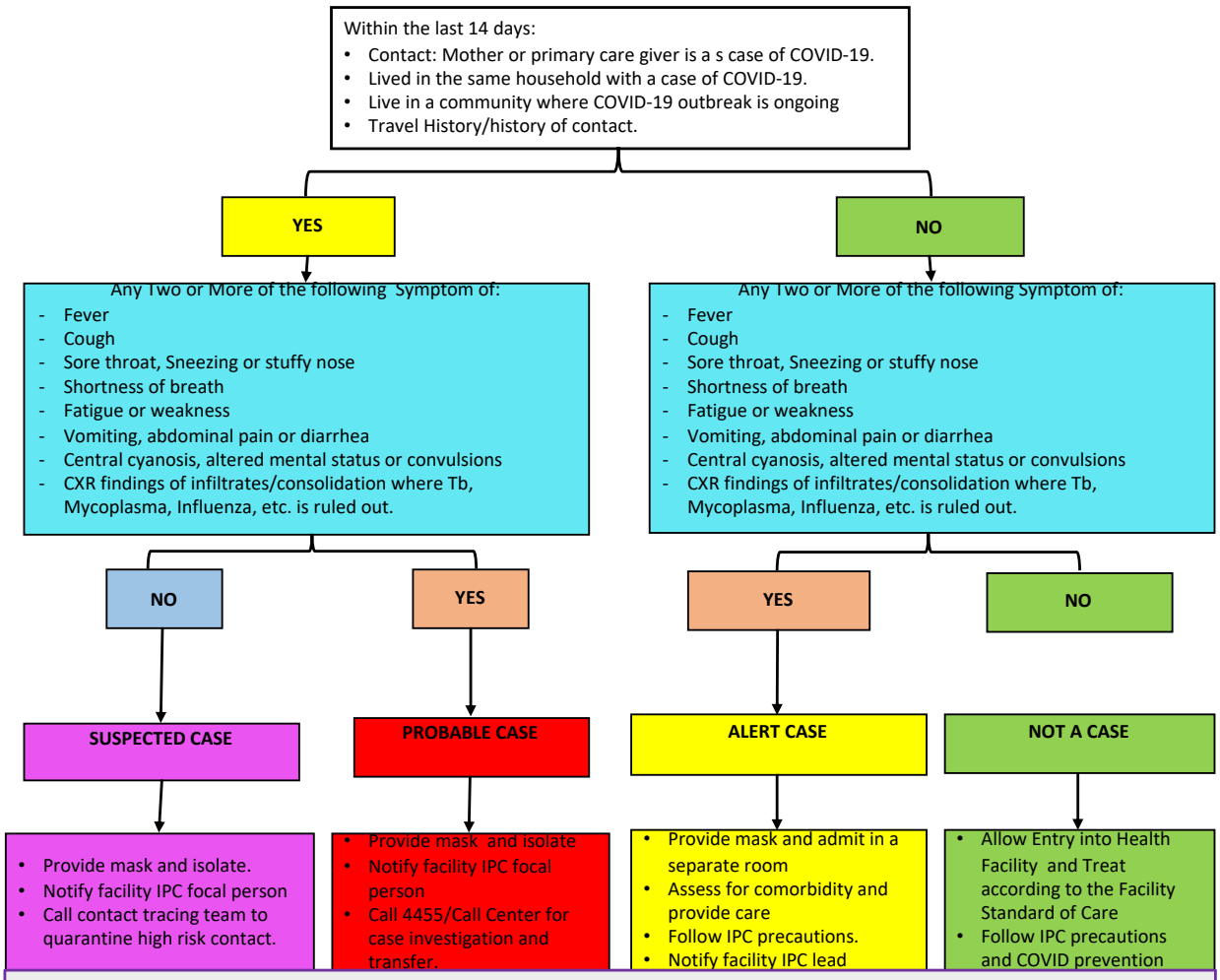
ii. Hospitalized child from a community with ongoing COVID-19 outbreak develops any one or more of the above symptoms or signs AND NOT improving on treatment with paracetamol, antimalarial and antibiotics or other treatment.

iii. A hospitalized child with CXR findings with/without the above symptoms in who Mycoplasma pneumonia, tuberculosis and influenzae have been ruled out.

d. Confirmed cases

i. Confirmed positive result of a standard test of COVID-19 approved for use in Liberia.

Figure 5: Screening Algorithm for COVID-19 in Children Under Five



Symptoms of COVID-19: Fever, cough, sore throat, shortness or breath, diarrhea, anosmia, fatigue, headache, myalgia, cold clammy skin, altered mental status, refusing all meals, convulsion, central cyanosis, hypoxemia, etc.

- **High Risk Contact:** A person is a high risk contact who has NO symptom of COVID-19 AND who within the past 14 days either travelled to a place where an outbreak of COVID-19 is ongoing, OR who had contact with a suspected, probable or confirmed case of of COVID 19 OR worked in a health facility without risk appropriate PPE where a suspected, probable, or confirmed case was detected.
- **SUSPECTED CASE:** A child under five years is a suspected case whose primary caregiver, household member or primary contact is a suspected or confirmed case or the newborn of a suspected or confirmed case.
- **PROBABLE CASE:** A child under five years old is a probable case who is a newborn of a suspected or confirmed case or a close contact of a suspected or confirmed case or traveled to or living in a community where COVID 19 outbreak is ongoing **AND** any one or more symptoms within 14 days of the contact.
- **CONFIRMED CASE:** A persons who has tested positive for COVID-19 using standard test for SARS-CoV-2.

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3.10.2.3 Clinical types of child cases

Children who are suspected and probable cases of COVID-19 should be isolated and treated for COVID-19 even if the test is initially negative. Childhood cases can be symptomatically divided into the following types[37]:

a. Asymptomatic infection: Without any symptom or sign apart from a positive SARS-CoV-2 nucleic test.

b. Mild disease: Mild fever, symptom of upper respiratory tract infection, normal respiratory rate and oxygen saturation (SPO_2>94%), no reduction in food intake or refusal to play. No signs of pneumonia are present (e.g. crackles, wheezing)

c. Moderate disease: Signs of pneumonia such as fever, cough, moderate increase in respiration, bronchial breaths sounds, crackles, wheezing, etc. or diarrhea AND absence of severe disease. The patient does not require oxygen therapy.

d. Severe disease: Children with signs of severe pneumonia.
    i. Fast or labored breathing when calm (0-2months: RR≥60c/min; 2-12 months: RR≥50c/min; 1-5 years: RR≥40/min; >5 years old: RR≥30/min.) with or without nasal flaring, stridor, subcostal retractions or grunting
    ii. SPO_2 ≤93% on room air.
    iii. Central cyanosis correctable by non-invasive ventilation
    iv. General danger signs:
        - Inability to breastfeed/drink, vomiting everything, or refuse meals
        - Signs of dehydration or cold clammy skin
        - Altered mental status, lethargy or coma
        - Convulsions

e. Critical disease:
    i. Signs of sever disease with Hypoxemia requiring invasive ventilation (SPO_2<90%) with signs of severe disease
    ii. Shock

iii. Unexplained metabolic acidosis

iv. Multiple organ failure: critical children can quickly progress to acute respiratory distress syndrome (ARDS) or respiratory failure, encephalopathy, myocardial injury or heart failure, coagulation dysfunction and acute renal injury.

v. Children with underlying medical risk/co-morbidity (heart disease, malnutrition, immunosuppression, or pulmonary tuberculosis, severe pneumonia, cancer, diabetes mellitus, severe anemia, etc.) AND signs of severe disease (see above).

3.10.2.4 Multisystem Inflammatory disorder in children and adolescents

Children and adolescents (0-19 years old) with multisystem inflammatory disorder in children and adolescents have the following presentation [34]:

i. Fever for 3 or more days AND

ii. Elevated markers of inflammation such as ESR, C-reactive protein, or procalcitonin; AND

iii. Any two or more of the following:

- Rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation signs (oral, hands or feet).
- Hypotension or shock
- Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated Troponin/NT-proBNP),
- Evidence of coagulopathy (by PT, PTT, elevated d-Dimers).
- Acute GI (i.e. diarrhea, vomiting, or abdominal pain)

AND

iv. No other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes; AND

v. Evidence of COVID-19 (RT-PCR, antigen test or serology positive), or likely contact with patients with COVID-19.

Children with multisystem inflammatory disorder in children and adolescents have critical disease and should be managed in the intensive care unit.

3.10.2.5 General treatment of Children with COVID-19

i. Isolation of children:

Isolation in CITU. If the primary caretaker is also suspected or positive for COVID-19 the child should be isolated together with the parent or caretaker if separating the child may cause more harm to the child's overall health and wellbeing than any benefit separate isolation or quarantine may offer. There is no evidence of immunity in survivors and this recommendation is conditional and should be weighed against the benefit to the childcare and risk of harm, if the child and survivor's illness does not concur in time.

Inform the caretaker to closely observe the child and inform the team of any observed changes. The caretaker should use mask at all times and observe frequent hand and respiratory hygiene at five key moments. The caretaker should be given protective equipment and education on IPC; particularly the correct use of the PPE–mask, gloves, paper towels or disinfectant wipes. The caretaker should wear long sleeved clothing/disposable gown and have access to soap and water and fresh disinfectant solution to disinfect vomit and other bodily secretions before disposal and cleaning. A child-friendly area should be created in the treatment unit where possible with dedicated health workers.

ii. Close monitoring

- Vital signs: Pulse oximetry for early identification of hypoxemia, temperature, respiration, pulse, blood pressure, level of consciousness (AVPU). Measure vital signs every four hours and document.

- Clinical Assessment: The clinical assessment in children should be done as described for adults. However, nutritional status (e.g. weight) should be measured and documented at baseline. The vaccination status should also be assessed and documented.

iii. Lab Assessment:

- Standard labs as outlined under supplementary lab assessment

iv. Management:

a) Fever is temperature >38.0 ^{0}C or <35.0 ^{0}C:

- Tepid sponging
- Paracetamol at 10-15mg/kg max 4 doses/day; OR
- Ibuprofen 10mg/kg po bid-tid.
- Aspirin (salicylates) is NOT recommended in children because it carries the risk of Reye's, but this does not extend to NSAIDs.
- Assess the child for other causes of fever (e.g. assess for signs of pneumonia, test for malaria, HIV, etc.)
- Children with sepsis or pneumonia should be treated with antibiotics as described for moderate and severe disease.

b) Antibiotics:

All children with respiratory symptoms consistent with moderate, severe or critical disease should be treated with broad spectrum antibiotics as described in moderate and severe COVID-19 (see relevant section above). Standard pediatric dosing should be used according to the national or Guidelines for the Hospital care for children [14, 38]:

c) Malaria:

- Test all patients for malaria (rapid antigen test).
- All children with fever and signs of complication should be treated for severe malaria with Artesunate or Athemeter (see above).

- Treatment should not be delayed if a rapid test kit is not available on site. Inquire about history of recent treatment for malaria.

d) Respiratory support:

- When there is hypoxemia or ARDS, oxygen therapy should be provided as described under respiratory management.
- Administer oxygen from an oxygen concentrator or a cylinder with humidifier at 1-3 L/min via nasal cannula (see respiratory management of severe and critical disease). If target saturation (SPO_2>94%) is not achieved or mouth breathing, switch to facemask, then non-rebreather mask (see oxygen support in severe COVID-19).

- Children with repeated episodes of apnea or cardiac arrest after CPR, should be escalated to facemask then to NIV and to IV (see management of critical disease above). Care should be taken to avoid respiratory trauma, aerosolization, and lung injury. Respiratory support should be provided by experienced staff.

- The diagnosis of ventilator-associated pneumonia (VAP) should be entertained when patients who are mechanically ventilated for at least 48 hours develop a new lower respiratory tract infection [39]. Consider adding fluoroquinolones or anti-pseudomonas to antibiotic regimen for patients with VAP:
    - Ciprofloxacin 15mg/kg iv q8h x 7 days; OR
    - Ceftriaxone 50mg iv q12h x 7days; OR
    - Ampicillin 50mg/kg IV q6-8h PLUS Gentamicin 5mgqd x 7

- Airway management:
    - Signs of airway obstruction:
        a. Mucus or food: suctioning (risk appropriate PPE is required for aerosol-generating procedure).

b. If no obstruction and airway is clear: consider nebulization with salbutamol.
c. Assess oxygen saturation, respiratory rate, and provide oxygen as described if indicated.

- For children with respiratory failure and/or circulatory failure that cannot improve after appropriate treatment consider compassionate care and counseling of family.

e) Pulmonary Edema

- Children with pulmonary congestion and cardiac failure should be treated with a diuretic to improve oxygenation:
  - Furosemide 1mg/kg iv q6 hours until condition improves.
  - Monitor for profound diuresis and electrolyte depletion.
  - Airway and oxygen management as described.
  - Assess for and treat underlying cause of pulmonary edema.

f) Prone positioning:

- Prone positioning as described above for children over six months with adequate head and neck control. A caretaker must be present at all times for constant monitoring.

g) Others supportive care:

- Diet: Ensure the child can take oral fluids and adequate feeds based on daily need.
- For children who cannot tolerate oral feeds, consider enteral or parenteral feeding calculated based on standard requirements according to the national therapeutic guidelines [14] or the WHO recommendations [38].

h) Supplementary treatment if required:

- Vitamins C 1 tablet qd, A 100000 IU qd,

- Vitamin B 1 tablet qd
- Zinc sulfate 10mg po qd (<1-year old) or 20mg qd (>1 year) in children with gastrointestinal symptoms or malnutrition) to boost mucosal immunity.
- Treat moderate and severe anemia as described above.
- Deworm all children not routinely dewormed in the past six months to reduce parasite burden. Mebendazole 100mg po bid x 3 days.

- Vaccination: Evaluate vaccination status to ascertain if child is up to date on their vaccine schedule. The caretaker should be counseled to ensure the patient is vaccinated after discharge from the CITU. This information should be documented on the discharge report.

3.10.3 ELDERLY

Older adults have increased risk of severe disease following infection from COVID-19 [40], many of whom also have underlying health problems and at least one other inherent risk. At baseline, all patients should be screened for the past medical history, underlying comorbidities, drug history, standard laboratory screening, and AFEM scoring as recommended in this guidance.

3.10.4 COVID-19 IN PEOPLE WITH HIV

Currently, there is limited data on COVID-19 in the setting of HIV. All patients admitted should be assessed for past diagnosis of HIV and treatment history. Patients with an unknown diagnosis should be screened for HIV according to the standard national guidelines for the care of people with HIV. All newly diagnosed cases of HIV in the unit should be documented and linked to the national HIV counselling, treatment and care program. Generally, HIV patients with COVID-19 should receive the same treatment approach applied to the general population [41].

Patients who are already on treatment for HIV should be encouraged to continue their prescribed antiretroviral therapy and cotrimoxazole prophylaxis. The patient living with

HIV with COVID-19 should be assessed for opportunistic infection (e.g. tuberculosis, pneumocyctis jeroveci, toxoplasmosis, cryptococcosis, etc.) and a low threshold for treatment. Signs of pneumocystis jeroveci and acute tuberculosis or severe pneumonia cannot be reliably distinguished from severe COVID-19. All treatment and medication should be documented, and the patient should be monitored for drug toxicity, drug interactions, and immune reconstitution inflammatory syndrome (IRIS). Patients with moderate/severe COVID-19 should be treated for pneumocystis jeroveci pneumonia with high dose cotrimoxazole unless contraindicated.

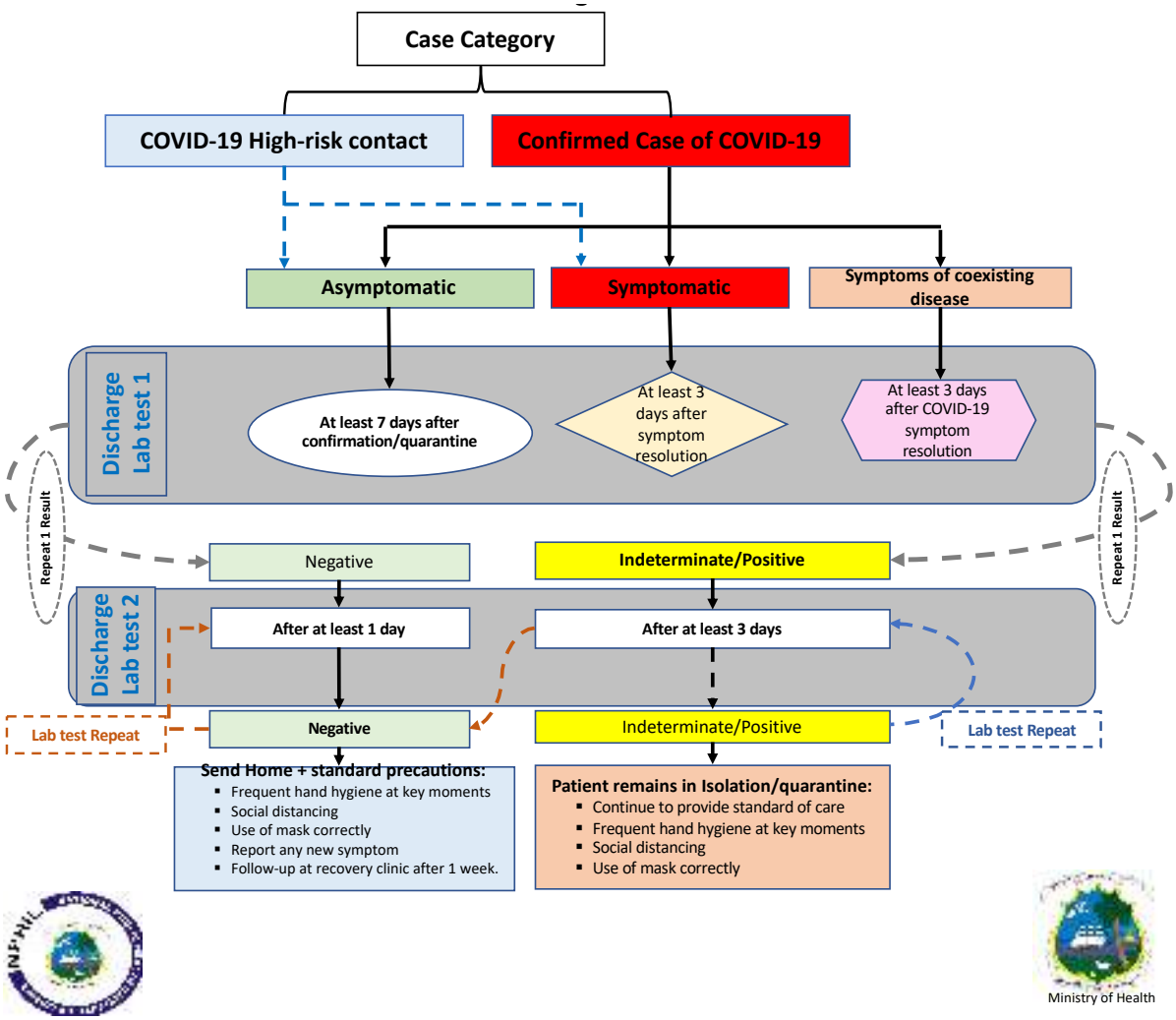
In the context of the emergency and the need to manage patients with severe and critical disease to mitigate the risk of a fatal outcome, testing and clinical management while admitted in the CITU should not be delayed because of pre-test and post-test counselling. However, upon discharge patients should be seen in the COVID-19 recovery clinic and then referred for ongoing counselling and lifetime management of HIV according to the national standard of care.

4 DISCHARGE CRITERIA AFTER COVID-19

4.1 Discharge from CITU when COVID-19 test is Accessible

The decision to discharge should be made for patients who meet the below Clinical **AND** Laboratory Criteria:

Figure 6: COVID-19 Test-Based Discharge Criteria



4.1.1 Clinical Discharge Criteria

1. Asymptomatic continuously for at least 7 days or more after diagnosis or throughout the full duration of their stay at the CITU.
2. Symptomatic patient at admission becomes and remains asymptomatic continuously for 72 hours or more.
3. Patients with advanced comorbidities (e.g. decompensated heart failure, COPD, PCP pneumonia, etc.), for whom complete resolution of symptoms may not be possible BUT has resolution of COVID-19 associated exacerbation with return to their pre-COVID-19 status for at least 72 hours or more.

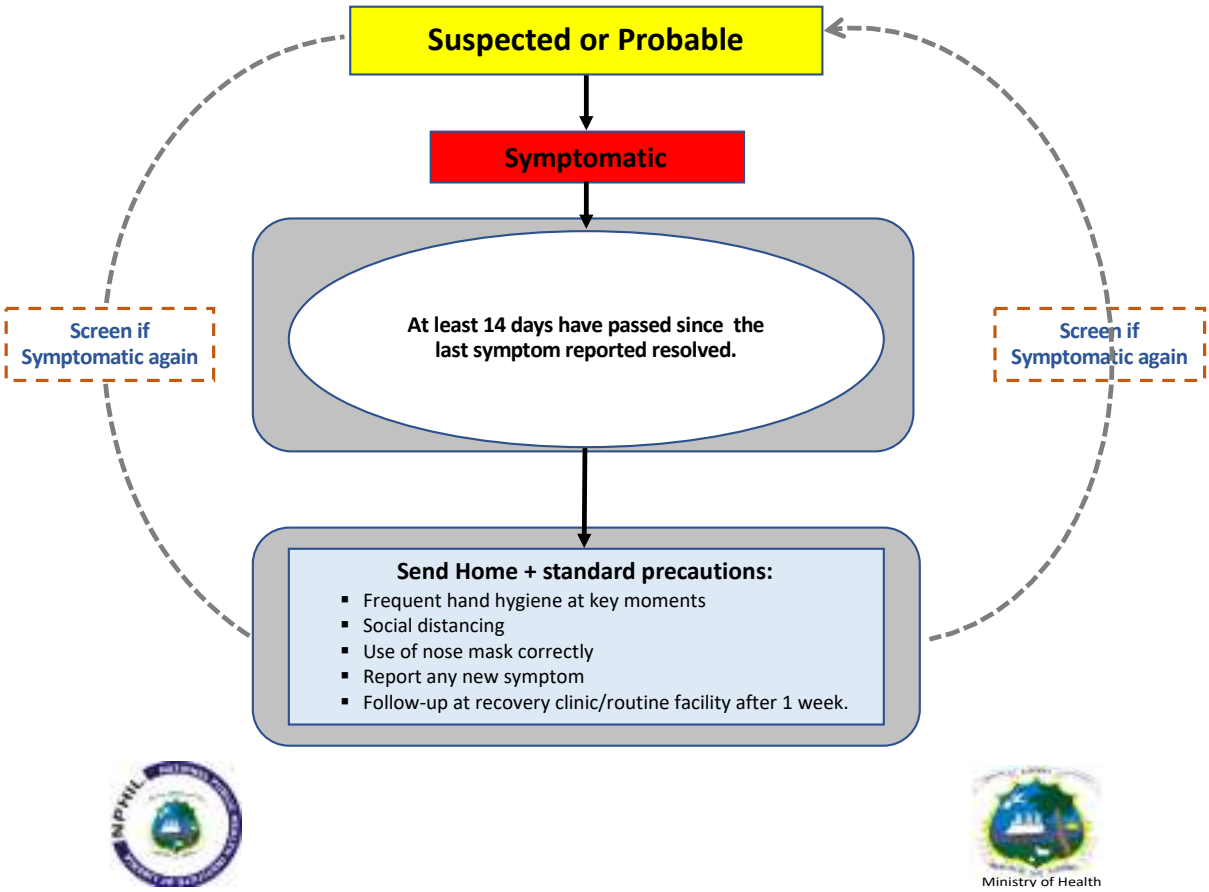
4.1.2 Laboratory Discharge Criteria

The first laboratory test for discharge is done only after the clinical criteria is met:

1. Standard SARS-CoV-2 test showed evidence of viral clearance or test is negative on two consecutive samples taken at least 24 hours apart.
2. If the first test for discharge is positive and the patient continues to remain asymptomatic, a repeat test should be delayed for at least 3 days after this positive test result [9, 10].
3. All patients have received pre-test and post-test psychosocial support regarding the disease and results.

4.2 Discharge from CITU when COVID-19 test is NOT accessible

Figure 7: COVID-19 NON-Test-Based Discharge Criteria



1. It is essential that all suspected cases of COVID-19 should have access to testing. In the absence of testing, patients should be discharged after at least 14 days have passed since the last reported symptom resolved without the use of fever-reducing medications. The decision to discharge the patient on clinical ground should be individualized based on the overall clinical outlook and clinical progression of the patient's condition.
2. No COVID-19 discharge certificate should be provided. However, a medical report or discharge summary should be written and given to the patient.
3. The patient should be advised to continue to follow COVID-19 prevention precautions (e.g. use of nose mask, frequent hand hygiene and social distancing).

4.3 Recommendations for Follow Up

a. Patients should be followed up weekly for the first two weeks and monthly for the next three months. Follow-up should occur in a COVID-19 recovery clinic or routine health facility. Follow-up care should be tailored to the patient's unique need in addition to assessment and care for any complications believed to be temporarily related to the COVID-19 illness. All findings and treatment should be recorded in the patient's chart.
b. Patients who require hospitalization for management of complication should be referred for further management in a routine health facility. Centers of excellence and referral linkages with designated clinics should be set at the onset of the response.
c. People living with HIV should be given psychosocial and adherence counselling and referred to the national HIV treatment and care program for lifetime follow-up.
d. The community engagement and psychosocial team should be informed about the discharge at least 2-3 days before, to prepare for community re-entry and post discharge support. A discharge certificate should be provided which should state that the patient tested positive for COVID-19 on a standard test, was isolated for a stated duration and repeat standard SARS-CoV-2 test showed evidence of viral clearance.
e. The patient should be advised to continue to follow COVID-19 prevention precautions (e.g. correct use of mask in public places when in proximity of another person, frequent hand hygiene, and social distancing).

5 OTHER CONSIDERATIONS

5.1 Rational Use of Antimicrobials

Currently, there is no specific drug treatment for COVID-19. Treatment strategies focus on symptoms management and supportive therapy. Antimicrobial drugs should be limited to the treatment of pneumonia or other co-existing infections when indicated. The blind/inappropriate use of antimicrobial drugs should be avoided unless to treat another bacterial infection diagnosed clinically through bacterial culture.

Patient should only receive medications that are appropriate for their clinical needs. The right drug should be prescribed at the right dose in the right form through the right route for the right duration for the right patient. Unnecessary use of antimicrobial medications is associated with rising resistance. This follows that patients should be thoroughly assessed, and the diagnosis is correct.

5.2 Other Drug considerations

5.2.1 ACE inhibitors (ACEIs) and angiotensin receptor blockers (ARB)

Apart from the debate on a possibly increased risk of complications/pneumonia associated to ACE inhibitors and angiotensin receptor blockers (ARBs) studies have not found increased risk of mortality [40] or community-acquired pneumonia associated with the use of these drugs [42-44]. However, ACEs interact with ACE-2 receptor (the receptor targeted by SARS-CoV-2) in the lungs and inhibit them [40]. In patients with heart failure or hypertension, keeping the number of medicines to those necessary and adjusting their treatment accordingly seems more important than withdrawing ACEIs or ARBs. Patients should be monitored for new respiratory symptoms and AFEM scoring of disease.

5.2.2 Opioid analgesics

These medicines are known to cause respiratory depression with the resulting pulmonary hypoventilation while others have immunosuppressive effects (morphine,

codeine). They increase the risk of pneumonia and respiratory mortality by 40%. Critical patients in the ICU may need to be treated for pain. Multimodal pain management such as combination of an NSAID and paracetamol is preferred. Morphine or opioid use should be determined cautiously on a case by case basis.

6 MENTAL HEALTH AND PSYCHOSOCIAL CARE

6.1 Psychosocial care for patients

6.1.1 Overview

People with untreated mental illness are least able to keep social distance, self-isolate and follow other COVID-19 prevention measures such as frequent hand hygiene with soap and water, correct consistent use of face mask, and cough hygiene [45]. These precautions may also prove difficult to enforce in this group of patients. Their risk of infection is potentially higher than the general population. Once infected, they may serve as super spreaders of COVID-19. On the other hand, the stigma and abuse meted against people infected with COVID-19 and the potential traumatic events experienced by individuals and local community may lead to mental and psychosocial problems or exacerbate underlying mental health conditions.

6.1.2 Management

a) Every unit should have a mental health clinician/psychosocial counsellor and optimum stock of essential medications and supplies for the management of the patient with mental illness.
b) A ward should be created to optimize the care of COVID-19 patients who have mental illness and attend to their special needs.
c) A detail assessment should be conducted because some patients may not be able to report all their symptoms and provide a complete and accurate medical and drug history. In addition, some patients with mental illness present signs of

physical disease. Where possible additional information should be sought from the caretaker, guardian or support person.

6.1.3 Hierarchy of mental health and psychosocial support including

a) Psychological First Aid.

b) Patients should be screened for specific mental illness or psychological condition/addiction. Screening tools can be used; such as Acute Stress Disorder, PHQ-9L, GAD-7, AUDIT, CAGE, PTSD Checklist -PCL, Addiction, etc.

c) Strategies to minimize psychological effects of quarantine[46, 47] include:
   - Good communication.
   - Restricting duration of quarantine to absolute minimum.
   - Providing adequate essential supplies and practical advice on coping with boredom and stress.

d) Other MHPSS should include the following interventions[48]:
   - Education and management of common symptoms of stress (sleep hygiene, relaxation and others),
   - Promoting precautionary measures,
   - Limiting exposure to media-related misinformation,
   - Promoting self-efficacy by problem solving, and
   - Advocating against stigmatization and marginalization.

e) Indicated interventions related to specific diagnosis
   - Patients with specific diagnosis who require psychiatric interventions (e.g. therapeutic (antipsychotic) and non-therapeutic) should be assessed by a psychiatrist.

     If this is not available at the facility, the clinician should consult with a psychiatrist or seek direct support. If this is not helpful, the patients who require specialist psychological management should be referred to the closest facility where this is available.

In addition to the recommendations in this guidance, MHPS personnel caring for COVID-19 patients can seek additional guidance where required (see preface).

6.2 RESPITE CARE FOR STAFF IN THE CITU

6.2.1 Daily screening

All staff and visitors to the CITU should have daily symptoms checked and body temperature measurement done at the facility entrance. Use of mask and physical distancing, hand washing practices and other IPC recommendations and risk mitigation should be practiced in the CITU. Staff who are feeling unwell while on duty, travelling to or from work or at home should report their symptoms to the medical coordinator and screened for COVID-19 (see above).

6.2.2 Accidental Exposure to droplets contaminated with SARS-CoV-2 while at work or going to or returning home

i. Stop ongoing task: Persons including HCWs with percutaneous or muco-cutaneous or other exposure to droplets, blood, body fluids, secretions, or excretions from a patient with suspected, probable or confirmed COVID-19 should immediately and safely stop any current tasks.
ii. Leave the patient care area immediately.
iii. Safely remove PPE according to the doffing protocol.
iv. Wash affected area: Immediately after leaving the patient care area, wash the affected skin surfaces or the percutaneous injury site with soap and water. Irrigate mucous membranes (e.g. conjunctiva) with copious amounts of water or an eyewash solution, and not with chlorine solutions or other disinfectants.
v. Report incident: The incident should be immediately reported to the medical director or clinical supervisor. Such exposed persons should be categorized as high-risk contact of COVID-19 and quarantine procedures should be implemented according to the national guidelines for quarantine of high-risk contacts of COVID-19.

vi. Baseline clinical assessment: Exposed persons should be medically evaluated including for other potential exposures (e.g., HIV, HBV, HCV, etc.) and receive treatment/prophylaxis and follow-up care according the standard guidelines in place.

vii. In the absence of injury or known exposure, staff who are feeling unwell or experience symptoms of COVID-19 while on duty, travelling to or from work or at home should immediately self-isolate and report their symptoms to the medical coordinator and be screened for COVID-19.

6.2.3 Healthcare personnel (HCP) returning to work after COVID-19 diagnosis

This guidance pertains to confirmed COVID-19 and those who have suspected COVID-19 but did not get tested for COVID-19.

6.2.3.1 Test-based strategy

Health workers who are confirmed cases of COVID-19 and were admitted and discharged from isolation according to the discharge criteria and without further need for hospitalization can return to work. These patients are not required to undergo additional 14 days of convalescent monitoring. Additional isolation after meeting the discharge criteria is not recommended for survivors who continue to remain well. It is important that all staff continue to practice social distancing and consistently follow the facility and national standard IPC guidelines in effect.

A health worker who is a suspected case but has no evidence of SARS-CoV-2 infection using standard PCR test on two occasions should receive routine care for the underlying diagnosis and be allowed to return to work in line with the health facility protocol in place and:

- At least 3 days (72 hours) have passed *since recovery* defined as resolution of fever without the use of fever-reducing medications **and** improvement in respiratory symptoms.

If an alternate diagnosis (e.g. tuberculosis, bacterial pneumonia, asthma, etc.), criteria for return to work should be based on that diagnosis.

6.2.3.2 Non-test-based strategy

It is essential that all health workers who show or report symptoms suggestive of COVID-19 should have access to standard SARS-CoV-2 test. If not available exclude from work until:

- At least 14 days have passed *since symptoms disappeared* without the use of fever-reducing medications.

Upon return to work, it is important that all staff continue to practice social distancing and respiratory precautions and consistently follow the facility and national standard IPC guidelines in effect. Healthcare facilities must be prepared for potential reallocation in the event of staff shortages caused by isolation and quarantine as the result of COVID-19. The facility IPC focal person should ensure all IPC measures are implemented, monitored and periodic facility risk assessments conducted according to the national guidelines.

7 INFECTION PREVENTION AND CONTROL WHEN COVID-19 IS SUSPECTED

Introduction

This section provides guidance on only the most salient features of IPC that can be applied to all health care settings managing patients with suspected or confirmed COVID-19. For more details reference should be made to the new Liberia National IPC Guidance for COVID-19 Response, 2020 document and the Liberia National IPC Guidelines [49].

The Key IPC Strategies in this guidance to prevent or limit transmission in health care settings include the following:

- Minimizing chances for exposure (source control)

- Ensuring Triage, early recognition, and Isolation of patients with suspected COVID-19
- Applying standard precautions at all times
- Implementing additional (transmission-based) precautions when COVID-19 is suspected
- Implementing administrative controls
- Using environmental and engineering controls.

Minimizing chances for exposures (Source Control):

To address asymptomatic and symptomatic transmission, implement source control and ensure COVID-19 screening for everyone accessing the facility i.e. staff, patients, visitors, regardless of symptoms.

a. Patients and visitors: should have their own mask or be provided with one during their stay in the facility except children less than 2 years of age, anyone with trouble breathing, and anyone who is unconscious or incapacitated or otherwise unable to remove mask without assistance.

b. Healthcare personnel: should always wear a medical mask while in the health care facility. Medical masks are preferred over cloth face coverings as they provide both source control and protection against splashes and sprays of infectious material.

Note: Care should be taken to prevent self-contamination (e.g. from prolonged use, frequent handling with hands) as masks can become saturated with respiratory secretions. Hand hygiene should be performed immediately before and after any contact with the mask and after disposing it off.

Ensuring rapid, safe triage, early recognition, and isolation of patients:

Clinical triage includes a system for assessing all patients at admission, allowing for early recognition of possible COVID-19 and immediate isolation of patients with suspected disease in an area separate from other patients (source control). To facilitate the early identification of cases of suspected COVID-19, health care facilities should:

i. Train healthcare workers to have a high level of clinical suspicion.

ii. Establish a well-equipped triage station at the entrance to the facility, supported by the trained staff

iii. Ensure all patients and staff entering the facility are screened using the MOH/NPHIL screening algorithm screening questionnaires according to the updated case definitions.

iv. Isolate all patients suspected to have COVID-19 at the designated area in the facility and trigger surveillance response team.

v. Post signs in public areas reminding symptomatic patients to alert health care workers.

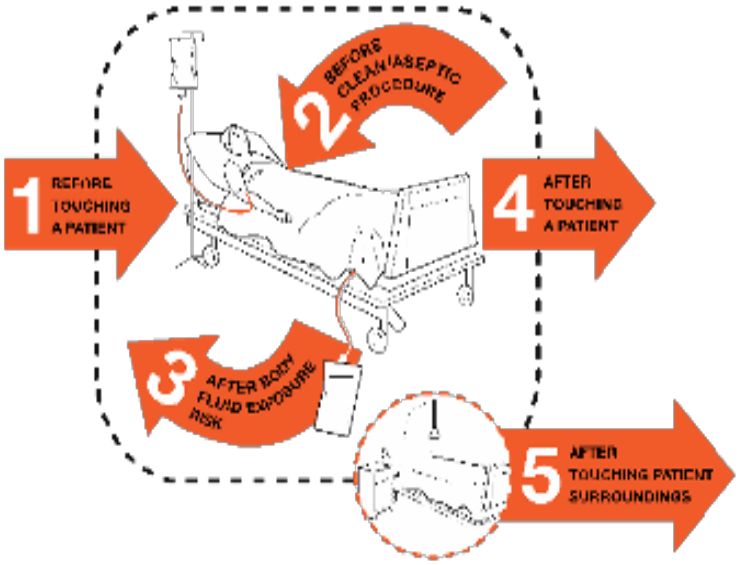
All staff, patients and visitors accessing a health care facility should wear a mask regardless of symptoms and be screened using the national screening tool according to updated case definitions.

Applying standard precautions at all times

Standard precautions include hand and respiratory hygiene, the use of appropriate personal protective equipment (PPE) according to a risk assessment, injection safety practices, safe waste management, proper linens, environmental cleaning, and sterilization of patient-care equipment.

i. Hand hygiene: Includes either washing hands with soap and water or using an alcohol-based hand rub for 20-30 seconds. When hands are visibly soiled, hand washing with soap and water for 40-60 seconds is preferred because of the cleaning effect especially when hands are visibly soiled. Do not use alcohol-based hand rub when hands are dirty. Health workers should apply the WHO My 5 Moments for Hand Hygiene approach.

Figure 8: WHO My Five Moments of Hand Hygiene



- Health care facilities should ensure that hand hygiene facilities are readily available to all persons accessing the facility and in every care location to encourage hand hygiene at all times.

ii. Respiratory hygiene

Respiratory hygiene measures apply to all persons (patients, visitors, and staff) presenting with respiratory symptoms to contain the secretions released during coughing, sneezing or talking and should be enforced throughout their stay/visit:

- All should correctly wear a mask at all times while in the facility and cover their nose and mouth with the elbow when coughing/sneezing.
- Perform hand hygiene after contact with respiratory secretions
- Maintain a physical distance of at least 2 meters away from others when not wearing risk-appropriate PPE.
- HCWs attending to such patients should wear an N95 mask surgical mask and face protection (googles or face shield)

iii. Rational and Appropriate use of PPE

PPE should be selected based on a complete risk assessment before exposure and used in combination with administrative and engineering controls (adequate and

regular supplies, adequate staff training, appropriate hand hygiene, and appropriate human behavior, etc.).

All healthcare workers must receive training on and demonstrate understanding of:

- When to use PPE
- What PPE is necessary
- How to properly don (put on), doff (take off) PPE in a manner to prevent self-contamination
- How to properly dispose of or disinfect and maintain PPE
- The limitations of PPE

PPE for COVID-19 Isolation and Treatment Units (CITU) include:

- Respirator or Face masks: surgical/medical or N95 masks
- Eye protection: goggles or face shield to avoid contamination of mucous membranes.
- Gloves: non-sterile, heavy duty or sterile surgical gloves. For aseptic procedures, sterile/surgical gloves will be required according to standard of care.
- Gowns: Disposable non-porous low-sleeved gowns or the re-usable surgical gown (where laundry facilities are available). In the absence of gowns, a coverall or hazmat suit. For aseptic procedures, sterile surgical (disposable/reusable) gown is required.
- Apron: May be disposable or re-usable apron depending on activity and availability
- Boots should be used in the red/infectious zones of the CITU. Closed/nonporous scrub slippers should be worn in staff areas.

The type of PPE when caring for COVID-19 patients will vary according to setting, type of personnel and activity (Table 1 below).

Table 2: Recommended PPE according to setting, personnel, and type of activity for COVID-19 Isolation and Treatment facilities

Setting	Target personnel	Activity	Type of precautions required	Type of PPE and recommended precautions
Health Care facilities with CITU				
Screening and Clinical Triage for prioritization of care according to severity	Health care workers	Preliminary screening not involving direct contact	Standard precautions	• Physical distance of at least 2m • Physical barrier between HCW and patient. • If not feasible, use a medical mask and face protection. • Perform hand hygiene.
	Patients with symptoms suggestive of COVID-19	Any	Standard + additional precautions	• Medical mask for patient if tolerated • Isolate if room is available • If not available maintain Physical distance of at least 2m from others • Perform hand hygiene and have patient perform hand hygiene
	Patients without symptoms suggestive of COVID-19	Any	Standard additional precautions	• Use a surgical mask/N95, gown, gloves, eye protection, boots. • Perform Hand hygiene
Patient room/ward	Health care workers	Providing direct care to COVID-19 patients, in absence of aerosol generating procedures	Standard + additional precautions	• Medical mask/N95, gown, gloves, eye protection (goggles or face shield), boots • Perform Hand hygiene
		Providing direct care to COVID-19 patients, in presence of aerosol generating procedures	Standard + additional precautions	• Respirator N95, Gown, gloves, eye protection, apron, boots • Perform hand hygiene
	Cleaners	Cleaning the room of COVID-19 patients	Standard + additional precautions	• Medical mask, gown, heavy duty gloves, eye protection, boots • Perform hand hygiene
	Visitors *(ideally NO visitors should be allowed)*	Entering the room of a covid-19 patient	Standard + additional precautions	• Physical distance of at least 2m • Medical mask, gown, gloves • Perform hand hygiene
Laboratory	Lab Technician	Collection, handling, and processing of respiratory specimens from suspected or confirmed cases	Standard + additional precautions	• Surgical mask/N95, gown, gloves, eye protection, boots • Perform Hand hygiene
Pharmacy, Administrative areas	All staff	Tasks that do not involve contact with COVID-19 patients	Standard precautions	• Physical distance of at least 1m from others • Medical mask +/- face protection • Frequent hand hygiene and environmental cleaning

Source: *Adapted from the WHO Interim guidance on rational use of PPE for COVID-19 and considerations for severe shortages, 6 April 2020*

Table 3: Reprocessing reusable supplies and equipment

Item	Process	Product	Other
Cleaning cloths, mop heads, cloth gowns, uniforms	1. Immerse in soap and water solution, use mechanical action (scrubbing) 2. Immerse in disinfectant solution, then rinse with clean water 3. Dry fully	Soap and warm water; 0.05% chlorine solution (30 minutes) or other approved disinfectant (manufacturer contact time)	Leave to dry in a clean and dry area to prevent recontamination Position mops with the head up to allow the mop head to fully dry Launder cloths and mops separate from gowns and uniforms
Buckets, plastic apron, rubber gloves and boots	1. Immerse in or wipe with soap and water solution, use mechanical action (scrubbing) 2. Immerse in or wipe with disinfectant solution, then rinse with clean water 3. Dry fully	Soap and warm water; 0.1% chlorine solution (>1minute) or other approved disinfectant (manufacturer contact time)	Store buckets and boots upside down to allow to fully dry Hang heavy duty rubber gloves with fingers up to allow to fully dry
Eye protection (goggles, face shield)	1. Immerse in or wipe with soap and water solution, use mechanical action (scrubbing) 2. Immerse in or wipe with disinfectant solution, then rinse with clean water 3. Dry fully	Soap and warm water; 0.1% chlorine solution (>1minute) or other approved disinfectant (manufacturer contact time)	Chlorine-based disinfectant recommended over alcohol, as alcohol may damage and discolor plastic and deteriorate glues over time; note that it may also remove anti-glare and anti-fogging properties of the eye protection.

iv. Environmental cleaning

- It is important to ensure that environmental cleaning and disinfection procedures are followed consistently and correctly. Health workers

should seek guidance as recommended in the Liberian National IPC Recommendation.

- Thoroughly cleaning environmental surfaces with water and detergent and applying commonly used hospital-level disinfectants (such as sodium hypochlorite) are effective and sufficient.

- Standard operating procedures (SOPs) for environmental cleaning should be available and displayed at the appropriate stations.

v. Proper handling of linens, waste, and patient equipment

- Medical devices and equipment, laundry, food service utensils, and medical waste should be managed in accordance with safe routine procedures.
- All medical waste and linens should be treated as potentially infectious.
- All reusable equipment should be cleaned and disinfected before each patient use.

Implementing Additional (Transmission-based) precautions when COVID-19 is suspected:

In addition to using standard precautions, all individuals accessing the treatment unit should use **contact and droplet precautions** and where needed, **airborne precautions** before entering the room and corridors of suspected or confirmed COVID-19 patients.

This set of additional measures are based on the specific mode of transmission for the infectious disease and are meant to compliment the standard precautions.

Table 4 summarizes the additional (transmission-based) precautions for use with suspected or confirmed COVID-19 patients.

Table 4: Additional Precautions when caring for patients with COVID-19

Transmission based precautions	Indication	Requirements

Contact precautions (reduce exposure to pathogens transmitted through direct or indirect contact)	Direct contact with the patient or their environment	• Isolate in Single rooms with ensuite facilities if available
		• If not available;
		  ○ Cohort patient with similar symptoms/diagnosis or similar risk in same room.
		  ○ ensure physical distance of at least 2m in between patient beds.
		• PPE:
		  ○ Gloves, gown
		  ○ Add apron, face mask, eye protection, if anticipate splashes.
		• Use dedicated equipment (e.g. stethoscopes, blood pressure cuffs and thermometers).
		  ○ If not available, clean and disinfect between each patient use
		• Refrain from touching EYES, NOSE, MOUTH with unwashed or gloved hands.
		• Environmental cleaning: at least twice daily cleaning of all frequently touched surfaces
		• Perform hand hygiene immediately after patient leaving the room/environment
		• Visitors should not be allowed in the high-risk areas unless critical for care.

Droplet precautions (reduce exposure to pathogens transmitted by droplets generated during coughing, sneezing or talking)	Close contact with patients with respiratory symptoms i.e. sneezing, coughing or their environment	**HCW:**
		• PPE: Face mask, and face protection (googles/face shield).
		Patient:
		• Isolate in Single room with ensuite facilities if available
		• If not available;
		  ○ Cohort patient with similar symptoms/diagnosis in same room
		  ○ ensure physical distance of at least 2m between patient beds
		• Medical mask (if tolerated)
		• Physical distance of at least 2m from others
		• Limited movement out of hospital room

Airborne precautions (reduce exposure to pathogens transmitted by aerosols)	All patients with ARI and undergoing Aerosol generating procedures such as Open Suctioning, intubation, extubating, CPR, manual ventilation, tracheostomy, some dental	• PPE: N95 particulate respirator, gloves, long sleeved gowns with/out apron, eye protection (goggles or face shield) • Adequately ventilated rooms • Avoid presence of unnecessary individuals in the room

Transmission based precautions	Indication	Requirements
	procedures, nebulization, induction of sputum	

Other additional precautions for health workers working in CITU

- All persons working in the CITU should change into scrubs and store away all their personal belongs including jewelry in a safe space.
- Where possible, a team of HCWs should be designated to care exclusively for suspected or confirmed cases to reduce the risk of transmission.
- When leaving the CITU for their homes or public areas, health workers should remove their scrubs, shower, and change into their personal clothes.
    - Access to shower areas is recommended.
    - If there is no shower area at the CITU, staff should shower at home, change into safe clothes before interacting with family members, loved ones or associates.
    - Soiled clothes should be stored away in a safe space and thoroughly cleaned at the first opportunity.
- Appropriate doffing and disposal of all PPE and hand hygiene should be carried out. All staff should be trained on the standard doffing SOP and the procedure should be visible in the doffing station.

Implementing Administrative controls

Administrative controls refer to work policies and procedures that prevent pathogen exposure, health care worker education, education of clients/patients/caregivers, healthy workplace initiatives and monitoring of compliance with feedback. Administrative controls for the prevention and control of transmission of COVID-19 within the health care setting may include:

- Establishing sustainable IPC infrastructures and activities for example triage stations, isolation facility, hand washing facilities etc. at key locations in the facility
- Ensuring an adequate patient-to-staff ratio
- Educating staff, patients and their caregivers on safe IPC practices

- Ensuring all staff are appropriately trained for their roles (IPC, case management, environmental cleaning, specimen transport, dead body management)
- All staff should be fully aware of all protocols, guidelines, and job aides
- Ensuring policies and protocols are in place for early recognition and management of acute respiratory infection potentially caused by COVID-19 including surveillance among staff;
- Ensure HCWs and the public understand the importance of promptly seeking medical care.
- Ensuring access to prompt laboratory testing for identification of COVID-19 and other etiologic agents;
- Preventing overcrowding, especially in emergency departments; providing dedicated waiting areas or treatment units for symptomatic patients
- Appropriately isolating hospitalized patients;
- Ensuring adequate supplies of PPE; and
- Ensuring adherence/compliance to IPC policies and procedures for all aspects of health care and providing mechanisms for improvement as needed
- A periodic IPC risk assessment should be conducted, and issues documented, reported in a timely manner to appropriate authority and addressed accordingly.

Each facility should have a dedicated and trained IPC focal point in place to ensure periodic facility assessments, supervision, training, and quality assurance.

Implementing environmental and engineering Controls

a) Patient placement:

Suspected or confirmed patients with COVID-19 not requiring intensive care should be placed in **single room** or **in cohort isolation** (maintain a distance of at least 2 meters between patient beds) of patients with similar risk categorization/exposure.

b) Infrastructure:

- **Adequate ventilation:** rooms should be well ventilated to allow easy air flow away from the entrance of the room.

- Adequate and regular cleaning and disinfection according to the SOPs in place
- Special attention should be paid to ensuring hand washing stations with the correct supplies (soap and water or sodium hypochlorite solution in the correct concentration) are available at all key locations in the facility.
- Manage laundry, food service utensils and medical waste in accordance with SOPs in place.

c) IPC barriers:

- Distinction with visible labels and barriers maintained between the three risk zones of the CITU (low/green, intermediate/orange, and highest/red).
- Medical personnel should follow all the safety and IPC precautions in place.

GREEN	● Staff rooms for sitting and paperwork, nurse working station, doctors etc ● Staff-Dressing- Room + shower for females / males separately ● Kitchen for distributing patient food / for staff ● Staff-toilets female / Staff-toilet male in working area ● Other rooms including Storage room clean laundry, Cleaner's room ● Laundry room for washing machine, dryer ● Stock room materials /equipment/drugs/treatments
YELLOW	● Doffing room ● Storeroom for used laundry
RED	● Patients Bedroom ● Entry / Patient Reception ● Waste collection area ● Mortuary ● Back-up Laboratory

d) SOPs

- SOPS should be developed for each IPC activity (e.g. cleaning of low risk and high-risk environment, preparation of disinfectant solutions, cleaning of boots scrubs and medical tools, waste management, staff screening and occupational health, etc.).
- The SOPS should be visible at the workstation where it is to be used.
- All staff working in the different areas should be trained on the correct implementation of the SOPs.

Precautions for collection and handling of laboratory specimens

All specimens collected for laboratory investigations should be regarded as potentially infectious. HCWs who collect, handle, or transport clinical specimens from COVID19 patients should adhere rigorously to the following standard precaution measures and biosafety practices to minimize the possibility of exposure to pathogens.

i. Ensure that HCWs who collect specimens are trained and always use appropriate PPE (see PPE section above) and follow the CITU donning and doffing procedures correctly.
ii. If the specimen is collected during an aerosol-generating procedure, personnel should wear a particulate respirator at least as protective as a NIOSH-certified N95, an EU standard FFP2, or the equivalent;
iii. Ensure that all personnel who transport specimens are trained in safe handling practices and spill decontamination procedures.
iv. Place each specimen for transport in a separate sealable pocket of a sealable leak-proof specimen bags (secondary containers). Place the bag that have the specimen a plastic biohazard specimen bag), with the patient's label on the specimen container. Place all specimens in safe sealable specimen transport box (the primary container).
v. Each specimen must be accompanied by a clearly written laboratory request form. Document clearly each patient's full name, date of birth and "suspected COVID-19" on the laboratory request form. The forms must be kept separately and NOT placed in the specimen transport box.
vi. Ensure that laboratories in health care facilities adhere to appropriate biosafety practices and transport requirements, according to the type of organism being handled.
vii. Notify the laboratory as soon as possible when the specimen is being transported.
viii. When collecting specimens from several patients, the HCW should change gloves and perform hand hygiene between patients

Recommendations for routine health facilities

The basic principles of IPC and standard precautions should be applied in all health care facilities, including outpatient care and primary care. Users of this guidance should reference the standard national IPC guidelines for recommendations on PPE and IPC requirements for routine health facilities [49]. Only salient features especially for screening and triage are included here for quick reference. All routine health facilities need to ensure that:

i. Both patients and staff conduct hand hygiene and don a mask (if not already wearing one or the one in use is visibly damaged/soiled) at the facility entrance.
ii. Clinical staff trained in IPC, triage procedures and COVID-19 case definitions are assigned at the triage area to conduct screening in the triage area.
iii. All patients, HCWs, and visitors are screened for COVID-19 at the entrance of the facility using a screening tool based on the updated COVID-19 case definition.
iv. All suspected patients and high-risk contacts are immediately isolated or kept in a designated area separate from other clients and alert the case investigation team.
v. Staff use the appropriate contact and droplet precautions for all isolated cases;
vi. There is a physical barrier (e.g., glass or plastic or wooden screens) to limit close contact between facility personnel and patients.
vii. Visitors to the facility maintain a physical distance of at least 2 meters from others.
viii. Educate patients and families about the early recognition of symptoms, basic precautions to be used, and which health care facility they should go to.
ix. All patient care areas and surfaces are frequently cleaned and disinfected.
x. Ensure that optimum stock of risk appropriate PPE (surgical mask, gown, face shield, gloves), boots, waste collection materials (waste bins with lid, biohazard bags) and other supplies (paper towel or tissue) are available at the health facility.

8 QUARANTINE OF HIGH-RISK CONTACTS

- All high-risk contacts should undergo up to 14 days of precautionary observation and where accessible, obtain evidence SARS-CoV-2 is undetectable in appropriate nasopharyngeal specimen tested on RT-PCR.
- A traveler arriving within 14 days from a country or region where an outbreak of COVID-19 is ongoing is a high-risk contact. The traveler should be screened for COVID-19 at the port of entry (POE) and send to a Precautionary Observation Center (POC). Explain the importance, duration of observation, process, what it entails, and what is expected of the high-risk contact.
- Baseline assessment at the POC: SPO_2%, vital signs, medical history, symptom check and education on standard precautions – social distancing, use of mask, hand hygiene following the WHO My Five Moments of Hand hygiene. Provide mask for contacts without ask or when the one in use is damaged/soiled. Daily assessment includes symptom check and education. Encourage self-reporting of symptoms.

Overview

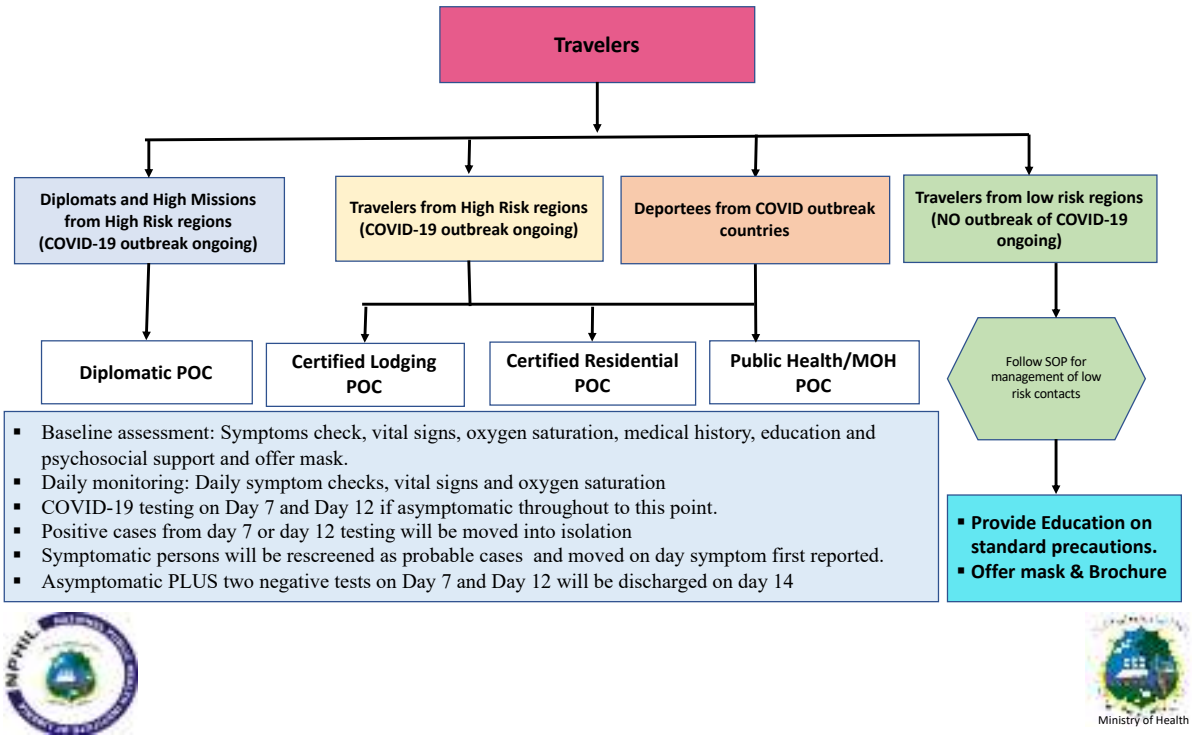
Precautionary observation refers to the quarantine and monitoring of persons who are high-risk contacts of COVID-19 in a designated facility, lodging or residence for 14 days after the last day of the contact or date of removal from a place where an outbreak of COVID-19 was ongoing. A person is a high-risk contact who meets the following criteria:

- Has no symptom of COVID-19: fever, cough, sore throat, shortness of breath, diarrhea, anosmia, loss of taste, fatigue, stuffy nose, headache, myalgia; **AND**
- Within the past 14 days travelled to a place where an outbreak of COVID-19 is ongoing, **OR** had contact with a suspected, probable or confirmed case of COVID-19 **OR** worked in a facility [without the use appropriate PPE] and provided direct care or had close physical contact with a case of COVID-19.

Point of Entry Screening (POE): Frontline staff conducting screening at POEs must be prepared to manage large traffic of passengers. A temporary holding area should be established at each POE for suspected, probable and confirmed cases and a resting area/lounge for high risk contacts before their transfer to the designated facilities.

Persons who are high risk contacts of COVID-19 should be monitored in a Precautionary Observation Center (POC) or approved residence for signs and symptoms to inform timely interventions. Under the best-case assumptions, screening will miss more than half of infected people because most cases are asymptomatic and unaware of their exposure and therefore fundamentally undetectable by screening [11]. Hence, POE and POC personnel need to exercise appropriate safety precautions and IPC measures to prevent exposure or nosocomial transmission. A patient admitted to a POC should be confirmed to have no evidence of SARS-CoV-2 in appropriate specimen tested by certified test for SARS-CoV-2 before discharge to the community.

Figure 9: Precautionary Observation for Travelers who are high risk contacts



8.1 Pre-commissioning assessment

Before coming into operation or use for quarantine, the facility should be assessed by designated personnel for its readiness to provide care as well as its safety for staff, high risk contacts, the environment, and community. The facility needs to have capability for waste management. The IPC, case management, and community engagement teams must be included in the pre-commissioning assessment.

8.1.1 Criteria for selecting a POC

Precautionary observation of high-risk contacts can occur within a facility, lodging (e.g. hotel, motel, hostel, inn, guest house, etc.) or residence. Any facility, lodging, or residence used for precautionary observation need to meet the below minimum standard:

8.1.1.1 Residence

- A space is available for safe entry, conduct assessment, and exit of a designated staff/health monitor/investigator to interact with the quarantined person, and store a small stock of essential materials (e.g. don and store PPE)
- Adequate space for single-person quarantine or a group of persons/family who share the same exposure and comparable level of risks to be quarantined in the same room and share the same lavatory, bathroom and other services. The space should be self-contained, and beds placed at least 2 m apart to prevent unanticipated interaction with other unexposed residents.
- Each quarantine room should have its own water source, lavatory, lockable door, and adequate lighting and optimum ambience.
- Safe areas/rooms for other unexposed family members away from the quarantined person(s) room.
- The family has adequate stock of food and essential supplies for the duration of the quarantine. On a case by case basis, the response should provide these supplies for families that have no other source or access.
- The residence has a barrier (e.g. fence or another barrier) to separate it from the surrounding residences or allow for privacy and confidentiality.
- Facility for safe management and disposal of waste is on site.
- Likelihood of violence or harm against the family in the residence is minimum.

8.1.1.2 Facility

- Appropriate IPC barriers and labelling, unidirectional flow for staff, waste, patients and supplies, IPC safety and fire safety, etc. are all in place.
- There must be a safe space for donning and doffing.

- Rooms should be self-contained and measures to mitigate risk-prone interaction of individuals under quarantine.
- Each room in the facility should have its own water source, lavatory, lockable door, and adequate lighting and optimum ambience.
- For facilities that contained shared bathrooms, spaces, and other services:
    - Group admission can be used. Persons/family who share the same exposure and comparable level of risks are kept together in the same room and share the same lavatory, bathroom and other services.
    - Adequate number of hygienists are available for more frequent disinfection, cleaning and waste management.
    - If an entire family or all members of a residence are high risk contacts and they can be monitored safely at home with minimal risk of harm to staff and family, and they are able to respect health regulations, the residential quarantine option should be considered.

- Fans are not recommended for use in a precautionary facility and CITUs because of the high aerosol generation. Air conditioning is allowable.
- The facility must have a barrier to separate (e.g. fence) the space from surrounding facilities and residences.
- The Facility should have a designated low risk area (green zone) for staff (e.g. resting/leisure, cleaning, staff meeting, admin offices, storage, etc.).
- Stock of a standard package of IPC, monitoring tools, essential medical and non-medical supplies are available.
- Risk of harm to staff and residents is low.
- Risk of infection posed to community and environment is minimum.
- If the facility is a lodging (e.g. hotel, guesthouse/another temporary abode:
    - A trained staff is available to deliver food and other essentials to the room and remove waste.
    - The high-risk contact is able to follow or respect regulations and avoid unnecessary movement into the lodging/hotel lobby and public spaces and visiting other rooms or guests while undergoing quarantine.

- To avoid overstretching monitors, a few numbers of lodging should be qualified and designated for high-risk contacts that prefer this option.
- The designated rooms are in one area/wing with less traffic.

For the purpose of quarantine, the following travelers should be treated separately:

- *A person who arrives in Liberia at a port of entry and does not leave the port of entry before leaving Liberia (transit). However, if such persons disembark the vehicle, they should be screened before entry into the terminal and if they meet the case definition of a suspected probable, or confirmed case, should be isolated and tested for SARS-CoV-2 according to the testing protocol.*

- *A person who arrives in Liberia in the person's capacity as a member of the flight crew of an aircraft. COVID-19 screening should be done. However, such persons should limit their travel from the POE to their lodging and back except in exceptional circumstances such as to seek medical care or the result of another emergency. The person should be isolated if a suspected, probable or confirmed case and tested for SARS-CoV-2.*

8.2 Monitoring of high-risk contacts

8.2.1 Baseline Assessment

- Document the epidemiologic link to a case if not already done by the case investigators/contact tracers, demographic detail (e.g. name age sex, residence, occupation, etc.), and travel history.
- History of current and past illness (e.g. cardiovascular disease, hypertension, and immunosuppressive diseases-HIV, malnutrition, tuberculosis, chronic disease, etc.)
- Social behavioral risk (e.g. smoking, alcohol intake, sex worker, etc.)
- COVID-19 clinical screening using the standard algorithm.
- Baseline Assessment: SPO_2, HR, RR, temperature, and BP.
- Provide a number to call to report symptoms or make a complaint or inquiry.

- Management:
    - Psychosocial support
    - Explain quarantine process/regulations, expectation, and answer questions
    - Offer a copy of the precautionary observation Frequently Asked Questions.

Daily Monitoring/Management of high-risk contacts

a) Assessment:
    - Oxygen saturation, SPO_2, HR, RR, temperature, and BP (only if indicated).
    - Symptom check.

b) Management:
    - A patient that develop symptoms should be screened for COVID-19 and if the case definition of suspected, probable or confirmed case is met should be referred to appropriate CITU and tested for SARS-CoV-2.
    - A person with pre-existing disease should continue treatment uninterrupted.
    - A nasopharyngeal sample will be drawn on day 7 and 12 for COVID-19 testing of persons that remain asymptomatic.
    - Provide adequate appropriate meal based on the dietary needs (regular non-diabetic, diabetic, vegetarian, tube feeding, etc.)
    - Ensure that patient has a provision of toiletries/ towel/ blanket/clean linen, pillow with covers, and other essential needs are met, etc.

Awareness

- High-risk contacts should be encouraged to use mask at all times (e.g. yard, sitting area, kitchen, etc.). A new mask should be given to each resident or upon request.
- Perform hand hygiene frequently at WHO My 5 key moments (before or after handling food, after using toilet or handling soiled materials and as often as desired).
- Wear mask when accessing public spaces and avoid frequent unnecessary touching of the face or mask.
- Maintain social distancing (avoid interaction or keep at least six feet apart from other patients).

- Avoid inviting other quarantine persons into the room and do not visit other rooms for group swimming, party, distance or other group activities.
- Avoid smoking, alcohol intake, and other high-risk social behaviors.
- Psychosocial: High-risk contacts admitted to precautionary observation should have access to mental health/psychosocial support when require.

8.3 COVID testing for high risk contacts

- Nasopharyngeal samples should be collected on days 7 and 12 for COVID-19 testing of persons who remain asymptomatic throughout their precautionary observation:
    - If any test is result is positive, refer for admission to the confirmed CITU.
    - If both results show no evidence of SARS-CoV-2, the high-risk contact will be discharge after 14 days of supervised precautionary observation.
    - Persons who become symptomatic prior to sample collection or test result is known should be transferred to the suspected CITU.

8.4 Criteria for Discharge from Precautionary Observation (Figure 6)

8.4.1 Criteria for discharge from POC when covid-19 testing is accessible

The decision to discharge a patient from the POC should be taken for patients who meet the below Clinical **AND** Laboratory Criteria:

Clinical Discharge Criteria:

a. Asymptomatic continuously for 14 days or throughout the full duration of their precautionary observation.

Use of COVID-19 laboratory result for discharge from the POC:

a. COVID-19 Test on two consecutive samples show no evidence of SARS-CoV-2. The first samples should be collected on day 7 and 12 or shortly after.

8.4.2 Criteria for discharge from the POC when COVID-19 testing is not accessible

a. It is essential that all high-risk contacts are tested for COVID-19. In the absence of testing, the contact should be discharged after at least 14 days of precautionary observation without any symptom.

8.4.3 Follow-up after discharge

- Patients who have no evidence of SARS-CoV-2 but who require health care should be referred for management in a routine health facility.
- The community engagement and psychosocial team should be informed about the discharge least 2-3 days in advance to prepare for community re-entry and post discharge support. A discharge certificate should be provided.

Epi-reporting

A designated POC staff should provide daily updates to the epi-surveillance and case management team on new admissions, transfers, discharge, available bed, and issues.

Operational management of the POC

The staffing requirements should be determined according to the standard guidelines for staffing of a quarantine facility. All personnel working in a POC should be trained on IPC and case management of COVID-19. Monitoring of persons quarantined at home require daily visits or reliable electronic monitoring and reporting of the monitoring findings. The standard monitoring and reporting tools should be used for assessment and documentation.

8.5 Low risk contacts

Overview

A person is a low risk contact of COVID-19 who within the last 14 days:

- Was more than two meters away of a patient of COVID-19 for more than 15 minutes but did NOT have face-to-face direct contact within one meter of the

patient and had no other direct contact with the patient or a physical environment (chair, linen, doorknob, phone, pen, etc.).

- Worked at a health facility where a case of COVID-19 was detected but was in risk-appropriate PPE and followed appropriate donning procedure and did not directly provide care to a case of COVID-19.

Management of low risk contact

- Self-monitoring for 14 days since the last day of the low risk exposure and during this time ensure social distancing from other members.
- Health education and COVID-19 prevention support and provide contact number (4455 and contact tracer's mobile number)
- Don face mask correctly at all times. A new facemask should be offered if the contact does not have mask and educated on how to use it:
- Practice correct hand hygiene frequently especially at the WHO 5 key moments and also after touching surfaces.
- Continue to use risk-appropriate PPE at work
- Call 4455 or report any symptoms of COVID-19 or seek help at a health facility and report the symptoms and history of contact.
- Encourage to visit a voluntary sample collection site for voluntary COVID-19 testing and explain the importance of doing so and what the test result means and what will happen after testing (positive result=isolation and case management PLUS contact tracing).

9 COVID-19 RESEARCH AS PART OF RESPONSE

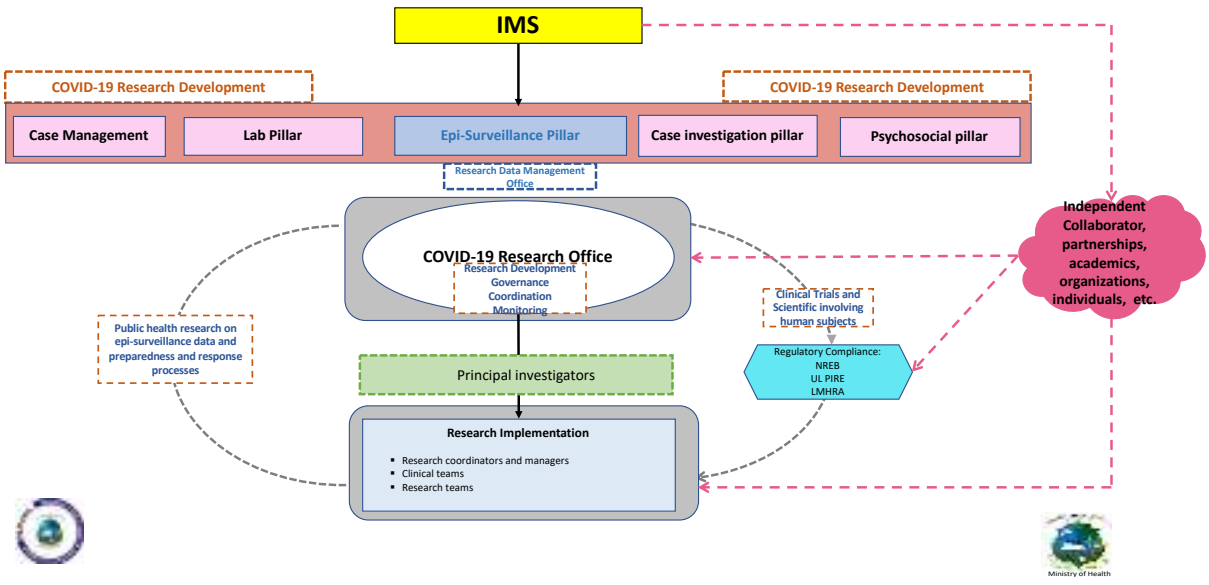
9.1 Research as part of Response

Scientific research should be conducted as part of the COVID-19 response. The Incidence Management System (IMS) should establish the Technical Advisory Committee (TAC) headed by the COVID-19 Response Research Coordinator to establish governance to

ensure streamlining, collaboration, and avoid duplication of research. The epi-surveillance pillar is the central repository of IMS and public health research data. The committee should engage with stakeholders and researchers:

- To define the national research priorities including vaccine and therapeutic trials and other public health research.
- Support and fast track the development and/or adoption of protocols for approval by the IMS in transparent and fair manner free of political and non-scientific biases and influences.
- To leverage partnership and collaboration to support defined research priorities
- Develop guidance and processes to integrate research into the response activities.
- To provide direct funding and support by the IMS for research as part of response.
- Ensure that experimental therapeutics are subjected to rigorous regulatory review and clinical trial before use. However, experimental products that received monitored emergency use authorization by the WHO can be used in this context.

Figure 10: COVID-19 Research Governance Structure



Research during health emergencies is associated with additional ethical considerations including safety of staff, requirement for community engagement and partnership, requirement for government and/or community consent, and data sharing, use, and ownership. Researchers must ensure that the following conditions are met:

1. Research should be in line with the national research priority and should facilitate and not impede emergency response efforts.
    - Research should be coordinated to avoid duplication and nonvalid results.
    - Operational research on all thematic areas of the epidemic preparedness and response should be encouraged. The pillar leads and IMS leaders of the response should ensure that there is accurate and complete documentation of all response activities, and a transparent and fair process is in place for access to data to enable retrospective research on stored data.
    - Collaborative research partnership should be based on equality, justice, and transparency.

2. Community engagement and participation:
    - Fair, meaningful engagement, and inclusive decision-making should occur. Community participation should be required for clinical trials conducted during all public health emergencies.

3. Ethical standards that protect the rights of participants and frontline health workers.
    - Ensure independent ethical review by the research ethics board of science research in a timely manner and decisions communicated without unnecessary delay. However, implementation and public health research based on epi-surveillance data can be directly approved for implementation. Researchers should be encouraged to first seek IMS approval prior to ethics review. The TAC will facilitate protocol review by the IMS.
    - All approvals should be obtained before proceeding and should be based on scientific merits and risk to participants is the minimum reasonably possible.
    - Individual informed consent should be required unless waived by the ethics board. However, some research may require additional community consent and approval of the relevant public authority.

4. Adapting research methodologies during emergencies:

- Research related to the emergency must have scientific validity and social value and prevent unnecessary exposure of participants and researchers to unacceptable risk.

5. Selection of research participants during emergencies:
    - Participants should be treated equally, with respect, and selected in a way that minimizes risk and protects vulnerable populations without routinely excluding them from participation without reasonable scientific justification.

6. Sharing of research data and samples during emergencies:
    - Participants, stakeholders and/or regulatory authorities should be informed about the collection, storage, future use, or export of biological material.
    - Information that has the potential to aid the response efforts should be quickly reviewed, quality-controlled and shared without delay. The information should be shared without waiting for its publication.

9.2 Clinical Trial Therapeutics and Vaccines

- Experimental therapeutics and vaccines are NOT recommended for use as treatment or prophylaxis for COVID-19 outside the context of approved clinical research.
- Experimental therapeutics and vaccines approved under monitored emergency use authorization by the WHO should obtain Liberian regulatory approval (e.g. LMHRA and/or NREB) for use.

There is no drug treatment for COVID-19. Treatment strategies focus on symptoms management and supportive therapy only. There are some articles citing effectiveness of azithromycin, convalescent plasma, anti-retroviral drugs (ritonavir, lopinavir either alone or in combination with oseltamivir, remdesevir), and chloroquine and hydroxychloroquine.

The antimalarial medication hydroxychloroquine and the antibiotic azithromycin have been proposed as potential treatments for COVID-19 and preliminary results on efficacy is controversial/mixed [50]. Some patients on the drug experienced higher odds of cardiovascular complications and mortality [8]. In patients with cardiovascular disease, the two

medicines are associated with complications such as severe electrical irregularities in the heart such as irregular heartbeat (arrhythmia), polymorphic ventricular tachycardia (including Torsade de Pointes) and long QT syndrome, and increased risk of sudden death. While there is a long history of use of chloroquine for treatment of malaria, a safe and effective dose in COVID-19 is not known. In the absences of capabilities for electrocardiographic and electrolyte monitoring and management of cardiovascular events, these medications should not be used.

An open label randomized control trial of lopinavir-ritonavir in comparison with standard of care in 199 patients with laboratory-confirmed SARS-CoV-2 found no benefit of lopinavir-ritonavir [51]. A systematic review of the safety and antiretroviral drugs against SARS, MERS, or COVID-19 found no benefit to support their use outside clinical trial [52]. Clinical trials of remdesevir have yielded some promising results.

The goal of treatment remains to achieve optimum care for patients with COVID-19. The urgency of COVID-19 must not diminish the scientific rigor required in evaluation of treatments. Administering treatment without evidence of benefit may be harmful and unethical, hence, cautions must be exercised.

At minimum, clinicians who care for patients with COVID-19 should advocate that emerging and experimental therapeutics be subjected to rigorous clinical and ethical investigation and/or obtain emergency use authorization from the WHO. This guidance will be reviewed in the light of new evidence and recommendations of the WHO and the Ministry of Health.

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