Management Guidelines for the Coronavirus Disease (COVID-19) Infection

1st Edition

May 2020

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I.   Introduction

Since the emergence of the 2019 novel coronavirus (2019- nCoV) infection in Wuhan, China, in December 2019, it has rapidly spread across the world. According to the WHO, as of May 16, 2020, there have been more than 4.5 million confirmed cases of infection with this virus worldwide. The World Health Organization (WHO) has named the disease associated with SARS-CoV-2 infections as Corona "COVID-19".
The available genetic and epidemiological data suggest that SARS-CoV-2 is a zoonotic pathogen with possible spillover directly from wildlife or via intermediate animal hosts or their products. Most cases have been associated with fever and respiratory symptoms (coughing and shortness of breath), while other cases are mild or subclinical cases. About 2% can have serious disease requiring intensive care. Fatality rate is variable from different countries ranging from < 1% to 7%. Serious disease is more frequent in the elderly and individuals with underlying comorbidities. Different therapeutic modalities are in use in the treatment of COVID-19; however, the evidence of efficacy is controversial. Supportive care remains the mainstay of management

I.   Statement of purpose

This document provides guidelines on managing COVID-19 infections based on the best available scientific evidence and broad consensus. Its objective is to:

1.   Provide guidance on COVID-19 management in the healthcare setting.
2.   Standardize the clinical management of COVID-19 patients.
3.   Provide management guide for critically ill patients with COVID-19.
4.   Care pathways for efficient care delivery to COVID-19 patients.

II.   Process of Consultation/ Admission from Emergency During COVID-19 Epidemic

1.   **Definitions:**
   1.1 **Confirmed COVID-19 negative critically ill patient:**
      1.1.1   Critically ill patient with PCR COVID-19 sent and has been resulted as negative.
   1.2 **Confirmed COVID-19 positive critically ill patient:**
      1.2.1   Critically ill patient with PCR COVID-19 sent and has been resulted as positive.
   1.3 **Pending COVID-19 test critically ill patient:**
      1.3.1   Critically ill patient with PCR COVID-19 sent and has not been resulted yet (status as far as COVID-19 continues to be pending)

2.   **Recommendations:**
   2.1 All patients presenting to ED with high likelihood of COVID-19 infection should have a COVID-19 Test done / follow KFSHRC policy for COVID-19 testing.
   2.2 If intubation is needed, please call COVID-19 assigned anesthesia provider
   2.3 Consider placing all lines (CVC, Arterial catheter) with the intubation process.

III. Criteria for Activating Critical Care COVID-19 Team

This protocol is applicable for all confirmed COVID-19 patients at KFSH&RC, in order to:
1. Identify the critically ill COVID-19 patients early
2. Facilitate intervention by the COVID-19 Critical Care Team
3. Facilitate early ICU transfer if and when warranted

1. **Responders to Critical Care COVID-19 team activation:**
    1.1.   Initial responders:
        1.1.1. The initial responders of any EWS activation:
            1.1.1.1. COVID ICU Nurse Responder
            1.1.1.2. Medical resident on call -Only 17:30 to 07:30 weekdays and during weekends-
            1.1.1.3. Respiratory therapist (COVID-19 ICU nurse will always activate RT)
    1.2.   The COVID-19 Critical Care Team is the second responder. It consists of:
        1.2.1. Consultant Intensivist or his designee: assistant consultant intensivist or critical care fellow
        1.2.2. Anesthesiologist (to be called by the consultant intensivist or his designee when appropriate)
2. **Criteria for Early Warning Scoring System:**
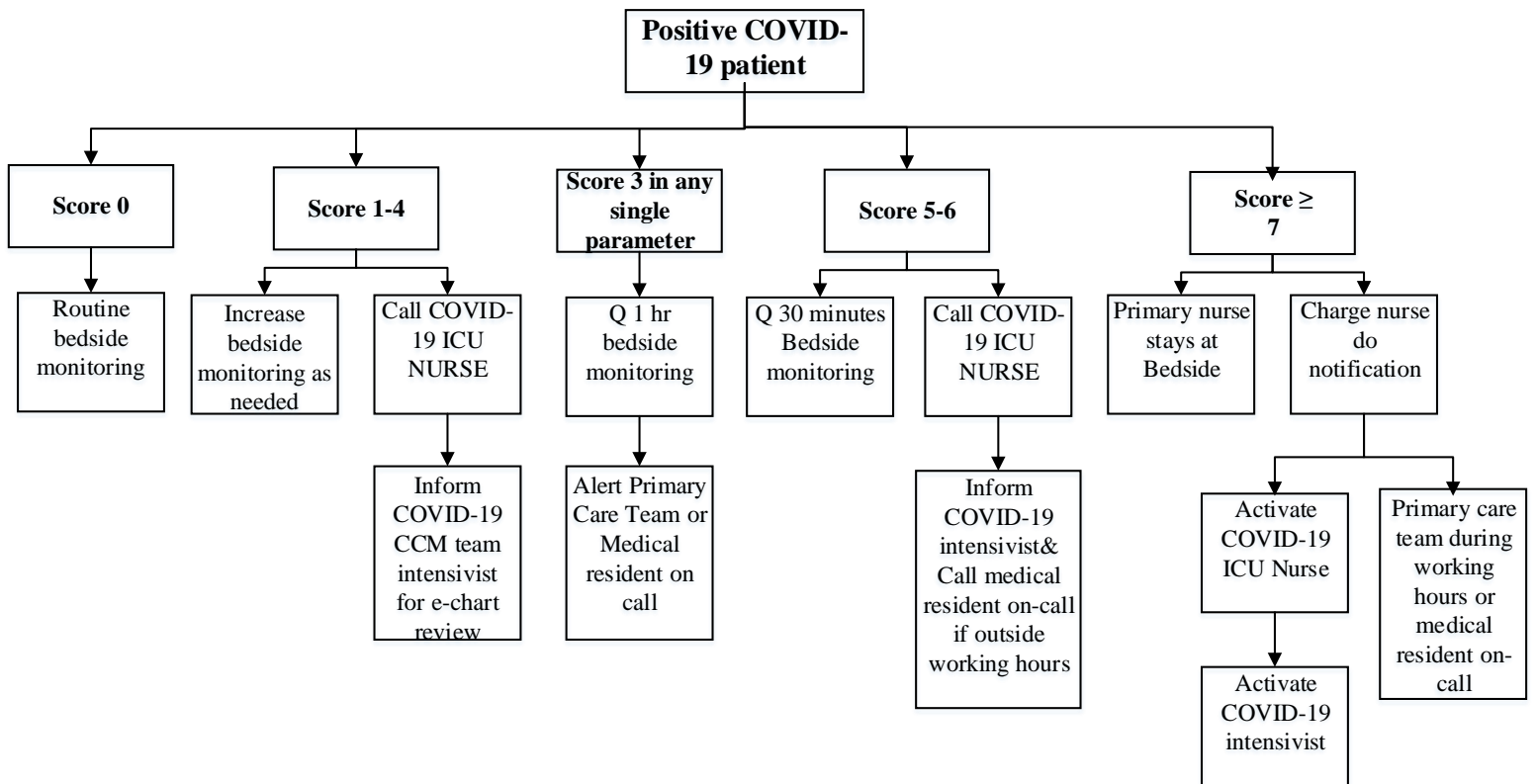   2.1.   Follow the COVID-19 Early Warning Scoring System outlined in (**Appendix 1: Table-1**)

3. **Actions according to the early warning scoring system:**
    3.1.   Follow the COVID-19 Early Warning Scoring System actions' plan as outlined in (**Appendix 2: table 2**) and the accompanying flowchart
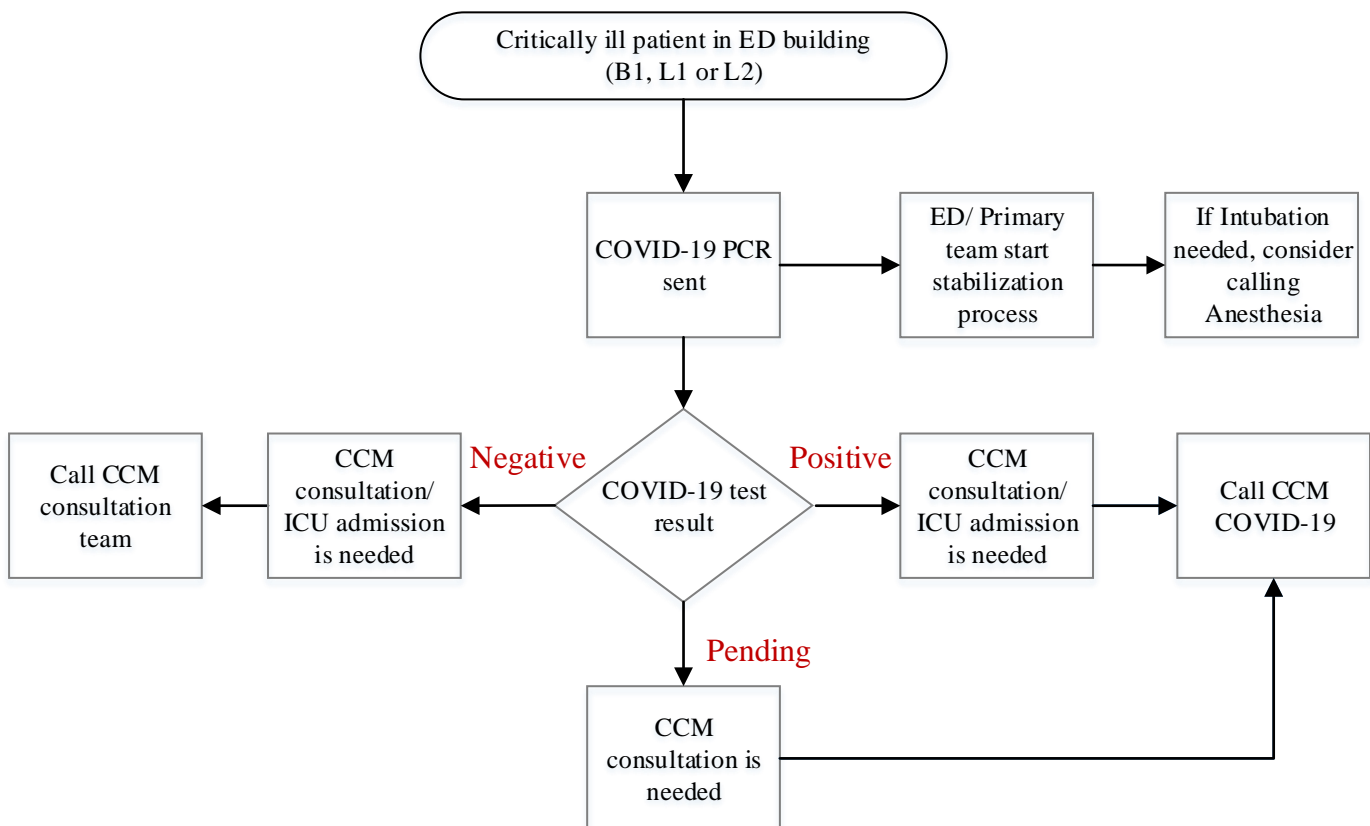
Flowchart of COVID-19 Early Warning Scoring System and COVID-19 Critical Care Team Activation

Positive COVID-19 patient

Score 0	Score 1-4	Score 3 in any single parameter	Score 5-6	Score ≥ 7
Routine bedside monitoring	Increase bedside monitoring as needed / Call COVID-19 ICU NURSE	Q 1 hr bedside monitoring	Q 30 minutes Bedside monitoring / Call COVID-19 ICU NURSE	Primary nurse stays at Bedside / Charge nurse do notification

- **Score 1-4** → Call COVID-19 ICU NURSE → Inform COVID-19 CCM team intensivist for e-chart review
- **Score 3 in any single parameter** → Q 1 hr bedside monitoring → Alert Primary Care Team or Medical resident on call
- **Score 5-6** → Call COVID-19 ICU NURSE → Inform COVID-19 intensivist & Call medical resident on-call if outside working hours
- **Score ≥ 7** → Charge nurse do notification → Activate COVID-19 ICU Nurse → Activate COVID-19 intensivist; and Primary care team during working hours or medical resident on-call

IV. Management of COVID-19 Patients

1. All patients should be verbally consented prior to the initiation of therapyز
2. For infection control purposes, printed detailed consent with full medication information will be provided to the patient/ legal guardian without the need for signature and documentation. This is to be done electronically as a form in ICIS.
3. These recommendations will be changed frequently based on available evidence
4. Recommendations available in these guidelines are based on the availability and supply of laboratory testing and medications at KFSH&RC
5. These guidelines are for confirmed cases of Coronavirus Disease 2019 (COVID-19)
6. Drug therapies for the management of COVID-19 are under compassionate use (Form B is **NOT** required)

1. **Definitions:**
   1.1 **Asymptomatic (Stage A)**
   1.1.1 Patients with no signs or symptoms of infection

   1.2 **Mild Infection (Stage B)**
   1.2.1 Patients with upper respiratory tract infection symptoms and other mild symptoms (including fever and gastrointestinal symptoms) without evidence of pneumonia

   1.3 **Moderate Infection (Stage C)**
   1.3.1 Patients with hypoxia with oxygen saturation less than 93% at rest or presence of pneumonia not requiring ICU admission

1.4 **Severe Infection (Stage D)**

    1.4.1   Patients with pneumonia requiring ICU admission or any of the following:

        1.4.1.1 Respiratory rate of 30 breaths/min (for pediatrics, respiratory rate more than 2 standard deviations with clinical evidence of increase work of breathing)

        1.4.1.2 Arterial oxygen partial pressure to fractional inspiratory oxygen ratio (PaO_2/FiO_2) less than 300

        1.4.1.3 More than 50% lung involvement on imaging within 24-48 hours

        1.4.1.4 Critical respiratory failure requiring mechanical ventilation, septic shock or multi-organ dysfunction

1.5 **High Risk Patients:**

    1.5.1   Any patient with COVID-19 with any of the following comorbidities:

        1.5.1.1 Age more than 60-years-old

        1.5.1.2 History of pulmonary disease

        1.5.1.3 Chronic kidney disease

        1.5.1.4 History of atherosclerotic cardiovascular disease

        1.5.1.5 Diabetes mellitus

        1.5.1.6 Hypertension

        1.5.1.7 History of solid organ or stem cell transplantation

        1.5.1.8 Human immunodeficiency virus (HIV) positive

        1.5.1.9 On chemotherapy or other immunosuppressive medications

        1.5.1.10   Children < 1-year-old

2. **Admission Care-set and Investigations:**

Table 1:

Recommended investigations for diagnostic and risk stratification purposes upon admission

	All admissions	Specific indication
Laboratories	- CBC with differential - Renal profile - Bone profile - Magnesium level - Hepatic profile - PT and PTT - Procalcitonin - ESR - Ferritin - D-dimer - LD and haptoglobin - CK and troponin T - Blood glucose - Urinalysis	- Respiratory culture (if patient is producing sputum) - Respiratory rapid multiplex PCR (for stages B, C and D) - MERS testing in the presence of epidemiological link or in the presence of other identified risk factors - Triglycerides, fibrinogen and Pro-BNP for stage B, C and D - Blood culture for patients with findings of bacterial infection or sepsis - Hepatitis B serology and hepatitis C antibody for patients with deranged liver biochemistry (for stage B, C and D)

	- Serum HCG for female patients - COVID 19 PCR	- Arterial blood gas in patients with severe or critical disease - G6PD qualitative screen for patients planned to be treated with chloroquine
Tests/Imaging	- Electrocardiogram for QTc - Portable chest x-ray on admission - When indicated, CT chest without contrast* - Consider transthoracic echocardiography in patients with cardiac symptoms	

*CT chest without contrast is indicated in the following cases:
- Any patient with lung infiltration/consolidation on chest x-ray
- High-risk group with respiratory symptoms regardless of chest x-ray findings

3. **Risk Assessment for QTc Prolongation while on Hydroxychloroquine and/or Azithromycin**

Risk Score for drug-associated QTc Prolongation (Tisdale Risk Score)

Table 2: Tisdale Risk Score

Risk Factors	Points	
Age ≥68 years old	1	
Female sex	1	
Loop diuretics	1	
Serum potassium ≤3.5 mmol/L	2	
Admission QTc ≥450 msec	2	
Acute myocardial infarction	2	
Sepsis	3	
Heart failure	3	
One QTc-prolonging drug*	3	
≥2 QTc-prolonging drugs*	3	
Maximum risk score	21	
Low risk = ≤6 points	Moderate risk = 7-10 points	High-risk = ≥11 points

* 3 points for taking 1 QTc-prolonging drug; 3 additional points for taking ≥2 QTc-prolonging drugs (for a total of 6 points)

4. **Relative Electrophysiological Contraindications to Hydroxychloroquine (with or without Azithromycin):**
   4.1 History of long QT syndrome

4.2 Baseline QTc >500 msec (or >530-550 msec in patients with QRS greater than >120 msec)

4.3 Tisdale risk ≥11 points (high-risk) **AND** inability to monitor with serial ECGs or telemetry

5. **Interventions before Starting Hydroxychloroquine (with or without Azithromycin):**
    5.1 Discontinue and avoid all other non-critical QT prolonging agents
    5.2 Keep potassium level > 4 mmol/L and magnesium level > 1 mmol/L
    5.3 For further details, please refer to Drug Induced QTc Prolongation Monitoring Guidelines for Patients at KFSH&RC (http://www.kfshrc.edu.sa/store/media/b08.pdf)

6. **Management of Adult Patients (for Dosing and Medication Related Information.**
    See Appendix 3-Table 3:
    6.1 **Stage A**

6.1.1	No need for treatment
6.1.2	Apply infection control measures and supportive care, if needed

    6.2 **Stage B:**

6.2.1	Consult Infectious Diseases team
6.2.2	Azithromycin for 5 days
6.2.3	Hydroxychloroquine for 5 days

    6.3 **Stage C:**

6.3.1	Consult Infectious Diseases team
6.3.2	Azithromycin for 5 days
6.3.3	Hydroxychloroquine for 5 days
6.3.4	Decision to add lopinavir/ritonavir or chloroquine for 6- 10 days should be made by Infectious Diseases team **with a clear documentation in ICIS**
6.3.5	In patients with suspected bacterial infection, start ceftriaxone in addition to oseltamivir for confirmed influenza
6.3.6	May consider levofloxacin instead of ceftriaxone in severe beta lactam allergy (closely monitor QTc interval)
6.3.7	Supportive care as needed

    6.4 **Stage D:**

6.4.1	Azithromycin for 5 days
6.4.2	Hydroxychloroquine for 5 days
6.4.3	Decision to add lopinavir/ritonavir or chloroquine for 6- 10 days should be made by Infectious Diseases team with a clear documentation in ICIS
6.4.4	The addition of high dose intravenous immunoglobulin (IVIG) 25 grams per day for 5 days for clinically deteriorating patients; should be decided by Infectious Diseases team with clear documentation in ICIS
6.4.5	May consider adding tocilizumab for patients meeting eligibility criteria in Table 5. (Tocilizumab order for this indication should be entered by the Infectious Disease services, in urgent cases documentation by the Infectious Disease team in ICIS will be accepted)

6.4.6   In patients with suspected bacterial infection, start piperacillin/tazobacatm +/- vancomycin if MRSA risk factors identified in addition to oseltamivir for confirmed influenza

6.4.7   May consider levofloxacin instead of piperacillin/tazobactam in severe beta lactam allergy (closely monitor QTc interval)

6.4.8   There is accumulating evidence that suggests that COVID-19 may predispose to both venous and arterial thromboembolisms in critically ill patients due to excessive inflammation, hypoxia, immobilization, and diffuse intravascular coagulation. Use of anticoagulation should be assessed on a case-by-case basis.

6.4.9   Supportive care as needed

7. **Management of Pediatric Patients.**
   For Dosing and Medication Related Information (**Appendix 3-Table 3**)

   7.1 **Stage A:**
   7.1.1   No need for treatment
   7.1.2   Apply infection control measures and supportive care, if needed

   7.2 **Stage B:**
   7.2.1   Consult Pediatric Infectious Diseases team
   7.2.2   Azithromycin for 5 days
   7.2.3   Hydroxychloroquine for 5 days

   7.3 **Stage C:**
   7.3.1   Consult Pediatric Infectious Diseases team
   7.3.2   Azithromycin for 5 days
   7.3.3   Hydroxychloroquine for 5 days
   7.3.4   Decision to add lopinavir/ritonavir or chloroquine for 6- 10 days should be made by Pediatric Infectious Diseases team with a clear documentation in ICIS
   7.3.5   In patients with suspected bacterial infection, start ceftriaxone in addition to oseltamivir for confirmed influenza
   7.3.6   May consider levofloxacin instead of ceftriaxone in severe beta lactam allergy (closely monitor QTc interval)
   7.3.7   Supportive care as needed

   7.4 **Stage D:**
   7.4.1   Consult Pediatric Infectious Diseases team
   7.4.2   Azithromycin for 5 days
   7.4.3   Hydroxychloroquine for 5 days
   7.4.4   Decision to add lopinavir/ritonavir or chloroquine for 6- 10 days should be made by Pediatric Infectious Diseases team with a clear documentation in ICIS
   7.4.5   In patients with suspected bacterial infection, start piperacillin/tazobacatm +/- vancomycin if MRSA risk factors identified in addition to oseltamivir for confirmed influenza
   7.4.6   May consider levofloxacin instead of piperacillin/tazobacatm in severe beta lactam allergy (closely monitor QTc interval)
   7.4.7   Supportive care as needed

8. **Monitoring during Hospitalization**
    8.1 **Laboratories:**
        8.1.1 For patients with mild or moderate disease, daily labs may be done including CBD with differential, renal profile and hepatic profile. Consider repeating other labs such as ferritin, CRP, D-dimer, CK and troponin T if baseline is abnormal. Consider blood glucose monitoring especially with risk factors or signs/symptoms of hypoglycemia.
        8.1.2 For patients with severe or critical disease, daily labs should be done including CBD with differential, renal profile, hepatic profile, bone profile, CRP, procalcitonin, ferritin, D-dimer, LD, CK and troponin T.
        8.1.3 Monitor and optimize serum potassium and magnesium daily while using hydroxychloroquine and/or azithromycin
    8.2 **Imaging:**
        8.2.1 Chest x-ray should be done in any patient with new respiratory symptoms.
        8.2.2 Chest x-ray may be repeated every 48 hours in patients with moderate disease or every 24 hours for patients with severe or critical disease.
    8.3 **Vital Signs:**
        8.3.1 For patients who are symptomatic with mild disease (stage A and B):
            8.3.1.1 Vital signs can be done every 12 hours and as needed.
        8.3.2 For patients with moderate or severe disease (stage C and D):
            8.3.2.1 Vital signs should be done frequently (every 1-6 hours) in a case-by case basis.
    8.4 **ECG:**
        8.4.1 Consider telemetry in patients at high-risk for QTc prolongation (Table 2)
        8.4.2 Acquire ECG 2-3 hours after the second dose of hydroxychloroquine followed by daily ECGs thereafter.
        8.4.3 If QTc increases by >60 msec or absolute QTc >500 msec (or >530-550 msec if QTS >120 msec), discontinue azithromycin (if used) or reduce dose of hydroxychloroquine and repeat ECG daily.
        8.4.4 If QTc remains increased, reevaluate the risk/benefit of therapy and consider discontinuation of hydroxychloroquine after consultation with Cardiac Electrophysiology.
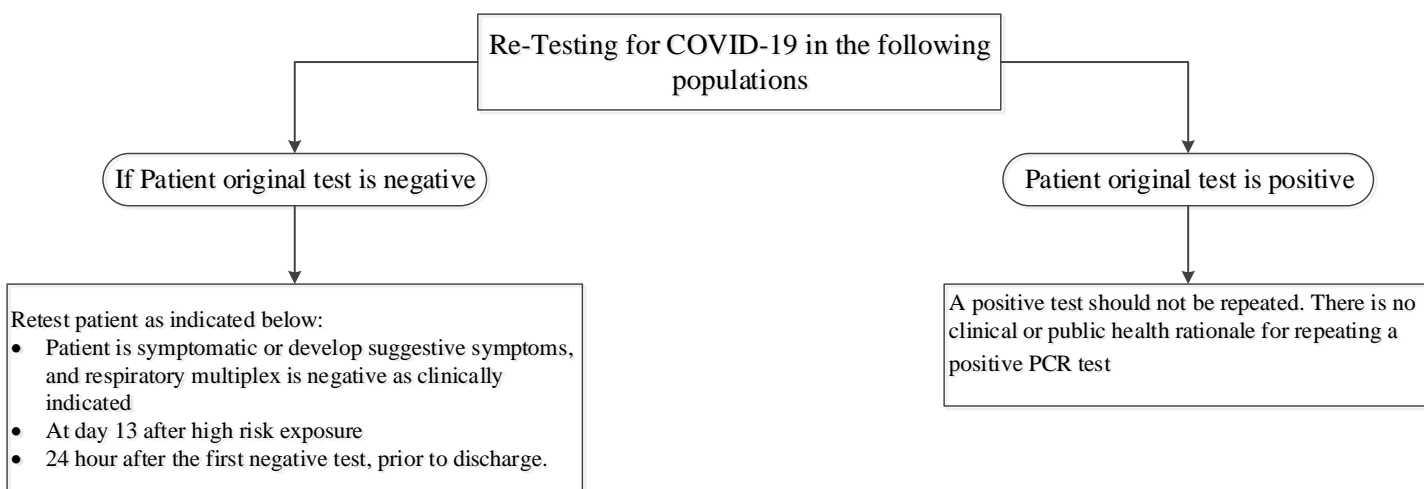   8.4.5 Consider cardiology consultation if needed
    8.5 **Drug-Drug Interactions:**
        8.5.1 Monitoring of drug-drug interaction is essential to avoid super or sub- therapeutic effects and avoid toxicities especially with immunosuppressive medications.
        8.5.2 Some COVID-19 therapies interact with ticagrelor, clopidogrel, warfarin and the direct oral anticoagulants (DOACs) (e.g. lopinavir/ritonavir increases drug concentrations of ticagrelor, apixaban and rivaroxaban and decreases the active metabolite of clopidogrel). If the patient is on any of the DOACs or warfarin, switch to anticoagulation with low-molecular-weight heparin (LMWH) or unfractionated heparin (UFH), as indicated based on the renal function and the clinical scenario.
        8.5.3 **(Appendix 4: Table 4)** contains major interactions with commonly used immune-suppressants.
        8.5.4 For more details regarding other important/potent drug-drug interactions, please refer to the hospital formulary **(https://online.lexi.com/lco/action/interact)** and/or contact the clinical pharmacist.

9. **Tocilizumab Eligibility Criteria:** Consider tocilizumab if either of the following three criteria applies and consult Infectious Diseases service as it should be prescribed by Infectious Diseases service only- may accept ICIS documentation in urgent situations **(Appendix 5, Table 5 & 6)**

10. **Pregnancy and Lactation:** Management of infection with COVID-19 in pregnancy is mainly based on supportive care. Consideration of antiviral therapy should be based on patient condition, safety profile and preference of the patient and treating team.

11. **Re-testing algorithm and Discharge Criteria:**

   Figure1: Re-testing algorithm:

Guideline for COVID-19 Testing and Re-Testing at KFSHRC 9 April 2020 V1.2

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                    ┌─────────────────────────────────────┐
                    │  Re-Testing for COVID-19 in the      │
                    │  following populations               │
                    └─────────────────────────────────────┘
           ┌─────────────────┴─────────────────────────────┐
  ┌──────────────────────────────┐          ┌──────────────────────────────┐
  │ If Patient original test is   │          │ Patient original test is      │
  │ negative                      │          │ positive                      │
  └──────────────────────────────┘          └──────────────────────────────┘
           │                                           │
  ┌──────────────────────────────┐          ┌──────────────────────────────┐
  │ Retest patient as indicated   │          │ A positive test should not be │
  │ below:                        │          │ repeated. There is no         │
  │ • Patient is symptomatic or   │          │ clinical or public health     │
  │   develop suggestive symptoms,│          │ rationale for repeating a     │
  │   and respiratory multiplex   │          │ positive PCR test             │
  │   is negative as clinically   │          └──────────────────────────────┘
  │   indicated                   │
  │ • At day 13 after high risk   │
  │   exposure                    │
  │ • 24 hour after the first     │
  │   negative test, prior to     │
  │   discharge.                  │
  └──────────────────────────────┘
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* Test to be done in a negative pressure room or neutral single room (with HEPA filter if available otherwise without)
** if the transfer to the unit is decided before the result get released (depending on the crowd in ER as decided by ER leadership) and no clinical picture of COVID-19, patient to be admitted in a negative pressure room or neutral single room (with HEPA filter if available otherwise without)

V. Management of the Critical ill Infected COVID-19 patients

1. **Infection Control:**
   1.1. During aerosol-generating procedures (AGP) on patients with COVID-19 in the ICU, it is recommended to use fitted respirator masks (N95 fitted ones), in addition to other personal protective equipment (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles) as per the KFSH&RC infection control policies.
   1.2. During intubation and other AGP is recommended to use N95 fitted mask or battery powered airway purifying respirator (PAPR).

1.3. It is preferred to use negative pressure room when performing AGP procedures on critically ill ICU COVID-19 patients.

1.4. When providing usual care for non-ventilated or ventilated COVID-19 patients, use what is recommended of personal protective equipment per infection control policies (i.e., gloves, gown, and eye protection, such as a face shield or safety goggles) (weak recommendation, low quality evidence).

2. **Endotracheal Intubation:**

1.1 Please follow separate intubation guidelines and checklists for COVID19 patients

1.2 Video guided laryngoscopy is recommended for endotracheal intubation: McGrath or Glidoscope

    1.2.1   It is recommended to have endotracheal intubation performed by an experienced operator.

    1.2.2   If Anesthesiology is unsuccessful in securing an endotracheal intubation, consider emergent cricothyrotomy or percutaneous tracheostomy to be performed by the anesthesia services or Critical Care respectively.

1.3 Pre-Oxygenation:

    1.3.1   Use face mask for oxygenation and avoid nonrebreather bag

    1.3.2   Avoid non-invasive ventilation

    1.3.3   May use HFNC up to a maximum of 30 LPM

2. **Diagnostic Investigations:**

2.1 Respiratory Samples:

    2.1.1   For diagnostic testing in mechanically ventilated patients, obtaining lower respiratory tract samples is preferred over upper respiratory tract nasopharyngeal swabs or washes. Lower respiratory samples are preferred over bronchial wash or bronchoalveolar lavage samples. Send for bacterial and fungal cultures.

2.2 Blood Investigations:

    2.2.1   CBC daily

    2.2.2   Differential WBC count (to diagnose and follow lymphopenia) on admission and every other day

    2.2.3   Daily VBG or ABG (if Arterial line is inserted) – can be more or less as clinically indicated

    2.2.4   Procalcitonin, Ferritin, CRP, ESR on admission and every other day

    2.2.5   Screen for G6PD

    2.2.6   LDH on admission and every other day

    2.2.7   Triglycerides on admission and every three days after (If started on Propofol)

    2.2.8   NT-ProBNP and hsTnT on admission and every other day

    2.2.9   Renal profile daily

    2.2.10 Liver profile every other day

    2.2.11 Coagulation profile (PT/INR and PTT) every other day

    2.2.12 DIC screen (D-dimer, FDP and fibrinogen) when indicated

2.3 Urine Samples:

    2.3.1   Urinalysis and Urine cultures on admission and when indicated

    2.3.2   Urine legionella and Pneumococcal antigens (to rule out superinfections) on admission once pneumonia or ARDS is diagnosed

2.4 Other investigations:

    2.4.1   12 lead ECG on admission and every 48 hours, and daily or more frequently if QT prolonged, or the patient is on QT prolonging medications (printing from monitor is acceptable).

    2.4.2   Consider a baseline transthoracic echocardiogram, if non done in the last few days since hospital admission.

    2.4.3   Consider Point-Of-Care ultrasound (POCUS) to help in the diagnosis and management of organ dysfunction. It should be followed by formal imaging as indicated

    2.4.4   In the presence of new hemodynamic instability or shock, consider Cardiac POCUS. It should be followed by formal transthoracic Echo if new cardiac dysfunction is noted or suspected.

    2.4.5   Portable Chest x-rays will be used for routine chest imaging unless there is a compelling indication to do CT Chest.

3. Supportive Care:

3.1 Hemodynamic Support:

    3.1.1   In presence of shock, consider initial fluid resuscitation with balanced (e.g. LR) crystalloids up to 30 ml/kg (guided by POCUS fluid responsive testing if possible) as 500 cc boluses at the time.

    3.1.2   If history of CHF is unknown or absent:

        3.1.2.1 Order ~20 cc/kg IV bolus of crystalloids and monitor response

        3.1.2.2 Additional boluses can be given as needed

        3.1.2.3 Consider ordering a stat transthoracic echocardiography to assess myocardial function and IVC collapsibility or diameter

        3.1.2.4 Consider early initiation of inotropic support with NE if MAP < 55

    3.1.3   If history of CHF or myocarditis is found:

        3.1.3.1 Order 500 mL of crystalloids bolus

        3.1.3.2 Consider early initiation of inotropic support

    3.1.4   Evaluate and trend the following:

        3.1.4.1 Central venous oxygen saturation (CvO_2)

        3.1.4.2 Capillary refill

        3.1.4.3 Extremities temperature

        3.1.4.4 Lactic acid

        3.1.4.5 Arterial – venous CO_2 gap

    3.1.5   Inotropic agents (Please choose maximum concentration):

        3.1.5.1 Norepinephrine is the first choice in all shock states

        3.1.5.2 Vasopressin to be added once norepinephrine dose exceeds 0.3 mcg/Kg/min.

        3.1.5.3 Avoid Dopamine if norepinephrine is available

        3.1.5.4 Vasopressin is preferred to be added to norepinephrine as a second choice

        3.1.5.5 If cardiac dysfunction is detected, consider the addition of dobutamine to norepinephrine is recommended

3.1.5.6 In refractory shock (with inotropes or vasopressors of norepinephrine 0.3 mcg/Kg/min or more), start hydrocortisone 50 mg IV every 6 hours for 5-7 days. You may wean or stop Hydrocortisone after stopping inotropes in 24 hours

3.2 <u>Respiratory Support and Ventilation:</u>

3.2.1   Start Supplemental Oxygen if SpO$_2$ drops to below 94%

3.2.2   Once acute hypoxic respiratory failure is confirmed (ABG pO$_2$ is less than 7.3 kPa or 55 mmHg), target SpO$_2$ to be more than 90-95%

3.2.3   Use High flow nasal cannula over conventional oxygen only in presence of negative pressure rooms

3.2.4   Do NOT consider non-invasive ventilation unless the patient is in a negative pressure room

3.2.5   Close monitoring is needed once the patient needs oxygen as there a high likelihood of rapid clinical deterioration

3.2.6   **Once intubated:**

Parameters	Target Settings
Mode of ventilation	Pressure or Volume targeted modes of assisted ventilation.
Target V_T	between 4 – 6 ml/Kg of IBW
P$_{plateau}$	< 30 cm H$_2$0
Driving pressure (P$_{plateau}$ – PEEP)	< 15 cm H$_2$0
FiO2	< 60% (to avoid oxygen toxicity)

3.2.7   Repeat ABG post intubation in one hour

3.2.8   **Use ARDSnet PEEP-FiO$_2$ Tables.**

3.2.8.1 Use high PEEP settings if Driving Pressure high (>15 cm H$_2$O) and P/F ratio <200.

FIO2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	o.5	0.5	0.5-0.8	0.8	0.9	1.0
PEEP cmH2O	5	8	10	12	14	14	16	16	18	20	22	22	22-24

3.2.8.2 Use low PEEP Table if PF ratio is > 200

FIO2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	o.7	0.7	0.8	0.9	0.9	0.9	1.0
PEEP cmH2O	5	5	8	8	10	10	10	12	14	14	14	16	18	18-24

3.2.8.3 PEEP flexibility between these two extremes allowable based on clinical judgment

3.2.9   If bronchodilation is needed, consider MDI albuterol and MDI ipratropium. Avoid nebulization

3.2.10 May consider intermittent boluses of neuromuscular blockers. Avoid continuous infusion of them

3.2.11 **Advanced modes of Oxygenation/Ventilation**

- It is recommended to consider proning when PaO2/FiO2 ratio is less than 150 (pO2 in mmHg) for 12-16 hours then to reposition them supine
- Do NOT consider High Frequency Oscillation Ventilation

- Do NOT consider Airway Pressure Release Ventilation
- Can consider recruitment maneuver of 40 PEEP for 40 seconds if no contraindications exist (hemodynamic instability, pneumothorax, or cardiac dysfunction)

3.2.12 **Inhaled NO:**
- If hypo inflammatory ARDS is diagnosed, a trial of iNO should be considered for not more than 6 hours if oxygenation failed to improve using maximum conventional ventilation strategies.
- If successful, should not exceed 24 hours in preparation for other modalities

3.2.13 **ECMO:**
- Proceed to discuss with the ECMO on call in the absence of contraindications:
- VV ECMO if persistent and refractory hypoxemia continues without a significant cardiac dysfunction
- VA ECMO if persistent and refractory hypoxemia and hypercarbia continues with significant cardiac dysfunction

3.3 **Therapeutics:**
  3.3.1 Discuss all patients with Infectious Disease Service upon admission and daily
  3.3.2 Review KFSHRC COVID19 treatment guidelines.
  3.3.3 Consider checking with clinical pharmacist about the planned order of medications to avoid interactions.

3.4 **Checklist of questions:**
  3.4.1 Consider Cardiology opinion for cardiac patients requiring ARBS and / or ACEI.
  3.4.2 Anti-Infectives:
    3.4.2.1 Antibiotics (including azithromycin)
    3.4.2.2 Oseltamivir (if influenza PCR is positive)
    3.4.2.3 Hydroxychloroquine or Chloroquine
    3.4.2.4 Protease Inhibitors: lopinavir/ritonavir (disfavored)
  3.4.3 Modulators:
    3.4.3.1 Tocilizumab
    3.4.3.2 IFN-B1
    3.4.3.3 Intravenous Immunoglobulin (IVIG)
  3.4.4 Antifungals:
    3.4.4.1 When and what to consider
    3.4.4.2 Is it time to deescalate or not?
  3.4.5 In presence of moderate to severe ARDS, can consider corticosteroids in moderate doses and if not already on hydrocortisone (suggestion: methylprednisolone 0.5 – 1mg mg IV daily or equivalent for a 3-6 days course then taper as clinically appropriate); however, very controversial and not very much advised.
  3.4.6 **Other therapies:**
    3.4.6.1 Sedation: Propofol and Dexmedetomidine (avoid dexmedetomidine if qTC is > 550 m sec)

3.4.6.2 Agitation: Haloperidol intermittent boluses (caution with qTC > 550 m sec).

3.4.6.3 Target glycemic control is 120-180 mg/dL (6.5-10 mmol/L)

3.4.6.4 Temperature control is recommended: using acetaminophen. Avoid NSAIDs

3.4.7 **FASTHUGMBID**

3.4.7.1 Feeding: According to comorbidities

3.4.7.2 Analgesia: Opioids and nonopioids (avoid NSAID) to target CPOT < 2. (See the PADIS protocol in COVID-19 patients for further details)

3.4.7.3 Sedation: Define daily target of RASS (See the PADIS protocol in COVID-19 patients for further details)

3.4.7.4 Thromboprophylaxis: Enoxaparin if no contraindications. Otherwise SCDs.

3.4.7.5 HOB: > 30 degrees

3.4.7.6 Ulcer prophylaxis: PPI if intubated

3.4.7.7 Glycemic control: 120-180 mg/dL (6.5-10 mmol/L)

3.4.7.8 Mobilization: As possible within the room. Passive exercises only

3.4.7.9 Bowel Movements: Movichol, Senna

3.4.7.10 Invasive lines: review CVCs, A-lines and make sure a functioning peripheral IV is there

3.4.7.11 De-escalate: minimize lines and indwelling catheters

3.4.8 Update the family

3.4.9 Consider reviewing prognosis (may use APACHE IV score)

VI. Coagulopathy Prevention and Management for COVID-19 Patients

Coronavirus disease 2019 (COVID-19), a viral respiratory illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), may predispose patients to thrombotic disease, both in the venous and arterial circulations. The pathobiology behind that is thought to be related to hyper inflammatory response, platelets aggregation and activation on top of endothelial dysfunction and stasis that may occur with relative pulmonary capillaries vasodilation. Below are points recommended for coagulopathy management of critically-ill patients.

1. **Recommendations**

1.1 Without respiratory failure ($SpO_2 > 90\%$ or pO_2 on ABG > 7.5 kPa on room air):

1.1.1 Review clinical history carefully

1.1.2 Obtain BMI

1.1.3 Assure absence of contraindications to anticoagulation including; active or within 2 weeks serious bleeding history, coagulopathy, platelet count below 25,000/mL or platelet dysfunction

1.1.4 **Prefer to have pharmacologic prophylaxis for all COVID-19 positive admitted patients:**

1.1.4.1 Enoxaparin 40 mg SC daily

1.1.4.2 If BMI > 35 kg/m², Enoxaparin 30 mg SC BID

1.1.4.3 If eGFR < 30 ml/min, Heparin 5000 units SC BID

1.1.4.4 If has a confirmed history of HITT, Fondaparinux 2.5 mg SC daily (will need hematology approval)

1.1.5 If there is an absolute contraindication to pharmacologic prophylaxis;

1.1.5.1 Order above knee SCDs and assure application for a minimum of 20 hours a day

1.1.5.2 Consider applying above knee elastic stockings and SCDs if possible

1.2 <u>With respiratory failure (SpO$_2$ < 90% or pO$_2$ on ABG < 7.5 kPa on room air)</u>

    1.2.1   Obtain or review recent imaging of the chest to rule out PE

    1.2.2   If no indication to start anticoagulation, apply recommendations above for prophylaxis

    1.2.3   If there is no clear explanation of the severity of hypoxic respiratory failure, with or without ARDS, obtain a consult from thromboembolic or benign hematology services to discuss other options of management

2. Notes

- It is not recommended to have anticoagulation started without a known indication
- Respiratory failure should not favor initiation of full dose anticoagulation unless part of a clinical trial.
- It is highly recommended to go for full anticoagulation dose when a clinical indication is there, such as; a diagnosis of VTE or atrial fibrillation

VII. Clinical Management Guideline for Pregnant Mothers Suspected or Confirmed to have COVID-19

1. Definitions

1.1. <u>Suspected COVID-19 case:</u>

Patient with acute respiratory illness (sudden onset of at least one of the following: fever or recent history of fever, cough or shortness of breath) AND in the 14 days prior to symptom onset:

    1.1.1   Had a history of travel abroad or

    1.1.2   Travel to an identified high-risk area in the kingdom ((determined and announced by MOH) or

    1.1.3   A close physical contact prior to symptom onset with a confirmed COVID-19 case or

    1.1.4   Working in or attended a healthcare facility where patients with confirmed COVID-19 are admitted.

1.2 <u>Confirmed COVID-19 case:</u>

    A suspected case with laboratory confirmation of COVID-19 infection.

1.3 <u>Close Contact</u>

    1.3.1   Health care associated exposure, including providing direct care for COVID-19 patients, working with health care workers (HCWs) infected with COVID-19, visiting patients or staying in the same close environment of a COVID-19 patient.

    1.3.2   Working together in close proximity or sharing the same classroom environment a with COVID-19 patient.

    1.3.3   Traveling together with COVID-19 patient in any kind of transportation.

1.3.4   Living in the same household as a COVID-19 patient.

Flow Map- Activation of OR Process for COVID-19 Patients

	Front Desk Nurse	OR Runner (Outside)	OR Nurse (Circulatory/ Scrub)	Anesthesiologist & anesthesia Tech	Houskeeper
For patients from Isolation ward/ICU: To give 30 minutes grace time for ward nurse to send patients to OR. Ward/ICU nurse to activate security &/or ambulance	Activate Team	Place infection control tags on doors and close corridor doors	Don full PPE and/or PAPR	Nurse ensure adequate PAPR available and functioning	
Preparation Phase	Communicate with Pharmacy to confirm preparation of the Medication kit (Senior staff only-Consultant/Assistant/ Fellow) Handover pouch to OR runner with the following: -Mobile phone -PPE cupboard key - Card access	Place equipment on PPE trolley near the room Open and wait at the card access door to receive the pre-op patient	Prepare OR accordingly Scrub nurse to scrub up and prepare trolley Circulating nurse to pass all additional consumables/ instruments to OR Runner (Before patient enters OR) Park patient's trolley in Ante room after transfer *** Refrain from entering the induction/prep room unless absolutely necessary***	Done full PPE and PAPR Place drug tray and airways adjuncts on respective designated trolley	
INTRA-OPERATIVE Phase		Place aby requested items on a trolley into Ante room	Unused consumables/drugs placed in OR intra-op must be thrown away Contact OR runner if require any other items. Receive requested items from Ante room		Wipe patient's trolley (especially siderails)
POST-OPERATIVE Phase	Facilitate transfer of patient post-operatively as follow: * Circulating nurse and anesthesia to send patient back isolation ward, (Activate security 30 mins prior to discharge) * Circulating nurse and anesthesia to send patient back to ICU, (activate security 30 mins prior to transfer)				
			Specimen handling: As per MERS-COV Policy	As per MERS-COV Policy	
	Disinfection guidelines:		As per MERS-COV policy	Removal of PPE and PAPER	
Follow up phase	All specimens to be sent to pathology with labels clearly stated if airborne or COVID-19 Replenish supplies and prepare OR in readiness. all personnel must shower after case				

VIII.   Code Green Guidelines for COVID-19 Patients

- This is a reference guide to the application of ACLS algorithms in case of cardiac / respiratory arrest or calling "Code Green" for a highly suspected or confirmed COVID-19 patient. **(Appendix 6)**
- American Heart Association (AHA) has recently published BLS and ACLS algorithms that are specific to COVID-19 infected patients. These algorithms should be followed and are attached to these guidelines.
- These guidelines are to be updated as new evidence-based practices evolve.

1. **Personal Protective Equipment Recommendations**

1.1. All "Code Green" health care workers should follow airborne precautions as per KFSHRC Infection Control Policy for AGP in patients with suspected or confirmed COVID-19, and the proper donning and doffing procedures.

1.2. Recommended PPE: fitted respirator masks (N95 fitted ones), in addition to other personal protective equipment (i.e., Shoes cover, head cover, gloves, long gown, and eye protection, such as a face shield or safety goggles)

1.3. No CPR (including BLS and ACLS) is to be performed without recommended PPE

2. **Appropriateness of ACLS / "Code Green":**

2.1. It is imperative that all medical teams and staff be vigilant and identify confirmed or highly suspected COVID-19 patients who are at risk for rapid deterioration and cardiopulmonary arrest, and to take appropriate measures to prevent this, including activating COVID-19 CCM Team as soon as possible

2.2. It is imperative whenever possible that all medical teams and staff to address the code status of confirmed or highly suspected COVID-19 patients as soon as possible and to identify the appropriate goals of care

3. **Code Green Team Members and Responsibilities:**

3.1. **Medical Floor Codes:**

3.1.1. **Inside the room (all health care workers donned)**

3.1.1.1. Code leader:
- Senior medical resident till arrival of Critical Care Physician (Fellow, Assistant consultant or Consultant)

3.1.1.2. Respiratory Therapist:
- Open patient airway using jaw thrust / chin lift maneuver
- Apply Ambu Bag-mask with an attached viral filter on patient's nose and mouth without active ventilation and oxygen up to 15 L/min
- If bagging is performed, it is highly recommended to use a transparent drape to cover the patient's body including the Ambu Bag-mask
- Bagging should be shallow with respiratory rate up to 15 b/min, with bag valve mask device connected to 100% oxygen with viral filter (Mask – viral filter – EtCO2 – Bag) and a tight seal on the nose and mouth using two-hand technique.

3.1.1.3. Anesthesiologist: Securing of definitive airway

3.1.1.4. Nurses: Three RNs present in the room:
- First & second to alternate in performing CPR and administering the "Code Green" medications
- Third will serve as runner and will record the code (primary nurse)

3.1.2. **Outside the room:**

3.1.2.1. Back up nurse (donned)

3.1.2.2. Back up RT (donned)

3.1.2.3. Clinical pharmacist for handling code medications

3.1.2.4. Paramedics: Will don PPE after arrival and assist with the code and be ready for transfer after ROSC

3.2. **Critical Care Unit Codes:**
 3.2.1 **Inside the room** (all health care workers donned)
  3.2.1.1 Code leader: Critical Care Physician (Fellow, Assistant or Consultant)
  3.2.1.2 Respiratory Therapist: If patient is not intubated
   3.2.1.2.1 Open patient airway using jaw thrust / chin lift maneuver
   3.2.1.2.2 Apply Ambu Bag-mask with an attached viral filter on patient's nose and mouth without active ventilation and oxygen up to 15 L/min
   3.2.1.2.3 If bagging is performed, it is highly recommended to use a transparent drape to cover the patient's body including the Ambu Bag-mask
   3.2.1.2.4 Bagging should be shallow with respiratory rate up to 15 b/min, with bag valve mask device connected to 100% oxygen with viral filter (Mask – viral filter – EtCO2 – Bag) and a <u>tight seal on the nose and mouth using two-hand technique</u>.
  3.2.1.3 If patient is intubated and connected to the ventilator:
   3.2.1.3.1 Keep the patient ventilated and switch to controlled mode with 100% FiO_2
   3.2.1.3.2 When defibrillation is indicated, place the ventilator on standby immediately before shocking and restart immediately afterwards
  3.2.1.4 Anesthesiologist: Securing of definitive airway
  3.2.1.5 Nurses: Three RNs present in the room:
  3.2.1.6 First & second to alternate in performing CPR and administering the "Code Green" medications
  3.2.1.7 Third will serve as runner and will record the code (primary nurse)
 3.2.2 **Outside the room:**
  3.2.2.1 Back up nurse (donned)
  3.2.2.2 Back up RT (donned)
  3.2.2.3 Clinical pharmacist for handling code medications

4. **Process**
 4.1. First responder Nurse who is appropriately donned with PPE should start CPR until "Code Green" team arrives
 4.2. Defibrillator, defibrillation pads and Automated Mechanical Chest Compressor to be delivered inside the room
 4.3. Crash cart to remain outside the room at all times to avoid contamination
 4.4. Follow AHA ACLS algorithm included below
 4.5. Medications ordered by code leader to be given from the pharmacy "Code Green" box
 4.6. If the patient is already receiving supplemental oxygen therapy using a face mask, the mask **should remain** on the patient's face during chest compressions until the respiratory therapist (RT) is available.
 4.7. Maintaining a closed suction system is recommended whenever possible.
 4.8. If the patient is already proned and airway secured, do back compressions and do not rotate.

5. **Nurse Manager or Charge Nurse role (floor or ICU)**
 5.1. Crowd control during a CPR to avoid unnecessary health care workers' exposures.
 5.2. Assure that all in room has proper PPE
 5.3. Identifying any exposures that may occur and ensuring proper exposure protocols are followed.

5.4. Ensure proper communication is taking place with the patient family.

5.5. Arrange a bed in critical care unit once ROSC is achieved.

6. **Paramedics**

   6.1. Their role is to prepare the transportation with proper airborne precautions once ROSC is achieved.

   6.2. They should arrange a Transportation ventilator.

   6.3. Once they arrive, can be ready to help with chest compressions.

7. **General Recommendations**

   7.1. Utilize the early warning scoring system as circulated and inform the COVID-19 CCM team ASAP when patient is deteriorating

   7.2. ASCOM phone system is recommended for close loop communication.

   7.3. Ensure Emergency trolley is available in each COVID-19 floor.

   7.4. Use COVID-19 "Code Green" pharmacy medication box for first 10 -15 minutes.

   7.5. Ensure proper handling of equipment and supplies according to KFSHRC infection control policy throughout the whole process.

   7.6. Post code debriefing and code summary.

IX.   PADIS (Pain, Agitation, Delirium, Immobility and Sleep) for COVID-19 Patients

This document represents a general guide on the management of Pain, Agitation, Delirium, Immobility and Sleep (PADIS) in the critically ill COVID-19 patients with respiratory failure on mechanical ventilation. These guidelines are derived from the SCCM protocol published in 2018.

Some modifications were considered from the COVID-19 SCCM recent management guidelines.

1. **Pain or Analgesia:**

   1.1 Use Critical Care Pain Observation Tool (CPOT [3]) to assess pain score (**Appendix 7**)

   1.2 Target pain score is < 2

2. **Opioid options for management:**

   2.1 Fentanyl 25-200 mcg/hour

   2.2 Morphine 2-10 mg/hour (better to be considered if tolerant to fentanyl or on ECMO), watch for hypotension that may result from Morphine induced Histamine release. Exercise extreme caution when used in renal failure patients due to accumulation of Morphine metabolites.

3. **Nonopioid Management options:**

   3.1 Acetaminophen or Paracetamol: 500 mg IV every 6 hours for pain (if no liver injury)

   3.2 NSAIDs are strongly discouraged

   3.3 Gabapentin or Pregabalin if neuropathic pain is suspected

   3.4 Consider continuing chronic pain medications from home

   3.5 Medications adjustments to be with 10% increments or decrements to meet the targeted CPOT

4. **Sedation:**

   4.1 Assess Richmond Agitation-Sedation Scale (RASS [4]) using the scale included (**Appendix 8**) before starting sedatives as pain management may achieve the appropriate target

   4.2 Preferred target RASS of -2 to -3

5. **Options for sedation:**
    5.1 Propofol 20-200 mg/hr. Higher dosages as warranted if tolerated. It is preferred to check triglycerides level if used more than 4 days to avoid propofol infusion syndrome
    5.2 Dexmedetomidine 0.2 – 1.5 mcg/kg/min as an adjunct to minimize propofol dose, or an alternative if hypotension is not desired or tolerated (caution with bradycardia as with prolonged QT_c may lead to arrhythmias). Dexmedetomidine should not be used for deep sedation (e.g. paralysis)
    5.3 Midazolam infusion: 2-10 mg/hour (preferred in ECMO patients only)
    5.4 If decided to target higher RASS (-1 or higher), to have a close in-room observation by the critical care nurse
    5.5 Titration for sedation to be with 10% increase or decrease in sedatives to meet the target RASS

6. **Delirium:**
    6.1 It is important to assess delirium in all patients
    6.2 Use Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) scale to address delirium
    6.3 If CAM-ICU scale was positive, to consider initiation of management options
    6.4 Options of Delirium management:
        6.4.1 Make sure you have a recent ECG to address QT_c (within 24 hours)
        6.4.2 Haloperidol 2.5 – 5 mg IV every 3-4 hours as needed for delirium
        6.4.3 Quetiapine 25-75 mg PO or NGT every 12 hours

7. **Immobility Management:**
    7.1 If targeted RASS remains -2 to -3, have range of motion exercises applied
    7.2 If RASS is > -1, start mobilization protocol in the adult critical care department
    7.3 Physical therapist will need to apply aerosolized risk personal protective equipment per infection control recommendations as working closely with patient

8. **Sleep Management:**
    8.1 Apply Sleep hygiene precautions
    8.2 Avoid sleeping agents unless chronically used by the patient
    8.3 Prophylactic sleeping aid are not recommended

X.   Intubation Process Protocol

Tracheal intubation of the patient with COVID-19 is an aerosol generating procedures (AGP) that increases the risk if exposure of the health care workers performing these procedures a high-risk procedure for staff, irrespective of the clinical severity of disease. In addition, there is evidence of dissociation between the severity of disease and oxygen requirement prior to intubation, as they are become sedated and loose the chest wall tone, the lung typically de-recruit quickly due to poor lung compliance, therefore, Intubation process must be swift as patients become hypoxemic quickly reducing the oxygenated apnea time.

Each patient is to be considered infected unless proven otherwise, thus personal protective equipment (PPE) gear should be worn.

1. **Preparation:**

1.1 Prepared in paper bag for intubation team (ready to go) to decrease time needed for emergency intervention)

1.2 Limit staff present at tracheal intubation: one intubator, one RT assistant and one to administer drugs/monitor

1.3 A check buddy should always supervise and check the donning and doffing of team members

2. **Recommended PPE:**

2.1 (PAPR, or fitted N95 fitted masks if not PAPR available)

2.2 Gloves x2 (1st sterile gloves to cover wrist, 2nd regular ones) or chemo glove),

2.3 Gown

2.4 Eye protection (goggles, facesheild)

2.5 Shoe cover

2.6 Head cover

2.7 Room setup (according to KFSH&RC GD ref: MCA-ED/1670/41):

    2.7.1   If negative pressure room is available → intubation should be performed in it

    2.7.2   If negative pressure room is not available → if not available use neutral room with two (2) Portable HEPA-filters placed at the level or the head of the patient one on each side

2.8 An open channel, /phone should be available for easier contact across the room door

3. **Team members/Personnel:**

3.1 **Inside the room:**

    3.1.1   Team leader: consultant intensivist /consultant emergency medicine

    3.1.2   Airway intubator: consultant anesthesia

    3.1.3   Respiratory therapist

    3.1.4   Nurse (RN)

3.2 **Outside the room (by the door):**

    3.2.1   Nurse (charge nurse or resource RN)

    3.2.2   Respiratory therapy

    3.2.3   Assistant doctor/fellow

4. **Equipment:**

	PPE	**Intubation bag (Inside the room)**	**Outside the room**
Preparation	**Pre-prepared in paper bag x4**	**To be kept in plastic bag**	**To be kept outside by the door**
Component (checklist tabbed on the bag with signature and date)	• Hand hygiene • Long sleeve gown • Sterile gloves • PAPR • Fit tested N95 respirator+ Eye	• Video laryngoscopy (VL) (Mcgrath and/or glidoscope) • ETT EVAC Size 7.5-8 • Viral filter • CO2 detector connected to MV • Ambu-bag	• Mcgrath video laryngoscope • Disposable laryngoscope • Glidescope (if C-mac or Mcgrath was used in 1st trial) • Stylet • ETT size 6-7

	protection (goggles or face shield) if PAPR not available • Head cover • Shoe cover	• 10 cc Syringe • 10 cmH$_2$O PEEP valve • Oral airway (90 &100 mm) • Tube tie • Metal Clamp • Lubricant • In-line suction catheter • OGT • Transparent plastic sheet • Sealable biohazard bag for non-disposables • LMA Size 4-5 (to be left at the door of the room)	• I-gel (size 4 and 5) • LMA Size 3-5 • Extra EtCO2 detector • Disposable fiber optic scope (Ambu) • Perc Trach (traco) size 7 • Scalpel (11 blade) • Bougie

5. **Intubation process (Refer to the intubation checklist for details and role assignment step by step):**
   5.1 Plan how to communicate before entering the room (difficult with PPE on)
   5.2 The anesthesia (best skilled airway manager) should manage it to maximize first pass success (No trainees).
   5.3 Video laryngoscope is the FIRST option.
   5.4 Wear all required PPE {Respirator, face shield, N95 Mask, gloves (consider doubling), goggles, Gown, shoe cover}.
   5.5 Limit staff to those necessary for intubation (intubating physician, RT, RN), back up staff outside the room in PPE (RT, RN and MD) (limited entry).
   5.6 Rapid sequence intubation with high dose NMB to avoid patient coughing or getting agitated (preferred long half-life NMB).
   5.7 Avoid Bag-mask ventilation as it increases aerosolization of the viruses. Pre-oxygenate with Facemask for 5-10 min (if possible) or high flow nasal cannula (30 L/min at FiO$_2$100%).
   5.8 If bag-mask ventilation is necessary:
      5.8.1 Use small tidal volumes, Vice (V-E) grip is recommended (2-person technique) (see graph).
      5.8.2 Use supraglottic airway device (SAD) (i.e LMA/i-gel) for airway rescue, or to improve seal during bagging.
      5.8.3 Ensure the addition of viral filter for expired gases.
   5.9 After intubation inflate cuff immediately, connect to ventilator directly and confirm with waves capnography on the ventilator. If immediate connection is not possible bag with -in line-filter.
   5.10 Avoid disconnecting the ETT. If disconnecting the circuit is a must, apply a clamp to ETT before any disconnection.
   5.11 Place OGT/NGT to minimize close contact to airway by others.
   5.12 Dispose all disposables in appropriate containers.
   5.13 Non-disposables (laryngoscope, Bronchoscope) are to be wiped down with virox and collected in safe container for processing as per IPAC policy.
   5.14 Remove PPE as you leave the room DO NOT leave the room with PPE on. Face mask and PAPR to be removed outside the room/ in the anteroom if available

5.15   Debrief after the intubation and document the steps and the opportunities for improvement

XI.   Extubation Guidelines for the Mechanically Ventilated COVID-19 Patients

1. **Clinicians should ensure:**
   1.1 The patient is ready to be liberated from the ventilator.
   1.2 The patient will be able to maintain a patent and protected airway following extubation.
   1.3 Intubation is readily available in case of failed extubation (refer to intubation protocol)

2. **Specific Considerations for the COVID positive patient:**
   2.1 Extubation should ideally take place in a negative pressure room, if that's not achievable, then extubation should take place in a room with 2 HEPA filters.
   2.2 Stop enteral feeding for 6 hours prior to extuabtion.
   2.3 May Consider administer Dexamethasone 6-8 mg IV , Ondansetron 8 mg IV bolus and/Or Metoclopromide 10 mg IV bolus 15 -30 minutes prior to extubation to prevent nausea, retching, or vomiting (Note: hold anti-emetic if QTc>500).
   2.4 Prepare and be ready for reintubation (drugs/equipment).
   2.5 Explain the procedure to the patient including the extubation precautions (Heliox bag or drapes..etc)
   2.6 Method of oxygen supplementation post extubation should be discussed with the team prior to extubation (e.g. nasal cannula, facemask, or HFNC with precautions -maximum flow 15-30 L/min-) and prepared.

3. **Procedure of Extubation:**
   3.1 Limit the number of staff to 2-3 (1 to 2 respiratory therapist and 1 nurse), the intensivist should be immediately available outside the room in case intervention is needed.
   3.2 Proper hand hygeine and PPE (as per KFSHRC policy for AGP) for those who are in the room (similar precautionary measures taken during intubation).
   3.3 Pre oxygenation with FiO2 1.0 for 3 minutes
   3.4 Position patient sitting up to 45 degrees.
   3.5 Gentle in-line suction.
   3.6 Apply extra protective coverage around the patient's head to avoid aerosolization (e.g. Helium bag, Transparent drape).
   3.7 Clear oropharyngeal secretions using a rigid Yankauer (refer to steps of extubation using Heliox bag or drapes).
   3.8 Put ventilator on stand by.
      3.8.1   Disconnect ventilator tubing from ETT and cover the circuit immediatley with the red cap
      3.8.2   Avoid extubating to BiPAP/HFNC if possible (if HFNC to be applied 15-30L/min)

4. **Extubation using Heliox-filled bag:**
   4.1 Assign roles to 3 operators:
      4.1.1   **Operator 1:** RT on left side of patient, for putting ventilator standby, deflating cuff and Removing ETT
      4.1.2   **Operator 2:** RT on Right side of patient, suctions airway, oral cavity and deflate bag at the end
      4.1.3   **Operator 3:** Nurse at right side of patient, ensures good seal and controls bag.

4.2 Enter the room with all equipment ready, and with your PPE on as per KFSHRC infection control policies

4.3 Prepare a transparent bag (100cm x120 cm)

4.4 Fill it ¾ of the way with Heliox (enough to make it float and contain the patient but do not over distend it as it makes control and procedure difficult).

4.5 All actions will be done from outside the bag (hold ETT and suction from outside NOT under the bag).

4.6 Gentle in-line suction

4.7 Explain the procedure to the patient and put bag over patient's head to cover till mid chest, **Operator 3** to insure tight seal around the patient chest and applies tape vertically to hold it down.

4.8 Place inside the bag:

    4.8.1   10 cc syringe attached to the cuff

    4.8.2   Yaunker/ suction tubing with suction on

4.9 Post extubation pre-planned O2 supply (no flow yet to prevent aerosolization) and apply it to patient's forhead.

4.10   Cap to cover circuit after disconnection

4.11   Suction orally from outside the bag (do not reach under the bag to the inside).

4.12   Place ventilator on a standby mode and disconnect the circuit and cap it with the red cap

4.13   Deflate ETT, extubate and pull OGT, keep all inside the bag.

4.14   Apply nasal cannula, Face Mask or high flow nasal cannula (<30L/min flow) do not turn on Oxygen yet (risk of aerosolization).

4.15   Finally remove bag while suction tubing is inside, disconnect yaunker, put suction to maximum to passively deflate the bag (do not force air out of it).

4.16   Once fully deflated, remove suction tubing and Dispose bag with content in appropriate container

4.17   **Operator 2:**

    4.17.1 Remove bag while suction tubing is inside disconnect Yaunker inside.

    4.17.2 Put suction to maximum to passively deflate the bag

    4.17.3 Remove suction tubing once fully deflated

    4.17.4 Dispose bag with content in appropriate container.

4.18   **Operator 1:** Turn on O2

XII.   COVID-19 Mechanical Ventilation Guidelines

This is a general guide on management of patients with hypoxemia and/or hypercarbia while being mechanically ventilated with positive COVID19 infection.

1. Initial Settings:

Parameters	Settings
Mode	Pressure or Volume control mode: Pressure targeted is suggested for hypoxic patients, and volume targeted for the hypercarbic patients
FiO_2	Start with 100%
PEEP	start with minimal 5 cm H_2O /Higher if warranted/
Target V_T:	Choose ~6 ml/Kg of ideal body weight
RR or frequency	~18 if only hypoxic, can be up to 30 if we need to have a high V_E as in hypercarbia

2. **Managing mechanical ventilation when intubated:**
   2.1 Blood gas (arterial or central venous) every day at a minimum. Can be more frequent if needed
   2.2 Assess ABG on PEEP of 5, determine PaO_2 and then calculate the PF ratio
   2.3 For managing hypoxemia, use ARDSnet PEEP-FiO_2 Tables.
   2.4 Determine if the patient has hypo or hyperinflammatory ARDS during rounds:

   2.4.1 Use low PEEP Table if chest imaging is not severely opacified and/or lung compliance is > 40 mL/cmH_2O (Hypoinflammatory ARDS for most of COVID-19 patients)

FIO2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0
PEEP cmH2O	5	5	8	8	10	10	10	12	14	14	14	16	18	18-24

   2.4.2 Use high PEEP settings if Driving Pressure is high (>15 cm H_2O), severely opacified lungs on chest imaging and/or lung compliance is < 40 mL/cmH_2O (Hyperinflammatory ARDS for COVID19 patients).

FIO2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5-0.8	0.8	0.9	1.0
PEEP cmH2O	5	8	10	12	14	14	16	16	18	20	22	22	22-24

   2.4.3 PEEP flexibility between these two extremes allowable based on clinical judgment by rounding consultant
   2.5 For refractory hypoxemia (PF ratio <100):
   2.5.1 Consider reviewing indications and contraindications for Proning (for both types)
   2.5.2 Consider iNO if hypo inflammatory ARDS is present
   2.5.3 Consider indications and contraindications with ECMO
   2.6 For managing hypercarbia with acidemia (pH < 7.20, pCO2 is > 8)
   2.6.1 Increase minute ventilation
   2.6.2 Respiratory rate up to 30x/min (as long as no air trapping is present)
   2.6.3 Tidal volume (while keeping plateau pressure < 30 cm H_2O)
   2.7 Preventing VILI
   2.7.1 V_T to be ~6 ml/kg of ideal body weight
   2.7.2 $P_{plateau}$ [Alveolar pressure obtained in inspiratory pause in paralyzed patients] < 30 cm H_2O.
   2.7.3 FiO_2: Helps to correct hypoxemia, not to exceed 0.6 (60%) as possible, to avoid oxygen toxicity.
   2.7.4 Driving pressure [$P_{plateau}$ – PEEP] < 15 cm H_2O
   2.8 Targets:
   2.8.1 PaO_2 on ABG: 7.3 – 10.6 kPa or SpO_2 90-95%
   2.8.2 $PaCO_2$ < 8 kPa and pH > 7.20

   2.9 **Weaning Ventilation:**
   2.9.1 Decrease the mechanical ventilation support if ventilation and oxygenation are improving per ABG result:
   2.9.1.1 For Oxygenation:
   2.9.1.1.1 Decrease PEEP or FiO_2 according to above PEEP FiO_2 tables
   2.9.1.2 For Ventilation:
   2.9.1.2.1 Lower VT to ~6 ml/Kg IBW

2.9.1.2.2   Then, Lower RR according to pH and pCO$_2$

XIII. Radiology Guidelines for Confirmed or Suspected COVID-19 Patient

1. **General Considerations:**
    1.1 All patients and visitors are screened at the entrances of the hospital (Temperature, Hand hygiene and given Surgical masks).
    1.2 Apply screening at radiology front desks for outpatients coming from home as an additional screening site to enhance safety. Patients should be screened for fever, cough, shortness of breath, recent history of travel abroad or to endemic areas in KSA and/or contact with confirmed positive cases. Screening should follow the updated surveillance guidelines of suspected and confirmed cases, using the updated respiratory Triage checklist. This should be documented by Radiology nurses and the patients should be given a surgical mask:
        1.2.1   Outpatients with normal Respiratory Triage scores will proceed with the check-in process and exam preparation will start.
        1.2.2   Outpatients who present with respiratory symptoms and are flagged per the respiratory Triage checklist should have their studies cancelled and direct communication with DEM should be performed to guarantee patient delivery. Take into consideration infection control precautions as per patient condition.
    1.3 Only one relative allowed to be with each patient in the waiting area.
    1.4 RT-PCR (Reverse transcription polymerase chain reaction) is the gold standard method for diagnosing COVID-19. However, if the hospital runs short of the viral testing kits or where imaging might alter patient management, the role of imaging could be suggested to help in diagnosis, keeping in mind the fact that until today CT-scan is recognized as being of high sensitivity but of low specificity in diagnosing COVID-19.
    1.5 All screening/non-urgent outpatients will be postponed unless justified by the referring team.
    1.6 Outpatient radiological imaging and procedures should be reserved for urgent cases and cases where imaging might alter patient management in the short-term. Imaging shall not be used to exclude covid-19 infection if RT-PCR testing is available.
    1.7 Imaging patients with suspected/confirmed COVID-19 should only be considered for emergent situations or when it might alter patient management.
    1.8 Inpatients and ER patients accepted for examination shall adhere to the following process:
        1.8.1   Inpatients coming for radiological studies: Do not require Covid-19 RT-PCR testing. These patients will all be tested upon hospital admission.
        1.8.2   ER patients requiring radiological imaging: Do not require pre-screening by Covid-19 RT-PCR testing unless the need for such testing is determined by the managing ER physician.
    1.9 Patients known/suspected to have COVID-19 infection who may need non-urgent imaging and/or procedures should be delayed until considered non-contagious.

2. **Infection control general considerations:**
    2.1 Precautionary measures for contact and droplet infection should be followed per the infection control policies. Surgical mask, gloves, yellow gown and face shield shall be used.
    2.2 Ensure all department employees are aware of and able to perform recommended infection control protocols. http://www.kfshrc.edu.sa/en/home/covid/nationalguidelines and through the Policy Management system http://www.kfshrc.edu.sa/en/home/apps/110

2.3 Update all staff regarding the situation and the new precautionary measures on time. Refer to the hospital COVID-19 webpage. http://www.kfshrc.edu.sa/en/home/covid

2.4 Staff shall be directed immediately to the screening clinic if unprotected contact with confirmed COVID-19 patients is confirmed.

2.5 Isolation of radiology staff who have had history of unprotected contact with confirmed COVID-19 patients shall be implemented, as per guidelines, until they are considered clear.

2.6 Avoid group gatherings and meetings and apply virtual meetings when needed.

2.7 Consider applying remote radiology reporting access from home provided that adequate diagnostic setup is available (e.g. connectivity and diagnostic workstations).

2.8 All direct contact staff should complete the N-95 Mask fit testing (each staff shall be fitted for at least 1 mask type) following infection control guidelines "CIPP - 5110HIGH-EFFICIENCY PARTICULATE MASK FIT TESTING"

2.9 PPE Donning and Doffing policy shall be followed at all times.

2.10   Radiology housekeepers should perform deep cleaning of all Radiology workstations at the end of each day.

2.11   After completion of radiological exams for Covid-19 confirmed/suspected patients:

      2.11.1 Terminal cleaning of the room shall be done immediately after the examination. Housekeeper shall be notified once schedule is confirmed.

      2.11.2 Disinfection of exam table using the authorized material shall be used immediately after exam completion.

      2.11.3 Disinfection of Portable machine's accessories and Lead aprons shall be performed using authorized disinfecting material after each exam.

      2.11.4 Room shall be closed as per the Housekeeper and infection control guidelines at the end of the day shift to be disinfected by bleach followed by Hydrogen Peroxide Vapour for 2 hrs.

      2.11.5 If designated COVID-19 room scheduled for more than one positive case, routine cleaning and disinfection by bleach (30 mins) shall be completed prior to the following positive case.

      2.11.6 All medical waste shall be discarded immediately as per the infection control guidelines.

3. **Radiology exam considerations:**

3.1 Limit access to Radiology department, including examination rooms and reporting areas.

3.2 Radiologists shall remain in specified reading rooms as applicable. Residents/fellows on duty shall be assigned to specific stations with adequate spacing, and these assignments shall be updated on a monthly rotational basis.

3.3 Minimize number of staff per examination room during procedures, only required staff for the procedure should be involved.

3.4 All Covid-19 positive or suspected patients requiring imaging (other than portable chest x-ray) should be accepted by the assigned consultant radiologist and the patient's status should be clearly communicated to the staff involved.

3.5 Radiology consultant should evaluate the need for the examination (benefit versus risk of delaying the exam) in collaboration with the referring clinician.

3.6 Each Radiology section shall assign a scanning room or portable machine (as applicable) designated specifically for Covid-19 patients to reduce the risk of cross contamination.

3.7 Each section shall divide their staff coverage into small fixed teams (including radiologists, technologists, nurses and clerks) which are completely separated by either location or by shift. Some of these teams shall be designated exclusively for Covid-19 patients (as applicable).

3.8 Patient transportation shall be arranged with the section prior to shifting the patient from their area, and all precautionary measures shall be maintained including the use of surgical masks for the patients.

3.9 Covid-19 confirmed/suspected patients should be directly taken into the assigned room without delay and should not wait in general waiting or holding areas.

3.10 All attempts should be made to perform the procedure towards the end of the afternoon to avoid secondary patient and staff exposure.

3.11 Personal Protective Equipment according to Health activity shall be followed

3.12 The following radiological procedures if performed on an outpatient basis or via the day procedure unit will require Covid-19 RT-PCR testing 24-48 hrs. prior to the time of the procedure:

 3.12.1 Central lines.

 3.12.2 Enteric tube insertions/changes.

 3.12.3 Image-guided lung/mediastinal biopsies or lung ablations.

 3.12.4 Thoracentesis/Pleural drains

 3.12.5 Any procedure/imaging which may require General Anesthesia.

 3.12.6 Any procedure/imaging under sedation.

 3.12.7 Procedures performed on patients with Tracheostomy

3.13 Any deviation from above guidelines should be reported through QIS and documented in Nurses handover in ICIS (if applicable).

4. Section Specific Considerations:

4.1 **CT Guideline:** (already mentioned above)

4.2 **General x- Ray guideline:**

 4.2.1 If an exam is needed to be performed, a portable machine should be used if possible and the examination performed bedside.

 4.2.2 Assign portable machine in each area or floor as applicable.

4.3 **Ultrasound:**

 4.3.1 If an exam is needed to be performed, a portable unit should be used if possible and the examination performed bedside.

 4.3.2 Assign a portable machine in each area or floor as applicable.

 4.3.3 Ultrasound machine's keyboard and probe shall be cleaned after each patient.

 4.3.4 All cases requested for static machines and/or advanced imaging/procedure, need to be approved by a consultant radiologist.

4.4 **Interventional exams:**

 4.4.1 Infection risks should be taken into account when justifying procedure requirement.

 4.4.2 Decide on time of imaging: All attempts should be made for performing the procedure time.

4.4.3   If applicable, assign 1 interventional suite/room for all suspected or confirmed cases of COVID-19.

4.4.4   The IR suite/room should be clear of any other patients. Also, any loose items/equipment should be cleared. A medical waste bin needs to be available in the room.

4.4.5   Limit the number of anesthesia staff to the minimum, if their presence is required.

4.5 **Magnetic Resonance Imaging (MRI):**

4.5.1   If alternative imaging modalities can be performed to answer the clinical question, then this is highly advised. Infection risks should be taken into account when justifying scan requirement.

4.5.2   Ensure that all equipment/material used are MRI compatible.

4.5.3   Surgical masks can be use in MRI

4.6 **Nuclear Medicine Imaging (NM) and PET/CT:**

4.6.1   If alternative imaging modalities can be performed to answer the clinical question, then this is highly advised. Infection risks should be taken into account when justifying scan requirement.

4.7 **General Anesthesia procedure or Imaging in radiology department:**

4.7.1   All General Anesthesia related procedures on suspected or confirmed COVID-19 patients should be discussed by primary team with the Anesthesiology consultant & Radiology consultant. It should be clearly communicated that the patient is suspected or confirmed to have COVID-19 infection.

4.7.2   If alternative imaging or procedure can be performed, then this is highly advised. Infection risks should be taken into account when justifying scan or procedure.

4.7.3   Time of imaging/procedure to be decided by consultation between primary team, Anesthesiology Consultant and Radiology Consultant. All attempts should be made to perform imaging/procedure towards the end of the afternoon to avoid secondary patient and staff exposure.

4.7.4   General Anesthesia to be provided by Anesthesiology Consultant as per hospital Infection control policy.

4.7.5   Once the procedure/imaging is done the patient leaves radiology department by anesthesia team where extubating shall be completed in the recovery unit following the infection control guideline

XIV.   Otolaryngology Head & Neck Surgery

1. **Consultation +/- nasal/laryngeal endoscopy (inpatients/emergency consults):**

   1.1 Examination to be done in a negative pressure room

   1.2 Only consultant/assist. consultant/senior resident (PGY 4-5) to perform the procedure

   1.3 PPE should include: Scrubs, gown, N95 mask, surgical hood, face shield and double gloves, Or, PAPR* (powered air-purifying respirator), scrubs, gown, and double gloves

2. **Surgery (Urgent and emergent cases only)**

2.1 Surgery to be done in a negative pressure room

2.2 Only essential personnel in the room (consultant +/- assist. consultant/senior resident)

2.3 PPE should include: PAPR*scrubs, gown, and double gloves

3. **Outpatient Clinic Service:**

   Based on the Saudi Patient Safety Center guidelines **(Appendix 12: Figure 1)** and Stanford University guidelines for Otolaryngology Head & Neck Surgery, Outpatient clinic service to be offered only for high priority cases. Given all the previously mentioned risks for infection transmission to Otolaryngologists and the high rate of asymptomatic transmission that can reach up to 57% as per the United States CDC, all patients presenting to our clinic for assessment and examination need to **undergo prior COVID 19 testing within 24-48 hours**.

   Only patients with any of the following presentations will be asked to present to clinic for further examination and assessment to avoid causing an emergency or a fatality that can be avoided, those cases are patients presenting with:

   - Head & Neck tumors/cancers
   - Progressive Airway symptoms
   - Pending Intracranial and orbital complication from sinus pathology

   The following protocol to be followed:

   - Patient get called by our clinic coordinator to plan testing at an "External Testing Center"
   - Testing to be done within 24-48 before planned procedure/examination
   - Results get communicated directly to clinic coordinator/Primary consultant
   - Afterwards to follow the below chart from Stanford University

   Figure 2: Stanford University Protocol for non-emergency cases when COVID-19 PCR status is known before presenting to clinic/admission/ or surgery

```
                    ┌─────────────────┐
                    │  COVID-19 PCR   │
                    │     Status      │
                    └─────────────────┘
                     │               │
          ┌──────────┘               └──────────┐
     ┌──────────┐                          ┌──────────┐
     │ POSITIVE │                          │ NEGATIVE │
     └──────────┘                          └──────────┘
          │                                     │
    ┌─────────────┐   YES   ┌──────────────┐    │
    │ Can case be ├────────►│Postpone case │    │
    │ delayed     │         │until COVID-19├────┤
    │ until       │         │ Negative     │    │
    │ COVID-19    │         └──────────────┘    │
    │ resolution? │                             │
    └─────────────┘                             │
          │ NO                                  │
    ┌─────────────────┐             ┌────────────────────┐
    │ Dose case       │             │ Dose case involve  │
    │ involve         │             │ significant nasal  │
    │ significant     │             │ mucosal            │
    │ nasal mucosal   │             │ manpulation(e.x.   │
    │ manipulation    │             │ endoscopic         │
    │ (ex. Endoscpic  │             │ endonasal surgery)?│
    │ endonasal       │             └────────────────────┘
    │ surgery)?       │              │                │
    └─────────────────┘              │ YES            │ NO
      │              │
   YES│              │NO
```

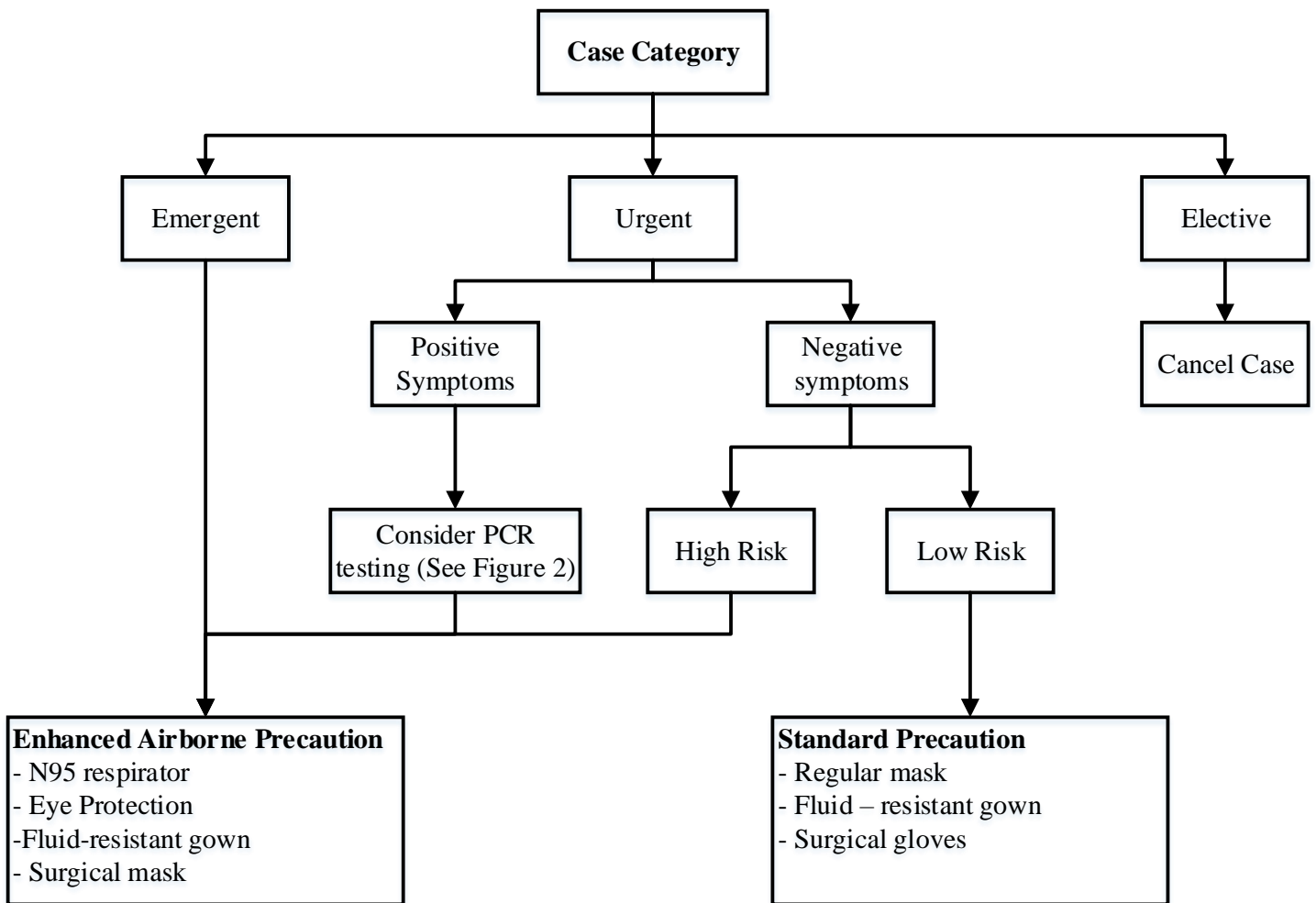| Extreme Airborne Precautions	Enhanced Airborne Precautions	Standard Precautions
-PAPR for all OR staff --Fluid resistant gown -Surgical gloves	-N95 -Eye protection -Fluid resistant gown -Surgical gloves	- Regular mask -Fluid resistant gown -Surgical gloves

4. In-patient & emergency room consultation:

In-patients and emergency room consultation to be limited for urgent and emergent cases with the following scenarios **ONLY**:

   4.1 Upper airway symptoms with pending airway emergency

   4.2 Progressive Head and neck pathology

   4.3 Refractory epistaxis not responding to basic nasal packing by emergency room

   4.4 In patient consult for tracheostomy (refer to the UK-Tracheostomy guidelines)

In an emergency situation when there is no time to wait for testing, then will have to follow the below flow chart from Stanford University (Fig 3):

```
                        ┌─────────────────┐
                        │  Case Category  │
                        └─────────────────┘
           ┌───────────────────┼───────────────────────┐
           ▼                    ▼                       ▼
    ┌────────────┐        ┌──────────┐           ┌────────────┐
    │  Emergent  │        │  Urgent  │           │  Elective  │
    └────────────┘        └──────────┘           └────────────┘
           │          ┌───────┴────────┐                │
           │          ▼                ▼                ▼
           │   ┌────────────┐   ┌────────────┐   ┌──────────────┐
           │   │  Positive  │   │  Negative  │   │ Cancel Case  │
           │   │  Symptoms  │   │  symptoms  │   └──────────────┘
           │   └────────────┘   └────────────┘
           │          │        ┌──────┴───────┐
           │          ▼        ▼              ▼
           │   ┌────────────┐ ┌──────────┐ ┌──────────┐
           │   │Consider PCR│ │High Risk │ │ Low Risk │
           │   │testing(See │ └──────────┘ └──────────┘
           │   │ Figure 2)  │        │           │
           │   └────────────┘        │           │
           │          └──────────────┘           │
           ▼                                      ▼
```

Enhanced Airborne Precaution
- N95 respirator
- Eye Protection
- Fluid-resistant gown
- Surgical mask

Standard Precaution
- Regular mask
- Fluid – resistant gown
- Surgical gloves

High Risk= Transmucosal Surgery
- All transmucosal surgery (Ex, Tonsillectomy, laryngeal surgery, etc)
- All intranasal surgery
- All transtracheal surgery (Ex, total laryngectomy, tracheostomy)
- Mastoidectomy

Low Risk = Non-Musocal Surgery
- Transcervical surgery (Ex,neck dissection, thyroidectomy, etc)
- Skin cancer surgery

XV. Guidelines for Extra-Corporeal Membrane Oxygenation (ECMO)

1. Personnel:
    1.1 Infection control:
        ECMO specialist, perfusion and surgeons are all fit tested for N95 masks and were trained by
        infection control for the use of PPE and PAPR (which will be used during ECMO insertion)
    1.2 ECMO specialist coverage:
        1.2.1   Senior ECMO specialist were chosen as team A to be the first patch to support COVID
                 patient in need of ECMO

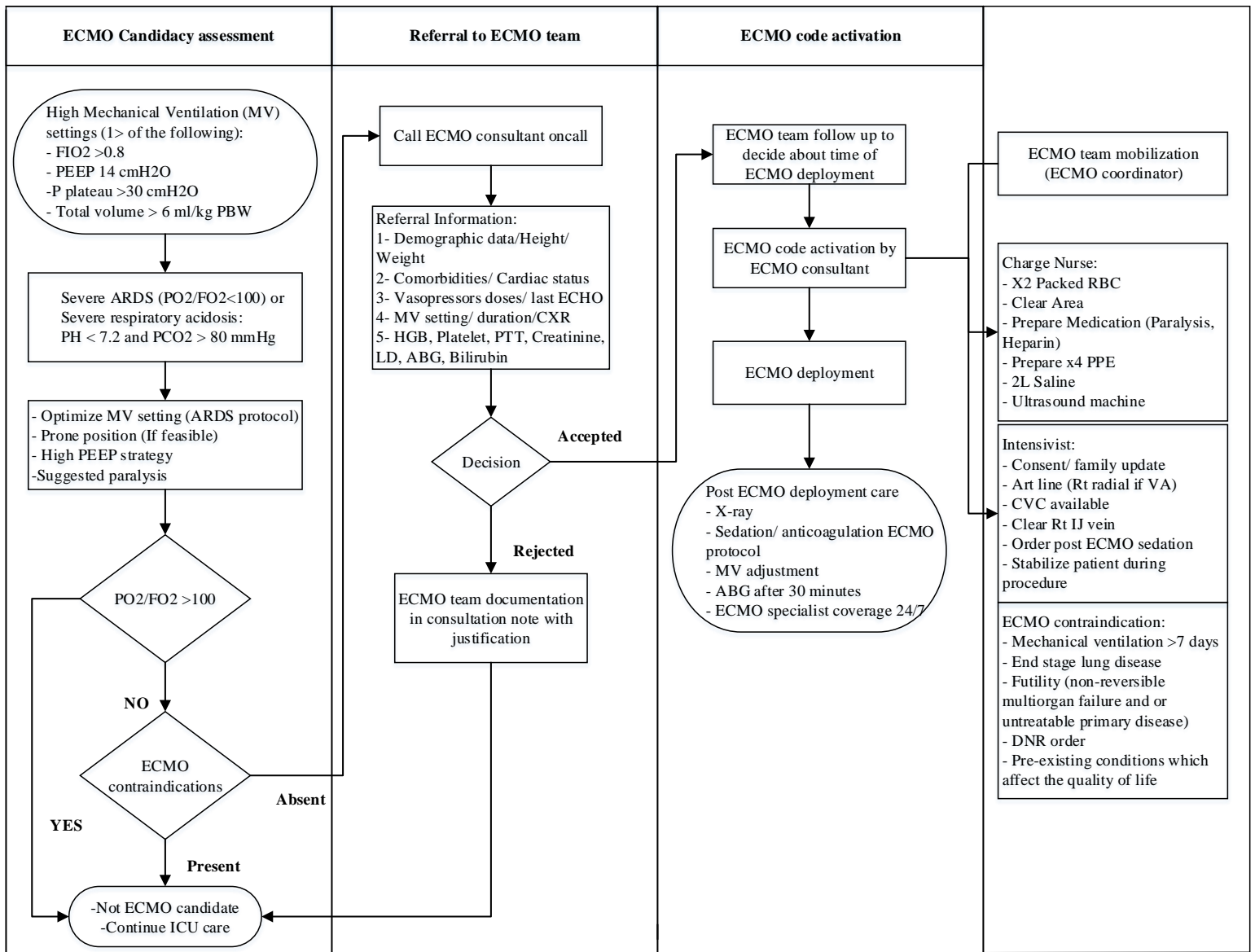1.2.2 Will provide 24/7 coverage at the bedside

1.2.3 Plan is already in action to increase our manpower to accommodate the increasing demand of the hospital

1.3 ECMO code and consultant:

1.3.1 Personal have on-call schedule on experienced staff

1.3.2 On-call ECMO consultant is available in the ICU on-call rota and updated regularly

2. COVIS-19 ECMO Consultation and Initiation workflow:

ECMO Candidacy assessment	Referral to ECMO team	ECMO code activation	
High Mechanical Ventilation (MV) settings (1> of the following): - FIO2 >0.8 - PEEP 14 cmH2O -P plateau >30 cmH2O - Total volume > 6 ml/kg PBW	Call ECMO consultant oncall	ECMO team follow up to decide about time of ECMO deployment	ECMO team mobilization (ECMO coordinator)
Severe ARDS (PO2/FO2<100) or Severe respiratory acidosis: PH < 7.2 and PCO2 > 80 mmHg	Referral Information: 1- Demographic data/Height/Weight 2- Comorbidities/ Cardiac status 3- Vasopressors doses/ last ECHO 4- MV setting/ duration/CXR 5- HGB, Platelet, PTT, Creatinine, LD, ABG, Bilirubin	ECMO code activation by ECMO consultant	Charge Nurse: - X2 Packed RBC - Clear Area - Prepare Medication (Paralysis, Heparin) - Prepare x4 PPE - 2L Saline - Ultrasound machine
- Optimize MV setting (ARDS protocol) - Prone position (If feasible) - High PEEP strategy -Suggested paralysis	Decision — Accepted / Rejected	ECMO deployment	Intensivist: - Consent/ family update - Art line (Rt radial if VA) - CVC available - Clear Rt IJ vein - Order post ECMO sedation - Stabilize patient during procedure
PO2/FO2 >100	ECMO team documentation in consultation note with justification	Post ECMO deployment care - X-ray - Sedation/ anticoagulation ECMO protocol - MV adjustment - ABG after 30 minutes - ECMO specialist coverage 24/7	ECMO contraindication: - Mechanical ventilation >7 days - End stage lung disease - Futility (non-reversible multiorgan failure and or untreatable primary disease) - DNR order - Pre-existing conditions which affect the quality of life
NO — ECMO contraindications — YES / Absent / Present			
-Not ECMO candidate -Continue ICU care			

XVI. Awake Prone Position Guidelines in Hypoxic Non-Intubated Novel Coronavirus Pneumonia (NCP) Patients

1. **Rationale:**

1.1 Prone positioning for 12-16 hours per day reduced mortality in intubated patients with moderate to severe ARDS

1.2 COVID-19 pneumonitis may progress to acute respiratory distress syndrome (ARDS) in up to 30% of hospitalized patients

1.3 Mortality of intubated patients with Novel Coronavirus Pneumonia (NCP) is high.

1.4 Recent non-randomized evidence suggests that early awake proning in hypoxic non-intubated NCP patients with moderate ARDS improves oxygenation and may prevent intubation

1.5 Early awake proning is a simple intervention that is well tolerated by patients

2. Indications:

2.1 Adult patients ($\geq$ 14) years of age.

2.2 Confirmed COVID-19 (i.e. a positive PCR for SARS CoV-2).

2.3 Hypoxemia on room air (SpO2 < 90% or PaO2 on ABG of < 7.6 kPa) and an oxygen requirement of $\geq$ 32% FiO2 to maintain saturation > 90% (please refer to the following table #1 for FiO2 estimation)

2.4 Bilateral or unilateral infiltrate(s) on chest x-ray

2.5 Patients are admitted to the ICU or an acute care unit with the capability of hemodynamic and respiratory monitoring

Method	O$_2$ Flow (L/min)	Estimated FiO$_2$ (%)
Nasal Cannula	1	24
	2	28
	3	32
	4	36
	5	40
	6	44
Face Mask	5	40
	6-7	50
	7-8	60

Table #1: Estimating FiO$_2$ from the O$_2$ flow per device

3. Contraindications:

3.1 Immediate need for intubation as determined by the treating physician (please refer to the KFSHRC COVID-19 intubation guidelines).

3.2 GCS < 10.

3.3 Confused, delirious or uncooperative patient or patient's refusal.

3.4 Hemodynamic instability (MAP < 60 mmHg) and/or need for moderate to high dose of vasopressors (Norepinephrine $\geq$0.1mcg/kg/min).

3.5 BMI $\geq$ 40 kg/m2.

3.6 Any of the following medical conditions: open chest or abdomen, abdominal surgery (i.e. laparotomy) within the last 4 days, facial fractures, cervical spine fractures or instability, or skeletal deformations that interfere with proning.

3.7 Pregnancy is a relative contraindication (may consider lateral proning, or full proning with the use of belly pillow℗)

4. **Awake proning with assistance by health care workers:**
    4.1 MD order must be documented in the patient's electronic medical records prior to the procedure.
    4.2 Needed Personnel:
        4.2.1   Respiratory Therapist (RT): x 1
        4.2.2   Critical Care Nursing (RN): x 2
    4.3 Procedure: Please refer to the following link to watch a full video demonstration: https://kfshrcedusa.sharepoint.com/sites/COVID19DCCMTEAM/Shared%20Documents/Protocols/Awake%20Proning%20Demonstration.mp4
    4.4 Health care workers' roles and responsibilities:

RT	RNs
• Observe for 15 minutes on current FiO_2 and ensure SpO_2 is > 90% • Ensure Oxygen source tubing is secure to <u>one</u> side of the patient (e.g. HFNC).	• Maintain the Patient NPO for 1 hour prior to proning • Explain procedure to the patient • Place cardiac leads on the right and left shoulders of the patients along with one on the left pelvis. • Ensure intravenous accesses and tubes are secure to <u>one</u> side of the patient. • Place 3 pillows on the patient to ensure comfort after proning, preferably one at the head of the bed, one on the chest and the third over the knees. (Can use more pillows if required by the patient).
• Move the patient <u>away from</u> the side of the oxygen tubing and IV lines with assistance of 2 healthcare workers (which is away from the side the patient will be turned to). • Finally, turn the patient to his side then face down.	
• Once proned, adjust patient's head to face the side of the device (e.g. HFNC)	• Lift one arm to the side that the patient is facing for comfort.

5. **Awake proning without health care workers' assistance:**
    5.1 Only for those patients who could prone themselves without assistance
    5.2 MD order must be documented in the patient's electronic medical records prior to the procedure.
    5.3 Please follow the instructions as shown in this image:

1. 30 minutes – 2 hours: lying fully prone (bed flat)
2. 30 minutes – 2 hours: lying on your right side (bed flat)
3. 30 minutes – 2 hours: sitting up (30-60 degrees) by adjusting head of the bed
4. 30 minutes – 2 hours: lying on your left side (bed flat)
5. Then back to Position 1. Lying fully prone (bed flat)
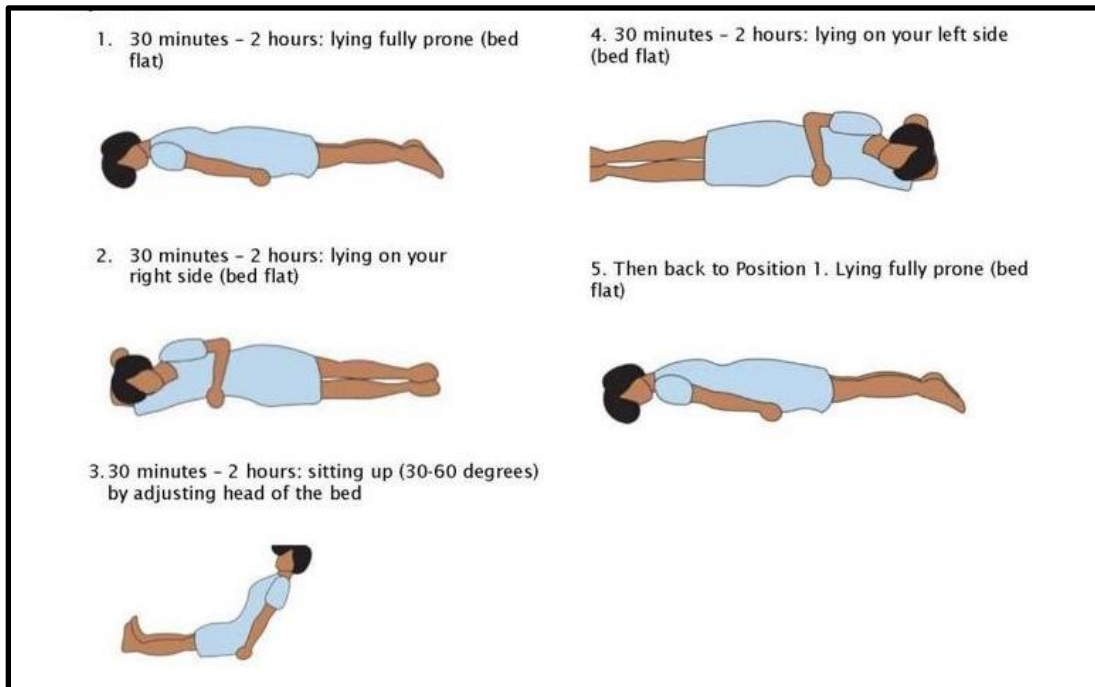
6. Monitoring:

6.1 Continuous cardiac monitoring (HR, BP, SpO2) should be monitored continuously throughout the proning period

6.2 Respiratory therapist to document the SpO2:FiO2 ratio:

6.3 Prior to proning.

    6.3.1   1 hour after proning

    6.3.2   4 hours after proning

    6.3.3   8 hours after proning

7. Duration of proning:

7.1 Total of 8-10 hours with 1-2 hours break in the supine position.

7.2 Proning sessions will continue daily until the SpO2:FiO2 ratio is above 240 and FiO2 requirement is $\leq 30\%$ for a minimum of two days, or the patient is intubated

8. Failure of prone positioning defined as:

8.1 An increase in FiO_2 requirement by 0.2 from baseline (due to sustained desaturation $< 90\%$) after 2 hours from initiation of proning

8.2 The need for endotracheal intubation (based on the indications for intubation in the KFSHRC COVID-19 intubation guidelines).

8.3 Patients discomfort or agitation that is not controlled by pharmacologic measures.

8.4 Persistent hemodynamic instability or arrhythmias (Bradycardia < 50, Tachycardia > 120, MAP < 60 mmHg not responding to treatment)

8.5 Physician order to stop the procedure

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Appendix 1

COVID-19 Early Warning Score Observation Chart

COVID-19 EARLY WARNING SCORE OBSERVATIONAL CHART

| MRN:
Bed No:
UNIT: | Date: | | COVID-19 ICU NURSE MCD 49718
COVID-19 MEDICAL RESIDENT on-call MCD 45415
CCM COVID-19 TEAM MCD 40881 |

	Parameters	Score	Time											
Age	>65	1												
Respiratory Rate	12 - 20	0												
	21 - 24	2												
	≥25 or ≤ 12	3												
02 Sat (%)	>95	0												
	94 - 95	1												
	92 - 93	2												
	<91	3												
O2 Supplement	Room Air	0												
	1L/m	1												
	2L/m	2												
	>3L/m	3												
SBP	111 - 180	0												
	101 - 110	1												
	91 - 100	2												
	>180 or <90	3												
Pulse Rate	51 - 90	0												
	91 -100	1												
	41 - 50	1												
	113 - 130	2												
	≥131 or ≤ 40	3												
Conscious Level (Altered = Confusion, Agitation, Drowsiness, Unresponsiveness)	Alert	0												
	Altered	3												
Temp. (◦ C)	36.1 - 38.0	0												
	35.0 - 36.0	1												
	38.1 - 39.0	1												
	≥ 39.1	2												
	≤ 35.0	3												
EWSS TOTAL														
Initial														
ID														

COVID-19 Early Warning Scoring System: Actions' plan

EWS Score	Actions in Medical Ward	Action by COVID -19 Critical Care Team
0	Routine bedside monitoring (Q4)	-
1-4	1. Increase Bedside monitoring by primary nurse as needed. 2. Call COVID-19 ICU Nurse for further recommendations	1. COVID-19 ICU Nurse to perform clinical assessment 2. COVID-19 ICU Nurse to alert COVID-19 CCM Intensivist to perform e-chart review
3 in any single parameters	1. Frequent monitoring by bedside nurse (Q 1 hr.) 2. Alert primary medical team during working hours or medical resident on-call outside working hours to review and decide if escalation is necessary	Pending upon notification or consultation from the primary care team or medical resident on call
5-6	1. Close monitoring by the bedside nurse (Q 30 min.) 2. Activation of the COVID-19 ICU Nurse	1. Urgent clinical assessment by COVID-19 ICU nurse 2. Notify COVID ICU Intensivist (may require immediate response to the bedside) 3. Notify Medical resident on-call

≥ 7	1. Bedside primary nurse to stay at bedside
	2. Unit charge nurse to activate COVID-19 ICU team:
	  - COVID-19 ICU Nurse
	  - Notify primary medical team during working hours or medical resident on-call outside working hours
		1. Immediate response by the COVID-19 ICU team

Table 3. Dosing and Medication Related Information*
*This table does not contain dosing recommendations for neonates

Medication	Dose	Notes
Ceftriaxone	<u>Adults:</u> 2 g IV daily <u>Pediatrics:</u> 100 mg/kg/dose once daily (usual maximum daily dose: 2,000 mg/day)	
Azithromycin	<u>Adults:</u> loading dose of 500 mg orally once followed by 250 mg orally daily for additional 4 days <u>Pediatrics:</u> 10 mg/kg on day 1; maximum: 500 mg/day followed by 5 mg/kg/day once daily for additional 4 days; maximum: 250 mg/day	• Monitor ECG in high risk patients due to the risk of QT_c prolongation. • Available in IV form for COVID-19 patients who are intubated with absorption issues or NPO and is restricted to **Infectious Diseases and Critical Care physicians.**
Levofloxacin	<u>Adults:</u> 750 mg daily orally or IV <u>Pediatrics:</u> 6 months to <5 years: 8-10 mg/kg twice daily ≥ 5 years: 10 mg/kg daily (maximum dose 750 mg)	• Not used as first line in children • Monitor ECG in high risk patients due to the risk of QT_c prolongation
Oseltamivir	<u>Adults:</u> 75 mg every 12 hours for 5 days (a longer duration can be considered in severely ill or immunocompromised patients). <u>Pediatrics:</u> • ≤15 kg: 30 mg orally twice daily • >15 to 23 kg: 45 mg orally twice daily • >23 to 40 kg: 60 mg orally twice daily • >40 kg: 75 mg orally twice daily For 5 days.	• In patients with impaired renal function, adjust oseltamivir dose according to hospital formulary.
Lopinavir/Ritonavir	<u>Adults:</u> 400/100 every 12 hours <u>Pediatrics:</u> Dosage based on weight, presented based on mg of lopinavir; maximum dose: Lopinavir 400 mg/ritonavir 100 mg • 7–15 kg: 12 mg/kg twice daily • 15–40 kg: 10 mg/kg twice daily • >40 kg: 400 mg/100 mg twice daily	• Decision to start should be made by Infectious Diseases team with a clear documentation in ICIS • Do not use lopinavir/ ritonavir in pre-term or full-term neonates before 14 days of gestational age • Check for drug-drug interaction (consult clinical pharmacist for recommendations) • If lopinavir/ritonavir is not available may consider darunavir/cobicistat as an alternative
Piperacillin/ Tazobacatm	<u>Adults:</u> 4.5 g IV every 6 hours <u>Pediatrics:</u> 300 mg/ kg/day divided every 6-8 hours	• Maximum daily dose for pediatrics: 16 g/day • In patients with impaired renal function, adjust piperacillin/tazobacatm dose according to hospital formulary.

Vancomycin	Adults: 15-20 mg/kg/dose every 8 to 12 hours Pediatrics: 15 mg/kg/dose every 6 hours	• In patients with impaired renal function, adjust vancomycin dose according to hospital formulary and guidelines. • Adjust the dose to target trough of 15-20 mcg/ml
Chloroquine	Adults: 500 mg every 12 hours Pediatrics: (dosing based on chloroquine base) loading 10 mg/kg orally (maximum 600 mg) followed by 5 mg/kg orally (maximum: 300 mg) daily 6 hours after the loading dose for 5 days.	• Decision to start should be made by Infectious Diseases team with a clear documentation in ICIS • Check contraindications carefully • Use with caution in QT interval prolongation • Can't be used concomitantly with macrolides • Check for drug-drug interaction (consult clinical pharmacist for recommendations) • Pediatric dose may change based on future studies
Hydroxychloroquine	Adults: loading dose of 400 mg orally every 12 hours for day 1, followed by a maintenance dose of 200 mg orally every 12 hours Pediatrics: 6.5 mg/kg/dose every 12 hours for day 1 (max: 400 mg/dose); followed by 3.25 mg/kg/dose every 12 hours for additional 4 days (max: 200 mg/dose)	• Check contraindications carefully • Use with caution in QT interval prolongation • Check for drug-drug interaction (consult clinical pharmacist for recommendations) • Pediatric dose may change based on future studies
Tocilizumab	Adult: 4-8 mg/kg (recommended dose 400 mg) to be repeated after 12 hours if the response to the first dose was poor (maximum of 2 doses with single maximum dose of 800 mg)	• To be prescribed by Infectious Diseases service only- may accept ICIS documentation in urgent situations • Refer to *Section 7 (Table 5 and 6)* for eligibility criteria • Recommended in patients with cytokine storm and elevated IL 6 • Consider dose capping and limiting the number of doses • Dose should be rounded to nearest full vial size [Available strengths at KFSH&RC: 20 mg/mL (4 mL, 10 mL)

Appendix 4

Table: 4 Drug-Drug Interaction with Immunosuppressant

Medications	Interaction	Intervention
Glucocorticoids and PI	Potentiate steroid effect and increase toxicity	Decrease steroid dose
MMF and PI	Decrease MMF level	Increase MMF dose

Calcinurin inhibitors (tacrolimus, cyclosporine) and PI	Increase calcinurin inhibitor levels and toxicity	Monitor levels closely and decrease the dose (may require around 75- 90% reduction in dose for tacrolimus and 5- 20% for cyclosporin)
mTOR Inhibitors (sirolimus, everolimus) and PI	Increase mTOR Inhibitors levels and toxicity	Avoid everolimus use Monitor sirolimus levels closely and decrease the dose (may require around 50-90% reduction in dose)
Methotrexate and PI	Potentiate methotrexate effect and increase toxicity	Decrease the dose
Chloroquine and PI	Potentiate chloroquine effect and increase toxicity	Close monitoring of toxicity and may consider dose reduction
Calcinurin inhibitors (tacrolimus, cyclosporine) and chloroquine/ hydroxychloroquine	Increase calcinurin inhibitor levels and toxicity	Monitor cyclosporine levels closely and decrease the dose

PI: Protease Inhibitors (lopinavir/ritonavir or boosted darunavir), **MMF:** Mycophenolate Mofetil

Appendix 5

Table 5. Tocilizumab Eligibility Criteria

Biochemical	Clinical + Biochemical	Clinical (Severe)
1. Established presence of hyper-inflammation: - Calculation of an H score may support clinical evidence and aid diagnosis. - (See table 6 or online calculator available at: https://www.mdcalc.com/hscore-reactive-hemophagocytic-syndrome 2. Exclude infection from sources other than COVID-19 and acute severe infection.	COVID-19 positive All of the following respiratory findings: - Abnormal chest imaging consistent with COVID-19 - Rapidly worsening respiratory symptoms/signs or any requirement of supplemental O_2 - Absence of systemic bacterial or fungal coinfection - **PLUS**; *(Ferritin > 900 ug/L **OR** doubling within 24 hours) **AND** (CRP > 70 mg/L)	COVID-19 positive All of the following respiratory findings: - Abnormal chest imaging consistent with COVID-19 - Rapidly worsening gas exchange (requirement of ≥ 4 Liter O2 or PaO2/FiO2 <300 mmHg) or requiring mechanical ventilation - Absence of systemic bacterial or fungal coinfection

*Beware of other causes of high ferritin (liver disease, chronic inflammatory conditions, malignancy, iron therapy/ overload etc.)

Table 6: H score for secondary HLH

Temperature	
< 38.4	0
38.4-39.4	33
>39.4	49
Organomegaly	
None	0

Hepatomegaly or splenomegaly	23
Hepatomegaly & splenomegaly	38
Number of Cytopenias *	
One lineage	0
Two Lineages	24
Three Lineages	34
Triglycerides (mmol/L)	
< 1.5	0
1.5 – 4.0	44
>4.0	64
Fibrinogen (g/L)	
> 2.5	0
≤2·5	30
Ferritin ng/ml	
< 2000	0
2000-6000	35
> 6000	50
AST	
< 30 IU/L	0
≥ 30 IU/L	19
Haemophagocytosis on Bone Marrow Aspirate	
No	0
Yes	35
Known Immunosuppression **	
No	0
Yes	18

Bone marrow aspiration not mandatory

The H score generates a probability for the presence of secondary HLH. A score greater than 169 is 93% sensitive and 86% specific for HLH. (HLH=haemophagocytic lymphohistiocytosis).

* Defined as either hemoglobin concentration of 9·2 g/dL or less (≤5·71 mmol/L), a white blood cell count of 5,000 white blood cells per mm 3 or less, or platelet count of 110,000 platelets per mm 3 or less, or all of these criteria combined.

**HIV positive or receiving long term immunosuppressive therapy (i.e. glucocorticoids, cyclosporine, azathioprine).

Appendix 6

ACLS Cardiac Arrest algorithm for Suspected or confirmed COVID-19 Patients

ACLS Cardiac Arrest Algorithm for Suspected or Confirmed COVID-19 Patients (Updated April 2020). © 2020 American Heart Association

<div style="text-align:right">Appendix 7:</div>

The Critical-Care Pain Observation Tool (CPOT) - (Gélinas et al., 2006)

Indicator	Score		Description
Facial expression Expression faciale Détendue, neutre / Tendue / Grimace 0 · 1 · 2 Caroline Arbour, RN, B.Sc., PhD(student) School of Nursing, McGill University	Relaxed, neutral	0	No muscle tension observed
	Tense	1	Presence of frowning, brow lowering, orbit tightening and levator contraction or any other change (e.g. opening eyes or tearing during nociceptive procedures)
	Grimacing	2	All previous facial movements plus eyelid tightly closed (the patient may present with mouth open or biting the endotracheal tube)
Body movements	Absence of movements or normal position	0	Does not move at all (doesn't necessarily mean absence of pain) or normal position (movements not aimed toward the pain site or not made for the purpose of protection)
	Protection	1	Slow, cautious movements, touching or rubbing the pain site, seeking attention through movements
	Restlessness/Agitation	2	Pulling tube, attempting to sit up, moving limbs/thrashing, not following commands, striking at staff, trying to climb out of bed
Compliance with the ventilator (intubated patients) OR **Vocalization (extubated patients)**	Tolerating ventilator or movement	0	Alarms not activated, easy ventilation
	Coughing but tolerating	1	Coughing, alarms may be activated but stop spontaneously
	Fighting ventilator	2	Asynchrony: blocking ventilation, alarms frequently activated
	Talking in normal tone or no sound	0	Talking in normal tone or no sound
	Sighing, moaning	1	Sighing, moaning
	Crying out, sobbing	2	Crying out, sobbing
Muscle tension Evaluation by passive flexion and extension of upper limbs when patient is at rest or evaluation when patient is being turned	Relaxed	0	No resistance to passive movements
	Tense, rigid	1	Resistance to passive movements
	Very tense or rigid	2	Strong resistance to passive movements or incapacity to complete them
TOTAL	___ / 8		

Appendix 8

The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU 5)

Term	Score	Description
+ 4	Combative	Overly combative or violent. Immediate danger to staff.
+ 3	Very Agitated	Pulls/removes tubes or catheters. Has aggressive behavior toward staff.
+ 2	Agitated	Frequent non-purposeful movement.
+ 1	Restless	Anxious or apprehensive but movements not aggressive or vigorous.
0	Alert and Calm	Alert and Calm
- 1	Drowsy	Not fully alert but has sustained (greater than 10 sec.) awakening with eye contact to voice.
- 2	Light Sedation	Briefly (less than 10 sec.) awakens with eye contact to voice.
- 3	Moderate Sedation	Any movement (but no eye contact) to voice.
- 4	Deep Sedation	No response to voice but any movement to physical stimulation.
- 5	Unrousable	No response to voice or physical stimulation.

"A" Donning on PPE for AGPs

COVID-19: Sequence for Putting on (Donning) Personal Protective Equipment (PPE) for Aerosol Generating Procedures (AGPs)

*Run donning checklist to yourself before entering the area
*Ensure you are cross-checked by a colleague after donning your PPE

1. **Perform hand hygiene**
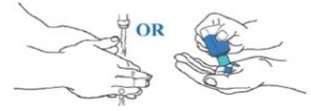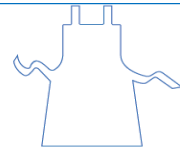
2. **Shoe cover**

3. **Perform hand hygiene**
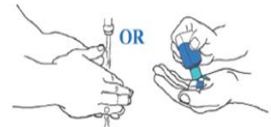
4. **Gown**
   Don the long-sleeves fluid repellent disposable gown.
   Gown to fully cover torso from neck to knees, arms to end of wrist and wrap around the back and fastened at the back
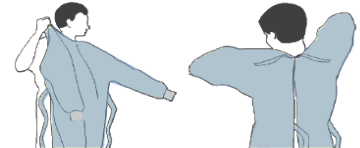
5. **Apron**

6. **Respiratory (fit-tested, seal-checked N95 mask) or PAPR (Powered Air Purifying Respirator)**
   - Hold the mask with your right hand, please it on your cover to cover your mouth and nose
   - Secure ties or elastic bands at middle of head and neck
   - Fit flexible band to nose bridge
   - Fit snug to face and below chin
   - Seal-check respirator

7. **Head cover**

8. **Googles or Face Shield**
   - Position googles over your eyes and secure to the head using the earpieces
   - Position face shield over your face and secure on the brow with headband
   - Adjust to fit comfortably

9. **Gloves**
   Select the gloves according to your hand size. Ensure the cuff of your gown is covered by the cuff of the glove.
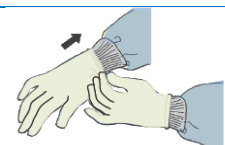
10. **Infection Control: How to Safely Use PPE**
    - Keep gloved hand away from face   • Avoid touching or adjusting other PPE   • Remove gloves if they become torn

- Hand hygiene before donning new gloves   • Limit surfaces and items touched

"B" Doffing PPE for AGPs

COVID-19: Sequence for Removing (Doffing) on Personal Protective Equipment (PPE) for Aerosol Generating Procedures (AGPs)

All PPE should be removed at your doorway except respirator. Remove the respirator after leaving patient room and after the closing door.

PPE should be removed in an order that minimize the potential for cross contamination.

11. Gown and gloves
- Gown front and sleeves and the outside of gloves are contaminated!
- Grasp the gown in the front and pull away from your body so that the ties break, touching outside of gown only with gloves hands.
- While removing the gown, fold or roll the gown inside-out into a bundle
- As you are removing the gown, peel off your gloves at the same time, only touching the inside of the gloves and gown with your bare hands. Place the gown and gloves into a waste container.
- If your hands get contaminated during gown or glove removal, immediately wash your hands or use an alcohol-based hand sanitizer.
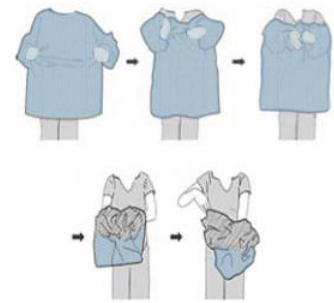
12. Goggles or face shield
- Outside of goggles or face shields are contaminated!
- Remove goggles or face shield from the back by lifting headband and without touching the front of the goggles or face shield and then discard in a waste container.
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer.

### 13. Remove your head cover and shoe cover

14. Perform hand hygiene
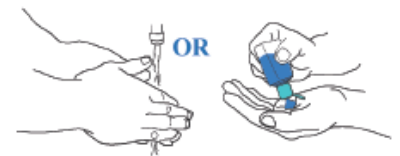
15. Remove your Respirator (Fitted N95 mask)
- Front of respirator is contaminated – DO NOT TOUCH!
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front.
- Disc in a waste container (follow your hospital policy)
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
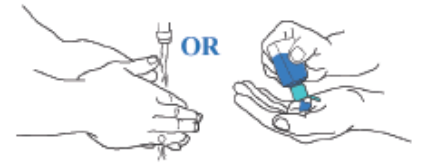
Appendix 10

"A" Doffing on PPE for AGPs

How to Safely Remove Personal Protective Equipment (PPE)

There are a variety of ways to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials

NOTE:
- Remove all PPE before existing the patient room except a respirator, if worn.
- Remove the respiratory after leaving the patient room and closing the door.
- If hands become visibly contaminated during PPE removal, wash hands before continuing to remove the remaining PPE

REMOVE PPE IN THE FOLLOWING SEQUENCE:
1. **GLOVES**
    - Grasp outside edge near wrist
    - Peel away from hand, turning glove inside-out
    - Hold in opposite gloved hand
    - Slide ungloved finger under the wrist of the remaining glove
    - Peel off from inside, creating a bag for both gloves
    - Discard into waste container
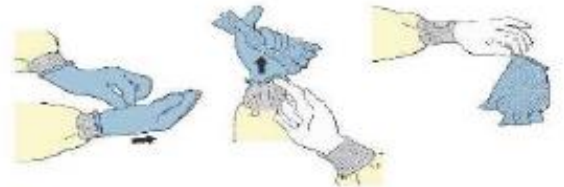
2. **PERFORM HAND HYGIENE**

3. **REMOVE GOGGLES OR FACE SHIELD**
    - Grasp ear or head places with ungloved hands
    - Lift away from face
    - Place in designated receptacle for reprocessing or disposal
    - Discard into waste container

4. **REMOVING ISOLATION GOWN**
    - Unfasten ties
    - Peel gown away from neck and shoulders
    - Turn contaminated outside toward the inside
    - Fold or roll into a bundle
    - Discard into waste container

5. **REMOVING MASK OR RESPIRATOR**

- Font of the mask/respirator is contaminated – DO NOT TOUCH
- Grasp bottom, than top ties or elastics and remove
- Discard in a waste container

6. IMMEDIATELY AFTER REMOVING ALL PPE WASH HANDS OR USE AN ALCOHOL–BASED HAND SANITIZER

PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATEL AFTER REMOVING ALL PPE

"B" Donning and Doffing PPE

# Sequence on Putting Personal Protective Equipment (PPE)

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

17. PERFORM HAND HYGIENE

18. GOWN
- Fully cover torso from neck and knees, arms to end of wrists, and wrap around the back
- Fasten in back of neck and waist
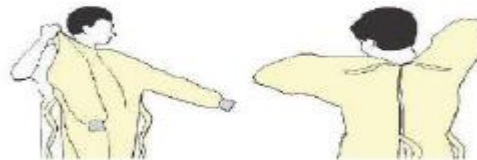
19. MASK OR RESPIRATOR
- Secure ties or elastic bands at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator

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

21. GLOVES

- Pull the gloves to cover the wrist of the isolation gown

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

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