

# MSHS Emergency Medicine COVID-19 Management Protocol <sup>1,2</sup>

## GENERAL

- All patients presenting to Mount Sinai Hospital System (MSHS) with influenza-like illness in the setting of widespread community transmission of Coronavirus Disease 2019 (COVID-19) should be considered a patient under investigation (PUI).
- Symptoms of COVID-19 include: fever (subjective or measured) OR myalgia OR cough OR sore throat.
- Risk factors for COVID-19 include: see Table 1.
- PUIs that do not meet criteria for hospital admission should NOT undergo testing for SARS- CoV-2.
- PUIs admitted to the hospital should undergo testing for SARS-CoV-2.

## LABORATORY

ED	INPATIENT
<p>Recommended Emergency Department (ED) laboratory indicators for PUIs reporting shortness of breath or chest pain, PUIs meeting Systemic Inflammatory Response Syndrome (SIRS), or PUIs with 2 or more category 1 risk factors for COVID-19: complete blood count (CBC) with differential, complete metabolic panel (CMP), blood gas, troponin, and B-type natriuretic protein (BNP)</p>	<p>Additional diagnostics that can be consider on COVID patients if clinically indicated can be added by the inpatient team: lactate dehydrogenase (LDH), ferritin, D-dimer, creatinine kinase (CPK), end sedimentation rate, C-reactive protein, procalcitonin, hepatitis viral serologies, and respiratory viral panel (RVP)</p>

## IMAGING

- Obtain chest x-ray (CXR) in PUIs with tachypnea or hypoxia.
- Batch indications for CXR together when possible (i.e. intubation, nasogastric tube, central line).
- Consider use of point of care (POC) ultrasound in PUIs with shortness of breath, chest pain, PUIs meeting SIRS criteria, or PUIs with 2 or more category 1 risk factors for COVID-19.
- Limit use of computed tomography (CT) unless likely to alter disposition of PUI.

<b>Table 3. Imaging Diagnostics for COVID-19</b>	
<b>Modality</b>	<b>Recommendation</b>
<b>CXR</b>	May avoid if lung exam is benign and in absence of tachypnea and hypoxia. Recommend with hypoxia, tachypnea, or potential alternative diagnosis. Due to infection control consider utilization of portable CXR to avoid contamination and nosocomial transmission. Equipment requires decontamination per use.
<b>US</b>	Ultrasound may show B-lines. Unilateral B-lines are non-specific. Bilateral B-lines higher indicator for COVID-19. Useful for intubated patients if concern for pneumothorax or for cardiac assessment with increased incidence of cardiomyopathy. Unclear benefit for all PUIs. Equipment requires decontamination per use.
<b>CT</b>	Only if clinically indicated, to look for alternative conditions. Most infiltrates in COVID-19 patients will be viral pneumonia and CT scan is not clinically useful. Equipment requires decontamination per use.

## OTHER DIAGNOSTICS

- Obtain electrocardiogram (EKG) in PUIs reporting shortness of breath, chest pain, or PUIs with tachycardia, tachypnea, or hypoxemia.

## GENERAL DISPOSITION CRITERIA

- Per Center for Disease Control and Prevention (CDC) updated interim guidance for the evaluation and management of PUIs for COVID-19, “The decision to monitor a patient in the inpatient or outpatient setting should be made on a case-by-case-basis.”

Criteria for Discharge	Mild disease as evidenced by no hypoxia, no tachypnea, ability to ambulate without severe symptoms, ability to isolate at home, ability to return for worsening symptoms. Instructions on self-isolation with home infection control measures in the home.
Criteria for Floor Admission	Oxygen requirement, moderate to severe shortness of breath or tachypnea, rapidly worsening course, fragility, living situation, and other risk factors should remain under consideration. Group living arrangement may necessitate admission.
Criteria for Critical Care Consult	Intubated, on pressors, rapid progressive hypoxic resp failure with increasing oxygen requirements, 100% FiO <sub>2</sub> on NRB, patient requiring HFNC or BIPAP. Strongly consider Critical Care consult for patients on patients with rapid increasing oxygen requirements Patients should not be being admitted to the floor without ICU consult if requiring 100% NRB or NIV

**FOR OTHER QUESTIONS OR EXPANDED GUIDELINES THAT INCLUDE COMORBIDITIES, PLEASE LOOK IN APPENDIX 1a FOR FURTHER INFORMATION AND GUIDANCE.**

## RESPIRATORY SUPPORT<sup>3</sup>

- Limit use of aerosol-generating modalities whenever possible (e.g., nebulized medications and bronchoscopy).
- Use metered dose inhalers (MDIs) instead of nebulized medications (see non-aerosolizing asthma pathway).
- **Supplemental oxygen (if SpO<sub>2</sub> <92%)**
  - Nasal cannula and non-rebreather masks may be used as usual
  - Avoid Venti masks due to risk of aerosolization
  - A short trial of High Flow Nasal Canula (HFNC) or second line BIPAP for acute respiratory failure with close monitoring is acceptable. Patient needs to be in airborne isolation room and HCP need to use N95 (instead of surgical masks) for PPE
  - If BIPAP must be used, use closed circuit ventilator with a filter on exhalation port
  - Strongly consider Critical Care consult for patients on NRB or with rapid increasing oxygen requirements
  - Patients should not be being admitted to the floor without ICU consult if requiring NIV
- **Intubation<sup>4</sup>:**
  - Have a **lower threshold for intubation** in order to avoid emergent intubations.<sup>4</sup> COVID patients may deteriorate rapidly
  - **N95** (instead of surgical mask), face shield, **double gloves**, blue **plastic gown**, **hat** must be used
  - Plan for **rapid sequence intubation** by an **experienced** physician to minimize exposure to health care personnel (*see Intubation Guidelines*)
  - Use doses in the higher range for paralytics: 1.0-1.5 mg/kg of rocuronium, 1.5-2.0 mg/kg of succinylcholine.

## VENTILATOR MANAGEMENT

- Initiate all patients on **low tidal volume** ventilation immediately (**4-6cc/kg IBW**)
- Goal SpO<sub>2</sub> no higher than 96%
- Moderate to severe ARDS (P/F<200)
  - Consider high PEEP (**16-22 cm H<sub>2</sub>O, plateau <30 cm H<sub>2</sub>O**) strategy
  - Sedate to RASS -4/-5
  - If persistent ventilator dyssynchrony, persistently high Pplateau, consider neuromuscular blocking agents
- Severe ARDS
  - Consider consulting ECMO team
  - consider inhaled flolan (prefer over iNO) as a bridge to proning / ECMO
  - ARDSnet protocol

## SEDATION

- Keep more sedated (e.g., RASS -2 to -3, instead of 0 to -1) because of risk of self-extubation

## **HEMODYNAMIC MANAGEMENT**

- Ultrasound, with focus on cardiac contractility and fluid assessment, should be used to help guide fluid resuscitation and vasopressor initiation
- Conservative Fluid Strategy
- Prefer buffered crystalloids over colloids/unbalanced crystalloids
- Diuresis if patient appears volume overloaded and not requiring vasopressor support
- If persistent hypotension after initial fluids, recommend starting levophed as first-line agent, and vasopressin if 2nd agent needed
- Target MAP 60-65
- If shock w/ cardiac dysfunction despite IVF and levophed, can add dobutamine
- Lactate may help guide resuscitation but high levels, but may also be caused by mitochondrial dysfunction, liver failure, beta-agonists, mesenteric ischemia, or epinephrine.

## **AIRWAY MANAGEMENT (See appendix 1)**

There should be a low threshold for early intubation. Patients with worsening respiratory failure should be intubated early. If needed High Flow Nasal Cannula (HFNC) and Non-invasive ventilation with BIPAP with a filter on the exhalation port can be considered for a short trial while patients are in a negative pressure room and staff wear N95s and full PPE. These have not been shown to prevent intubation but is more likely to delay it.

**PHARMACOLOGIC TREATMENT (See appendix 2) See Mount Sinai Health System Treatment Guidelines for SARS-CoV-2 Infection (COVID-19)**

There is no currently approved treatment or evidence that medications for outpatient treatment are effective. We should NOT initiate patients who are discharged on any treatment protocols until additional evidence is found.

Antipyretics	The use of non-steroidal anti-inflammatory drugs to treat fever in patients with COVID-19 is subject to ongoing debate. While no evidence has proven harm and concern based on case reports initial treatment with acetaminophen.
Antiviral therapy	Should use in conjunction with ID only, generally started as part of an inpatient plan of care.
Antibiotics	Based on clinical suspicion. Can hold unless sepsis or other non covid cause of infection suspected. Not indicated for tx of covid alone.
Steroids	Per WHO guidelines, given the lack of effectiveness and possible harm, especially delayed viral clearance, routine corticosteroids should be avoided unless they are indicated for other reasons such as exacerbation of asthma, COPD and refractory septic shock.
Albuterol	See Attached Protocol
Oseltamivir	SARS-CoV-2, the virus that causes COVID-19, does not use neuraminidase as part of the viral replication cycle so oseltamvir is unlikely to be of therapeutic value, and supplies of the drug should be preserved for patients with influenza.
ACE/ARB	<b>Patients should NOT be started on an ACE inhibitor or an ARB for the treatment of COVID-19.</b> <b>It is strongly recommended that those patients prescribed ACE inhibitors and ARBs for preexisting conditions should be continued on their ACE inhibitor and ARB therapy.</b> Currently, there is no scientific or clinical evidence that taking ACE inhibitors or ARBs increases the risk of acquiring COVID-19 or that use may increase the severity of illness for those acquiring infections.

## APPENDIX

### 1. INTUBATION

#### Tips:

- Rapid Sequence Intubation (*i.e.* sedative hypnotic followed by muscle relaxant without delay) using video-guided laryngoscopy by critical care or anesthesia attending. Keep sedated at RASS -4/-5 until neuromuscular blockade has worn off
- Consider placing NGT and CVC (if needed) after intubation to check placement on same CXR.

#### Staffing (limit number of staff exposed to aerosolized virus)

- Inside room: Critical Care Attending MD and Anesthesia Attending MD
- Outside room: MD or APP observing and, if needed, entering room to assist; respiratory therapist
- If known / concern for difficult airway or difficulty intubating, notify DART (146-209-3278; see AMION  ICCM  Other)
- Avoid pregnant and immune compromised providers

#### Prepare before intubation

- Patient: IV access (ask bedside RN)
- Ventilator: if time permits, RT sets up ventilator inside room and exits before intubation
- Equipment
  - Glidescope (next to code cart in the back of the unit), Size 3 and 4 covers, stylet
  - Airway box (ETT, CO2 detector, ETT holder, surgilube, 10cc syringe)
  - Filter for bag valve mask and ventilator
  - Optional: NGT
- Medications (drawn up and ready)
  - Suggest: sedative(s) of choice (etomidate, propofol, versed, fentanyl) AND succinylcholine 1-1.5 mg/kg OR rocuronium 1.2 mg/kg
  - If MAP <70, vasopressor and IV fluids
  - Sedative/analgesia drip(s)
  - Multiple flushes
- PPE: **blue plastic** waterproof gown, **hat**, **N95** mask, face shield, **double** gloves

#### Intubation

- Avoid manual ventilation unless absolutely necessary
- Avoid awake fiberoptic and LMA intubation unless absolutely necessary
- Set up intubation table outside room and only bring in what you need
- Preparation in room
  - Preoxygenate for 4-5 minutes with 100% FiO2 non-rebreather mask if possible
  - To ensure proper depth of insertion, leave video laryngoscope in place until after ETT balloon has passed through vocal chords
  - Place filter between ETT and ventilator tubing
  - Consider using continuous suctioning to reduce dispersion<sup>5</sup>
- If manual ventilation is required: 1) place filter between mask & bag, 2) apply small tidal volumes with 2-handed mask seal
- Confirm correct position of endotracheal tube before and after securing it with:
  - End Tidal CO2
  - Auscultation using Disposable Stethoscope
  - Ultrasound to assess for bilateral lung sliding (if available)
- Before doffing and exiting room
  - Clean Glidescope/nondisposable stylet w/ green hydrogen peroxide wipe (≥2 minute contact time)
  - Roll Glidescope to provider outside room. Repeat cleaning steps outside room.
- Doff PPE (see APPENDIX for details)

*Adapted from protocol by Dr. Evan Leibner, ICCM*

1a. EXPANDED RISK STRATIFICATION FOR ADMISSION:

<b>Table 1. Risk Factors for Severe Illness in COVID-19</b>		
<b>Category 1: Epidemiology</b>	<b>Category 2: Vital Signs</b>	<b>Category 3: Laboratories</b>
Age > 55	Respiratory Rate >24 breaths/minute	Absolute Lymphocyte Count <0.8
History of Lung Disease	Heart Rate >125 beats/minute	LDH >245 U/L
History of Heart Disease	Oxygen saturation <92% on room air	Ferritin >300 ug/L
History of Diabetes A1c >7.6%		CPK >twice upper limit normal
History of Hypertension		CRP >100
History of Chronic Kidney Disease		D-dimer >1000 ng/mL
History of Immunosuppression (including Transplant)		
All patients with HIV (regardless of CD4 count)		

<b>Table 4. Disposition Criteria</b>	
<b>Disposition</b>	<b>Recommendation</b>
Criteria for Discharge with Follow Up As Needed	Mild disease as evidenced by <b>no hypoxia, no tachypnea, 0-1 category 1 risk factors</b> , ability to ambulate without severe symptoms, <b>ability to isolate at home</b> , ability to return for <b>worsening symptoms</b> . Instructions on <b>self-isolation with home infection control measures in the home</b> .
Criteria for Discharge with Follow Up within 24 Hours	As above with the following modifying factors: <b>mild persistent or exertional shortness of breath without oxygen requirement, mild tachypnea without oxygen requirement, 2 or more category 1 risk factors with VSS, mildly elevated LDH</b> .
Criteria for Floor Admission	<b>Absolute:</b> <b>Oxygen requirement</b> , moderate to severe <b>shortness of breath or tachypnea, rapidly worsening course, sepsis, LDH &gt;245 U/L</b> . <b>Case-by-Case:</b> <b>2 or more category 1 risk factors with unstable vitals</b> . Consider other modifying factors. No absolute age

	<p>requirement or limits, however, fragility, living situation, and other risk factors should remain under consideration. Group living arrangement may necessitate admission.</p>
<p>Criteria for Intensive Care Unit (ICU) Admission</p>	<p><b>Absolute:</b> respiratory failure, severe sepsis.  Case-by-Case: patients &gt;70, 3 or more category 1 risk factors, any supplemental oxygen requirement &gt;4 L/min or diffuse bilateral infiltrates on radiograph, China considered severe cases to be: Adults who meet any of the following criteria: respiratory rate &gt; 30 breaths/min; oxygen saturations &lt; 93% at a rest state; arterial partial pressure of oxygen (PaO<sub>2</sub>)/oxygen concentration (FiO<sub>2</sub>) &lt; 300 mm Hg. Patients with &gt; 50% lesions progression within 24 to 48 hours in lung imaging.</p>

## 2. MSHS INPATIENT TREATMENT GUIDELINES FOR COVID-19



### Mount Sinai Health System Treatment Guidelines for SARS-CoV-2 Infection (COVID-19)<sup>1-14</sup>

Patient group	Current Potential Therapy Options	Notes
<p><b>Mild disease:</b> Not requiring hospitalization</p> <p>OR</p> <p>Hospitalized patient with (SPO<sub>2</sub> &gt; 94%), and NO radiographic evidence of pneumonia</p>	<p>Not hospitalized: Supportive care</p> <p>Hospitalized: Start Hydroxychloroquine 400 mg PO q 12 hrs x 2 doses then 12 hours later start 400 mg PO q 24 hrs for 5 days total</p> <p>***May add azithromycin 500 mg PO x 1 dose then 24 hours later start 250 mg PO q 24 hours x 4 doses for a total of 5 days OR 500 mg PO q 24 hours for 3 days</p> <p><b>If discharged, discontinue hydroxychloroquine and azithromycin.</b></p>	<ul style="list-style-type: none"> <li>• Infectious Diseases consult required for all hospitalized patients with confirmed COVID19</li> <li>• Check ECG prior to hydroxychloroquine initiation for QT prolongation. Risk is increased when used with other QT prolonging drugs.</li> <li>• Follow QT monitoring algorithm below.</li> <li>• Review potential medication interactions and other possible side effects</li> </ul> <p>*** Combination Azithromycin and Hydroxychloroquine: contraindicated in persons with known WPW and prolonged QT</p>
<p><b>Moderate disease:</b> Hospitalized patients with hypoxia (SPO<sub>2</sub> ≤ 94 %) OR Radiographic evidence of pneumonia</p>	<p>Start Hydroxychloroquine 400 mg PO q 12 hrs x 2 doses then 12 hours later start 400 mg PO q 24 hrs for 5 days total</p> <p>***May add azithromycin 500 mg PO x 1 dose then 24 hours later start 250 mg PO q 24 hours x 4 doses for a total of 5 days OR 500 mg PO q 24 hours for 3 days</p> <p><b>If discharged, discontinue hydroxychloroquine and azithromycin.</b></p>	<ul style="list-style-type: none"> <li>• Infectious Diseases consult required for all hospitalized patients with confirmed COVID19</li> <li>• Check ECG prior to hydroxychloroquine initiation for QT prolongation. Risk is increased when used with other QT prolonging drugs.</li> <li>• Follow QT monitoring algorithm below.</li> <li>• Review potential medication interactions and other possible side effects</li> </ul> <p>*** Combination Azithromycin and Hydroxychloroquine: contraindicated in persons with known WPW and prolonged QT</p>
<p><b>Severe disease with respiratory failure but no other end organ damage:</b> Patient requiring high flow, NRB, BIPAP or mechanical ventilation</p> <p>AND</p> <p>Not on pressors, CrCl &gt; 30 ml/min, ALT &lt; 5x upper limit of normal</p>	<p>Start Hydroxychloroquine: 400 mg PO q 12 hrs x 2 dose then 12 hours later start 400 mg PO q 24 hrs for 5 days total</p> <p>***May add azithromycin 500 mg PO x 1 dose then 24 hours later start 250 mg PO q 24 hours x 4 doses for a total of 5 days OR 500 mg PO q 24 hours for 3 days</p> <p>Consider Tocilizumab or sarilumab clinical trial.</p> <p><b>If discharged, discontinue hydroxychloroquine and azithromycin.</b></p>	<ul style="list-style-type: none"> <li>• Infectious Diseases consult required for all hospitalized patients with confirmed COVID19</li> <li>• Check ECG prior to hydroxychloroquine initiation for QT prolongation. Risk is increased when used with other QT prolonging drugs.</li> <li>• Follow QT monitoring algorithm below.</li> <li>• Review potential medication interactions and other possible side effects</li> </ul> <p>*** Combination AZ and HCO contraindicated in persons with known WPW and prolonged QT</p>

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<p><b>Severe disease with respiratory failure and other end organ damage:</b> Patient requiring mechanical ventilation</p> <p>AND</p> <p>Requiring pressors or CrCl &lt; 30 ml/min or receiving HD or CVVH or ALT &gt; 5x upper limit of normal</p>	<p>Start Hydroxychloroquine: 400 mg PO q 12 hrs x 2 dose then 12 hours later start 400 mg PO q 24 hrs for 5 days total</p> <p>***May add azithromycin 500 mg PO x 1 dose then 24 hours later start 250 mg PO q 24 hours x 4 doses for a total of 5 days OR 500 mg PO q 24 hours for 3 days</p> <p>Consider Tocilizumab or sarilumab clinical trial.</p> <p><b>If discharged, discontinue hydroxychloroquine and azithromycin.</b></p>	<ul style="list-style-type: none"> <li>• Infectious Diseases consult required for all hospitalized patients with confirmed COVID19</li> <li>• Check ECG prior to hydroxychloroquine initiation for QT prolongation. Risk is increased when used with other QT prolonging drugs.</li> <li>• Follow QT monitoring algorithm below.</li> <li>• Review potential medication interactions and other possible side effects</li> </ul> <p>*** Combination AZ and HCO contraindicated in persons with known WPW and prolonged QT</p>
<p><b>Evidence of cytokine release syndrome:</b> Worsening of respiratory function with evidence of CRS including elevations of IL-6, fibrinogen, d-dimer, CRP</p>	<p>Consider Tocilizumab or sarilumab clinical trial.</p>	<ul style="list-style-type: none"> <li>• Infectious Diseases consult required for all hospitalized patients with confirmed COVID19</li> </ul>

### 3. CARDIAC ARREST PROTOCOL

***Any out of hospital unwitnessed arrest without ROSC OR asystolic arrest OR no signs of cardiac function on POCUS upon arrival have a uniformly poor prognosis.***

***It is the recommendation of the department that efforts to resuscitate are futile and should, unless changed by a clear overriding clinical finding, be terminated.***

1. Consider **LUCAS** device if available
2. Door remains closed
3. PPE *before* room entry: **double** gloves, **plastic** gown, bouffant **cap**, **N95**, face **shield**
4. If patient is intubated: perform *CPR with patient ON VENT (no BVM)* in VC mode
5. Intubating during codes (while minimizing aerosolization of virus)
  - a. Code leader intubates
  - b. **HOLD** chest compression during intubation
  - c. If vent in room:
    - i. **NO BVM after tube is in**
    - ii. 1) Inflate balloon, 2) place filter between ETT and vent, 3) directly connect patient to vent
  - d. If no vent in room:
    - i. **Filter** between bag and mask, apply small tidal volumes
6. After code complete, doff before exiting room and debrief
7. Explore goals of care and futility of CPR with family before and during ACLS

#### **Equipment to bring into room**

- LUCAS device (consider) vs Backboard
- Instead of bringing code cart / intubation box into patient's room, hand carry:
  - Defibrillator, Zoll pads
  - Medications: epinephrine x 5; bicarb x 2; calcium x 1; flushes x 10
  - If not intubated
    - filter, videolaryngoscope, stylet, Surgilube, ETT, 2x 10cc syringe, yankauer, CO2 detector, fixation device, BVM, ventilator

#### **Team Members / Roles**

##### **Inside room: all wearing PPE (max 5)**

1. Critical Care Attending or Fellow : Cardiac Arrest Leader:
2. RN: Medication administration
3. RN or MD : CPR #1
4. RN or MD : CPR #2 (if not using LUCAS)
5. Respiratory therapist: Place filter, secure airway, vent initiation

##### **Outside room: NO PPE**

1. RN or MD: Asks for extra medications / supplies, observes for PPE breach by code team members, records code log
2. RN or PA: Runner for extra medications / supplies

*Adapted from protocol by Dr. Miguel Martillo, ICCM*

#### 4. NON-AEROSOLIZED ASTHMA PROTOCOL

##### OBJECTIVE

In the setting of the COVID-19 pandemic, all efforts to prevent transmission of virions must be taken. Many patients present to the emergency department with dyspnea and hypoxia in the setting of severe asthma exacerbation which could potentially be triggered by a novel viral infection. Caution must be taken in managing these patients as the backbone of traditional management protocols involves the use of nebulized beta-agonists which carry the risk of aerosolizing virions. This change in protocol is an stepwise approach to avoid the use of NIPPV before intubation for ventilator support.

- A. Protocol for the stable patient w/ moderate to severe symptoms:
1. Albuterol MDI administered using a spacer 6-8 puffs (+/- ipratropium) every 20 minutes in the setting of initial presentation  
-Immediate testing for COVID-19 (Reasonable to continue the above modality even if testing is negative due to questionable sensitivity and high risk of transmission)
  2. Prednisone 60mg PO x1 vs Methylprednisolone 60mg IV/IM depending on the patient's ability to tolerate PO
  3. Magnesium 2g IV over 20 minutes
  4. IM epinephrine 0.3 mg q20minutes or IV epi 1-5mcg/min initial dose with titration to effect (D/C if intubated) vs SQ terbutaline 0.25 mg q20minutes (up to three doses) as options for systemic beta-agonist treatment if inhaled options are not leading to clinical improvement
  5. Early consult to Critical Care
  6. Consider RSI if worsening
  7. Ketamine gtt as an option for refractory status asthmaticus
  8. Glycopyrrolate IM/IV
- B. Protocol for the crashing decompensating patient: Steps occur concurrently
1. Albuterol MDI+ spacer 6-8 puffs if the patient's mentation allows.
  2. IM Epi .3mg, then to be followed by IV Epi infusion 1-5mcg/min initial dose with titration to effect (D/C if intubated)
  3. Methylprednisolone 60mg IV
  4. Mag 2g IV over 20 minutes
  5. Prepare for intubation following MS Covid Intubation Protocol
  6. Consider NIPPV if negative pressure room available and no obvious Covid symptoms
  7. Consider RSI if remains patient remains severe or worsens
  8. Consider IV ketamine
  9. If intubated then utilize in-line nebs with HEPAA filter in place.

## 5. SELECTED REFERENCES

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