Emergency Department COVID-19 Management Tool

May 2021

This tool was developed to provide a pragmatic framework to assist with severity classification, risk assessment, diagnostic workup, disposition, and treatment of patients with suspected or confirmed SARS-CoV-2 (COVID-19) in the emergency department.

- It is designed to assist with the management of adult patients (≥18 years old) with symptomatic infection.
- It is not a substitute for clinicians’ own assessment and clinical judgement of what is best for the patient.
- This tool is not exhaustive in regards to diagnostic and treatment recommendations. Patients may present with particular conditions (MI, PE, stroke) that could be manifestations of severe or critical COVID-19. These conditions may require additional specific diagnostic and therapeutic interventions not discussed in this tool.
- Evidence on this topic is evolving quickly and may change recommendations.

A digitized version of this tool can now be found at MCCalc.

**Step 1 - Severity Classification**

Assess the patient’s severity of disease utilizing NIH criteria.

### MILD MODERATE SEVERE CRITICAL

<table>
<thead>
<tr>
<th>Variable</th>
<th>1 Point</th>
<th>2 Points</th>
<th>3 Points</th>
<th>4 Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate (per minute)</td>
<td>□ 12-20</td>
<td>□ 9-11</td>
<td>□ 21-24</td>
<td>□ &lt;9 or &gt;24</td>
</tr>
<tr>
<td>Oxygen saturation (%)</td>
<td>□ &gt;95</td>
<td>□ 94-95</td>
<td>□ 92-93</td>
<td>□ &lt;92</td>
</tr>
<tr>
<td>Heart rate (per minute)</td>
<td>□ 51-90</td>
<td>□ 41-50 or 91-110</td>
<td>□ 111-130</td>
<td>□ &lt;41 or &gt;130</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>□ 111-219</td>
<td>□ 101-110</td>
<td>□ 91-100</td>
<td>□ &lt;91 or &gt;219</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>□ 36.1-38.0</td>
<td>□ 35.1-36.0 or 38.1-39.0</td>
<td>□ &gt;39.0</td>
<td>□ &lt;35.1</td>
</tr>
<tr>
<td>Alertness</td>
<td>□ Alert</td>
<td>□ Room Air</td>
<td>□ Male</td>
<td>□ Supplemental Oxygen</td>
</tr>
<tr>
<td>Inspired oxygen</td>
<td>□ Limited activity, can do light activity</td>
<td>□ Limited activity, can self-care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>□ Female</td>
<td>□ Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>□ 16-49</td>
<td>□ 11-24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance status</td>
<td>□ Unrestricted Normal Activity</td>
<td>□ Limited strenuous activity, can do light activity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total number of boxes checked in each column:

- x 0 = 0
- x 1 = 1
- x 2 = 2
- x 3 = 3
- x 4 = 4

**Add Subtotals**

<table>
<thead>
<tr>
<th>Score</th>
<th>0-1</th>
<th>2-3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk %</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
<td>9%</td>
<td>15%</td>
<td>18%</td>
<td>22%</td>
<td>26%</td>
<td>29%</td>
<td>34%</td>
<td>38%</td>
<td>47%</td>
<td>48%</td>
<td>50%</td>
<td>55%</td>
<td>66%</td>
</tr>
</tbody>
</table>

**Step 2 - Risk Prognostication**

Patients with **MILD** and **MODERATE** severity should be further assessed to determine their risk of disease progression.

The PRIEST Score is a validated tool to predict a patient’s risk for end organ failure and/or mortality. The ACEP working group recognizes that there are other risk prognostication calculators that have been published. The PRIEST Score is included here as it offers a diagnostic testing, disposition, and treatment.

**Step 3 - Risk Assessment**

Assess the patient for additional risk factors that have been correlated with higher risk for severe disease, organ failure, and/or mortality. If your patient has one (or especially multiple) risk factors, you may want to consider in the approach taken in subsequent steps for diagnostic testing, disposition, and treatment.

- The CDC notes that patient race/ethnicity, socioeconomic status, and healthcare resources may effect clinical outcomes and advise consideration in clinical risk assessment.
- Risk factors include, but are not limited to:
  - Cancer: especially those with diagnosis <1 year, actively in treatment, and/or hematologic malignancies
  - Cardiovascular Disease
  - Chronic Respiratory Disease (including COPD)
  - Diabetes Type II
  - Down’s Syndrome
  - Hypertension
  - Immunosuppression (including organ transplant and asplenia)
  - Neurologic disease (including dementia and previous strokes)
  - Obesity (BMI ≥35)
  - Obstructive Sleep Apnea
  - Pregnancy
  - Renal Disease (GFR ≤30)
  - Steroid usage (recent)
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Step 4 - Diagnostic Testing
The following imaging and lab tests should be considered based on your patients severity and risk for disease progression.

<table>
<thead>
<tr>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
<th>CRITICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on clinician’s judgement, diagnostic testing may not be necessary in patients with (ALL):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Mild Severity</td>
<td>☐ PRIEST score ≤4</td>
<td>☐ 1 or less Risk Factors</td>
<td>Exertional SpO2 may have limited ability to identify adverse outcomes in otherwise well-appearing patients:</td>
</tr>
</tbody>
</table>

Per the NIH...
Imaging: the optimal imaging technique has not yet been defined for people with symptomatic COVID-19. Initial evaluation for these patients may include:
- ☐ Chest X-ray
- ☐ Pulmonary Ultrasound
- ☐ CT Chest (if indicated)
ECG: should be performed if indicated
- ☐ ECG
Labs:
- ☐ CBC w/ differential
- ☐ CMP
While not standard of care, the following may have prognostic value:
- ☐ CRP
- ☐ D-dimer
- ☐ Ferritin

Step 5 - Diagnostic Interpretation
The following lab results (if obtained) have been shown to potentially be indicators of risk of disease progression, more severe disease, and/or mortality.

| Lab Cutoffs: | | | |
| ☐ ALT (>40 U/L) | ☐ D-dimer (>1µg/mL) | ☐ Neutrophils (>8,000/mm³) |
| ☐ AST (>40 U/L) | ☐ Ferritin (>300 µg/L) | ☐ Thrombocytopenia (<150,000/mm³) |
| ☐ Creatinine (>1.5 mg/dL) | ☐ LDH (>250 U/L) | ☐ Troponin (>99%) |
| ☐ CRP (>125 mg/L) | ☐ Lymphopenia (<0.8 x10⁹/L) | ☐ WBC (>10,000/ mm³) |

Unfortunately, cutoffs used for abnormal lab values are heterogeneous across studies and may need to be adjusted based on reference ranges at your facility.

Step 6 - Disposition
The following represents a pragmatic approach for disposition of patients depending on their disease severity. Clinicians should consider a patient’s risk for progression of disease based on PRIEST Score, risk factors, imaging, and labs in their disposition decision.

<table>
<thead>
<tr>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
<th>CRITICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Discharge Home</td>
<td>☐ Discharge Home, consider if ALL:</td>
<td>Admission Location: based on clinician’s judgement</td>
<td>Admission</td>
</tr>
<tr>
<td>☐ Supply patient with educational materials on precautions and items to be monitoring at home (CDC Patient Educational Materials)</td>
<td>☐ PRIEST Score ≤4</td>
<td>☐ Floor Bed</td>
<td>☐ ICU</td>
</tr>
<tr>
<td>Consider</td>
<td>☐ 1 (or less) Risk Factors</td>
<td>☐ Intermediate</td>
<td>☐ Transfer</td>
</tr>
</tbody>
</table>
| ☐ Home pulse oximetry | ☐ No concerning Imaging or Lab results | ☐ ICU | ☐ Consider transfer if your facility does not have the resources or capacity to care for a critically ill COVID patient.
| In patients with PRIEST Score ≥5 and/or multiple Risk Factors | ☐ Capability and resources to care for self at home | ☐ Transfer | ☐ Consider transfer to an ECMO facility for patients who may benefit from this after consultation with receiving facility. |
| ☐ Clinicians should consider early follow-up with primary care physician or other health system access points. | ☐ No other condition that warrants admission | | |
| ☐ Patient should be educated on their increased risk for severe disease and precautions to return to the ED. | ☐ Admission, consider if ANY: | Admission Location: based on clinician’s judgement | |
| | ☐ PRIEST Score ≥5 | ☐ Observation | ☐ ICU |
| | ☐ Multiple Risk Factors | ☐ Inpatient Floor | ☐ Transfer |
| | ☐ Concerning Imaging or Lab results | ☐ Intermediate | ☐ Consider transfer if your facility does not have the resources or capacity to care for a critically ill COVID patient.
| | ☐ Does NOT have the capability or resources to care for self at home | | |
| | | Admission Location: based on clinician’s judgement | ☐ Consider transfer if your facility does not have the resources or capacity to care for a critically ill COVID patient. |

| | Floor Bed | Intermediate | ICU |
| | ☐ Observation | ☐ Inpatient Floor | ☐ Intermediate |
| | ☐ Admission Location: based on clinician’s judgement | ☐ Observation | ☐ ICU |
| | ☐ Consider transfer if your facility does not have the resources or capacity to care for a critically ill COVID patient. |

AMA
☐ Patient wishes to leave Against Medical Advice (AMA) for admission to the hospital and/or additional therapeutic treatment.
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Step 7a - Non-Pharmacologic Treatment
The following treatments should be considered based on the patient’s severity and risk of disease progression.

### MILD
- Consider home oxygen therapy (for those who may benefit)
- Breathing exercises for breathlessness
- Progressive ambulation as tolerated (if no contraindication)
- Resting in the prone position if dyspneic
- Adequate rest/sleep
- Balanced diet
- Adequate hydration

### MODERATE
- Oxygen support-nasal cannula, titrate up to 6L with an oxygen saturation goal of > 92%
- High-Flow Nasal Cannula (HFNC) or high-velocity therapy (titrated up to a flow of 60L and FiO2 up to 100%) are recommended over NIPPV
- Non-Invasive Positive Pressure Ventilation (NIPPV) if HFNC not available
- Consider trial of awake prone positioning if patient can be monitored or can self-rescue. Awake proning is contraindicated in patients in respiratory distress.

### SEVERE
- Intubation is recommended for severe respiratory failure:
  - Oxygenation goal for ventilated patients should be 95-98%.
  - Consider low tidal volume (VT) ventilation (VT <8 mL/kg of predicted body weight) over higher VT ventilation (VT >8 mL/kg) (AII).
  - Target plateau pressures of ≤30 cm H2O (AII).
  - A higher positive end-expiratory pressure (PEEP) strategy is recommended over a lower PEEP strategy (BII).
  - For mechanically ventilated adults with refractory hypoxemia despite optimized ventilation, consider prone ventilation for 12 to 16 hours per day over no prone ventilation.
  - Consider using a conservative fluid strategy over a liberal fluid strategy (BII).
  - Insufficient Data to recommend for or against ECMO in these patients.
  - Against the routine use of inhaled nitric oxide (AII).

### CRITICAL

Step 7b - Pharmacologic Treatment
The following medications should be considered for treatment based on the patient’s severity and risk of disease progression.

**Pharmacologic recommendations for patients with COVID-19 are evolving quickly. For the latest updates visit the NIH or IDSA Guidelines.**

### MILD

**Monoclonal Antibodies**
Recommendation for use in outpatients with mild to moderate COVID-19 who are at high risk of clinical progression as defined by the EUA criteria (see footnote).
- Listed in alphabetical order: bamlanivimab 700 mg plus etesevimab 1,400 mg (Alfa), or casirivimab 1,200 mg plus imdevimab 1,200 mg (Alfa).
- Treatment should be started as soon as possible after the patient has a positive result on a SARS-CoV-2 antigen or nucleic acid amplification test and within 10 days of symptom onset.
- See the Footnotes page for links to the FDA fact sheets with information on which patients qualify and may benefit from AB therapy.

**Steroids**
Dexamethasone (or other corticosteroids) should NOT be initiated in these patients (Mild: All; Moderate: Alla)³

**Remdesivir**
There is insufficient evidence to recommend either for or against the routine use of remdesivir in hospitalized mild/moderate COVID-19 patients.

**Anticoagulation**
Admitted nonpregnant adults should receive prophylactic dose anticoagulation (AII)

**Insufficient Evidence**
At this time there is insufficient data to recommend either for or against the following medications for SARS-CoV-2 (COVID-19):
- Budesonide
- Colchicine
- Fluvoxamine
- Ivermectin
- Nitzoxanide
- Vitamin D

**DO NOT USE**
The following are recommended AGAINST for the treatment of SARS-CoV-2 (COVID-19) at the time of publication of this tool:
- Anti-interleukin-6 receptor monoclonal antibodies (except tocilizumab)(e.g., sarilumab, tocilizumab) or anti-IL-6 monoclonal antibody (siltuximab), except in a clinical trial (BII).
- Azithromycin alone (AII)
- Chloroquine or hydroxychloroquine with or without azithromycin (AII)
- Lopinavir/ritonavir (AII) or other HIV protease inhibitors (AII) except in a clinical trial
- Zinc supplementation above the recommended daily dietary allowance for the prevention of COVID-19, except in a clinical trial (BII)

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³ May 2021
SMART PHRASES

This page represents a list of phrases that clinicians may want to utilize within their EMR documentation. It is broken down based on the steps that are outlined on the prior pages of this tool. EMR and IT vendors may want to utilize these phrases, along with specific data that is selected by clinicians as they utilize electronic versions of this tool.

☐ The ACEP Emergency Department COVID-19 Management Tool was utilized to assist in the decision process on how to best manage this patient. This tool is a pragmatic approach to management of patient’s with suspected or confirmed SARS-CoV-2 in the emergency department. It is based on guidelines from the CDC, NIH, and additional published studies. COVID-19 is a novel pandemic and as such evidence is rapidly evolving on the best way to manage patients with this condition.

**Step 1 - Severity**

☐ Severity Classification was determined based on NIH criteria.

<table>
<thead>
<tr>
<th>Severity Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILD</td>
<td>Based on the criteria present at the time of evaluation, the patient was determined to have MILD Severity.</td>
</tr>
<tr>
<td>MODERATE</td>
<td>Based on the criteria present at the time of evaluation, the patient was determined to have MODERATE Severity.</td>
</tr>
<tr>
<td>SEVERE</td>
<td>Based on the criteria present at the time of evaluation, the patient was determined to have SEVERE Severity.</td>
</tr>
<tr>
<td>CRITICAL</td>
<td>Based on the criteria present at the time of evaluation, the patient was determined to have CRITICAL Severity.</td>
</tr>
</tbody>
</table>

**Step 2 - Risk Prognostication**

☐ The PRIEST Score, a validated tool to determine the risk of mortality and/or end-organ failure, was utilized to assess the patient’s risk of disease progression.

<table>
<thead>
<tr>
<th>PRIEST Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Based on a PRIEST Score of _____ the patient is estimated to have a _____% risk.</td>
</tr>
</tbody>
</table>

**Step 3 - Risk Assessment**

☐ A Risk Assessment was performed that considers additional factors that have been shown in published studies to increase a patient’s risk for disease progression.

<table>
<thead>
<tr>
<th>Risk Assessment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Risk Factors</td>
<td>Patient did not have any additional risk factors based on those included within this tool.</td>
</tr>
<tr>
<td>1 Risk Factor</td>
<td>Patient was noted to have an additional risk factor.</td>
</tr>
<tr>
<td>2 (or more) Risk Factors</td>
<td>Patient was noted to have 2 (or more) additional risk factors.</td>
</tr>
</tbody>
</table>

**Step 4 - Diagnostic Testing**

☐ Appropriate Diagnostic Testing was performed on the patient based on their severity and risk of disease progression.

<table>
<thead>
<tr>
<th>Diagnostic Testing</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILD... no additional testing obtained</td>
<td>No diagnostic testing was obtained, because the patient was noted to have MILD severity, ≤4 on the PRIEST Score, and ≤1 additional risk factors.</td>
</tr>
<tr>
<td>Exertional O2</td>
<td>An O2 saturation was obtained after the patient exerted themselves for &gt;1 minute. Their SpO2 stayed stable.</td>
</tr>
<tr>
<td>Imaging / Labs Obtained</td>
<td>Appropriate imaging and labs were obtained in the emergency department based on clinical assessment of the patient.</td>
</tr>
</tbody>
</table>

**Step 5 - Diagnostic Interpretation**

☐ The Diagnostic Interpretation of imaging and labs that were obtained was as follows:

<table>
<thead>
<tr>
<th>Diagnostic Interpretation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO Concerning Imaging/Labs</td>
<td>There was no concern on imaging or labs.</td>
</tr>
<tr>
<td>Concerning Imaging</td>
<td>There was a concerning finding discovered on imaging that may prognosticate an increase in the patient’s risk of disease progression.</td>
</tr>
<tr>
<td>Concerning Lab</td>
<td>There was a concerning finding discovered on lab testing that may prognosticate an increase in the patient’s risk of disease progression.</td>
</tr>
<tr>
<td>Multiple Concerning Imaging/ Labs</td>
<td>There were multiple imaging and/or lab testing results that may prognosticate an increase in the patient’s risk of disease progression.</td>
</tr>
</tbody>
</table>
### SMART PHRASES (continued)

#### Step 6 - Disposition

<table>
<thead>
<tr>
<th>Severity</th>
<th>Discharge</th>
<th>PRIEST ≤ 4 AND ≤ 1 Risk Factors</th>
<th>PRIEST ≥ 5 OR ≥ 2 Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILD</td>
<td>Discharge Home</td>
<td>Patients with MILD Severity, a low PRIEST Score, and ≤ 1 risk factors are appropriate for Discharge Home.</td>
<td>Patients with MILD Severity who have an elevated PRIEST Score (≥5) and/or multiple risk factors, may still be discharged home. These patients should receive information on their elevated risk for Severe disease and should connected with early follow-up.</td>
</tr>
<tr>
<td>MODERATE</td>
<td>Discharge Home</td>
<td>Patients with MODERATE Severity, a low PRIEST Score, and ≤ 1 risk factors may be Discharged Home based on an emergency physician’s clinical judgement.</td>
<td></td>
</tr>
<tr>
<td>SEVERE</td>
<td>Admission</td>
<td>Patients with MODERATE Severity and an elevated PRIEST Score or the presence of risk factors for disease progression meet criteria for Hospital Admission.</td>
<td>At times of COVID volume surges or reductions in hospital bed capacity, some patients who would normally meet criteria to hospital admission, may need to be Discharged Home.</td>
</tr>
<tr>
<td>CRITICAL</td>
<td>Admission</td>
<td>Patients with SEVERE Severity meet criteria for admission to the hospital.</td>
<td>Transfer should be considered if you are at a facility that does not have the resources or capacity to care for a patient with SEVERE Severity.</td>
</tr>
<tr>
<td>AMA</td>
<td>Transfer</td>
<td>Patients with CRITICAL Severity meet criteria for admission to an ICU setting.</td>
<td>Transfer should be considered if you are at a facility that does not have the ICU resources or capacity to care for a patient with CRITICAL Severity.</td>
</tr>
<tr>
<td></td>
<td>ECMO</td>
<td>Transfer may be considered to an ECMO facility if, based on clinical judgement, it is determined that the patient may benefit from this procedure.</td>
<td>The patient signed out Against Medical Advice, despite the offer of admission to the hospital and treatment due to the severity of their COVID manifestation. The patient is of normal mentation and has the capacity to make this decision, while understanding the consequences to their health.</td>
</tr>
</tbody>
</table>

#### Step 7a - Non-Pharmacologic Treatment

The following Non-Pharmacologic Treatments were ordered on the patient, based on best practice guidelines at the time of publication of this tool.

<table>
<thead>
<tr>
<th>Severity</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILD / MODERATE</td>
<td>Discharged Home</td>
</tr>
<tr>
<td></td>
<td>Home O2</td>
</tr>
<tr>
<td></td>
<td>Home Pulse Oximetry</td>
</tr>
<tr>
<td>SEVERE</td>
<td>O2 via NC</td>
</tr>
<tr>
<td></td>
<td>HFNC</td>
</tr>
<tr>
<td></td>
<td>NIPPV</td>
</tr>
<tr>
<td>CRITICAL</td>
<td>Intubation</td>
</tr>
<tr>
<td></td>
<td>Prone Ventilation</td>
</tr>
<tr>
<td></td>
<td>Conservative Fluids</td>
</tr>
</tbody>
</table>

#### Step 7b - Pharmacologic Treatment

The following Pharmacologic Treatments were administered to the patient, based on NIH recommendations at the time of publication of this tool.

<table>
<thead>
<tr>
<th>Severity</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILD / MODERATE</td>
<td>Monoclonal Antibodies</td>
</tr>
<tr>
<td></td>
<td>Steroids</td>
</tr>
<tr>
<td></td>
<td>Anticoagulation</td>
</tr>
<tr>
<td>SEVERE / CRITICAL</td>
<td>Remdesivir</td>
</tr>
<tr>
<td></td>
<td>Dexamethasone PLUS Remdesivir</td>
</tr>
<tr>
<td></td>
<td>Dexamethasone</td>
</tr>
<tr>
<td></td>
<td>Baricitinib PLUS Remdesivir</td>
</tr>
<tr>
<td></td>
<td>Dexamethasone NOT available</td>
</tr>
<tr>
<td></td>
<td>Tocilizumab</td>
</tr>
</tbody>
</table>
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FOOTNOTES

Step 1 - Severity

- All severity classifications are outlined by the NIH. The NIH COVID-19 Treatment Guidelines Panel is a multi-disciplinary team of experts that meets routinely to discuss the impact of new evidence on best practices in addition to providing a standardized system for classifying clinical severity. 8

Step 2 - Risk Prognostication

- The PREST Score is a validated tool to predict a patient’s risk for end-organ failure and/or mortality. 11
- The PREST Score can be accessed on MD Calc.

Step 3 - Risk Assessment

The CDC maintains a reference for medical conditions associated with high risk for severe COVID-19.
- Race/Ethnicity and access to healthcare: the CDC has more information on how race, ethnicity, and access to healthcare resources may affect outcomes 7
- Economic Disparity: has been shown to be an independent variable of risk 11
- Cancer 4: especially those with recent diagnosis <1 year (OR 1.72) and/or hematologic malignancies (OR 2.8) 11
- Cardiovascular: OR 3.4 mortality, 3.4 higher level of care 2
- Chronic Respiratory Disease: OR 1.6 11 - 3.7 7 mortality
- Diabetes: OR 1.9 mortality 2; 1.8-2.1 higher level of care 2
- Down’s Syndrome: OR 10.4 mortality (independent of other variables) 15
- Hypertension: OR 2.5 mortality, 3 higher level of care 2
- Immunosuppression / Asplenia: OR 1.3 (asplenia) - 3.5 (immunosuppression) mortality 11
- Neurologic disease / Stroke / Dementia: OR 2.2 (stroke / dementia) - 2.6 (other neurologic disease) mortality 2
- Obesity (BMI ≥35). FDA EUAs for AB use ≥35 for BMI cutoff
  - One study showed increased risk for mortality in those with BMI 40-44 (OR 2.7) and ≥45 kg (OR 4.2) 11
- Obstructive Sleep Apnea: OR 2.9 hospitalization, 2.4 severe disease 15
- Pregnancy: has been shown to have increased hospitalization (OR 3.5). 2
  - Severe cases have been shown to have pre-term labor 45.4% compared to 6.9% of mild and recovered cases. 9
  - ACOG has published a guideline to assist with risk stratification of pregnant patients
- Renal Disease (GFR ≤30): OR 2.5 15 - 4.3 mortality 2

Step 4 - Diagnostic Testing

- Exertional Sp02: post-exertional Sp02 may provide modest prognostic information of adverse outcome at 30 days 3, 13, 21
  - Optimal time interval is not established.
  - Some have suggested 1-2 minutes and a sit-stand option in the patient’s room (due to COVID restrictions) 2
  - A 3% drop has been used in several studies 21, 13
  - Another study used a quick walk test of 6 minutes. Decrease in ≥3% or ≥5% (conservative cutoff or postexercise ≥90%) suggest poor outcome (need for mechanical ventilation) with LR+=3.5 and LR=-0.22 1
- Diagnostic Testing: labs and imaging may be of assistance in determining patients risk for disease progression and mortality (Zhou F; Cummings MJ; Wynants L; Galloway JB; Zhao Z)
  - The NIH maintains recommendations for appropriate diagnostic testing.
  - The following represents a practical imaging approach 22 and a consensus guideline. 23

Step 5 - Diagnostic Interruption

Imaging Interpretation

- Pulmonary US (POCUS) is appropriate as a COVID rule-in test (with diagnostic accuracy similar to CT) but should not be used for risk classification. 24
- Models to prognostic risk based on CXR results have been published.

Lab Interpretation

- ALT (≥40 U/L) is associated with increased mortality. 2
- AST (≥40 U/L) is associated with increased mortality. 2
- Creatinine (≥133 µmol/L) is associated with increased mortality. 1
- CRP (≥125 mg/L) is associated with increased mortality 22 and intubation within 48-hours. 11
- D-dimer (≥1 mg/mL) is associated with increased mortality. 1
- Ferritin (≥300 µg/L) is associated with increased mortality and worsening oxygenation within 48-hours. 26, 20
- LDH (≥250 U/L) is associated with increased mortality 22 and worsening oxygenation 29 or intubation within 48-hours. 29
- Lymphopenia (≤0.8 x10^9/L) is associated with increased mortality and higher level of care. 2
- Neutrophils (≥5,000/µL) is associated with increased mortality. 7
- Thrombocytopenia (<150,000/µL) is associated with increased mortality and hospitalization within 48-hours. 26
- Troponin (≥99%) is associated with increased mortality. 2
- WBC (≥10,000/µL) is associated with increased mortality. 2

Step 6 - Disposition

Discharge of select COVID patients with Home Oxygen has been shown to be associated with low rates of mortality and return admission 20

The CDC maintains Patient Educational Materials.

Helpful links from JAMA include:
- What does this mean for families?
  - https://jamanetwork.com/journals/jamapaediatrics/fullarticle/2763176
- Masks
  - https://jamanetwork.com/journals/jama/fullarticle/2768495
- Stopping the spread
  - https://jamanetwork.com/journals/jama/fullarticle/2763533
- What is herd immunity?
  - https://jamanetwork.com/journals/jama/fullarticle/2772168

Step 7a - Non-Pharmacologic Treatment

Home Supplemental O2

Discharge of select COVID patients with Home Oxygen has been shown to be associated with low rates of mortality and return admission 20

Studies in COVID and other viral illnesses 32, have shown the benefit of:
- Rest 10
- Healthy diet 17
- Adequate sleep 10
- Exercise 13

Issues with SpO2 measurements

- If sending patients home with instructions for pulse oximetry, be mindful that SpO2 readings should always be considered an estimate of oxygen saturation. The FDA has just issued precautions on SpO2 devices. 24
- If an FDA-cleared pulse oximeter reads 90%, then the true oxygen saturation in the blood is generally between 86-94%. Pulse oximeter accuracy is highest at saturations of 90-100%, intermediate at 80-90%, and lowest below 80%.
- Additionally, SpO2 measurements have been shown not be as reliable in patients with pigmentation of their skin 28

Treatment of Severe and Critical patients

- Recommendations for respiratory support, IV fluids, and other interventions are maintained by the NIH HERE.

Step 7b - Pharmacologic Treatment

Medications - recommendations are maintained by the NIH and IDSA.

Monoclonal Antibodies

Please read this advisory on the use of Monoclonal Antibodies

NIH

Rating of Recommendations

- A = Strong
- B = Moderate
- C = Optional

Rating of Evidence

- I = One or more randomized trials without major limitations
- IIa = Other randomized trials or subgroup analyses of randomized trials
- IIb = Nonrandomized trials or observational cohort studies
- III = Expert opinion
Emergency Department COVID-19 Management Tool

May 2021

CITATIONS


Co-Leads

Stephen Cantrill, MD, FACEP
Emergency Physician and Consultant
Denver Health

Brian Fengler, MD
Co-Founder and Chief Medical Officer
EvidenceCare

Contributors

Shannon Brown
Veterans Health Administration

Christopher R. Carpenter, MD, MSc, FACEP, AGSF
Professor
Wash University in St. Louis

Brenna Farmer, MD, MBA, MS
Associate Professor of Clinical Emergency Medicine
NYP/Weill Cornell Medical Center

Kent C. Grimes
Medical Student
Texas Tech University Health Sciences Center
El Paso

Tara Khan, DO, MS
Emergency Medicine Physician
Department of Veterans Affairs

Dan Mayer, MD
Retired Professor of Emergency Medicine
Niskayuna, NY

Laura Melville, MD, MS
Associate Research Director
NYP/Brooklyn Methodist Medical Center

David Ng, MD, MS, FACEP
Chief of Emergency Medicine and Occupational Health
Veterans Health Administration

Christopher Sampson, MD, FACEP
Associate Professor of Emergency Medicine
University of Missouri School of Medicine

Sandy Schneider, MD, FACEP
Associate Executive Director
ACEP

Saman Shahid, MBBS
Practice Management Manager
ACEP

Bradley Shy, MD, FACEP
Associate Professor
University of Colorado - School of Medicine

Peter A D Steel, MA, MBBS
Director of Clinical Services
NYP/Weill Cornell Medical Center

Edward H Suh, MD
Assistant Professor of Emergency Medicine
Columbia University Medical Center

Contributors to Previous Versions

Amy Baxter, MD
Clinical Associate Professor
Augusta University

Jonathan A Handler, MD
Adjunct Associate Professor
Northwestern University Feinberg School of Medicine

Phil Parker, MD
SVP of Integration
SCP-Health

Matt Burton, MD
VP Clinical Informatics
Apervita

Sharon Hibay, DNP, RN
Chief Clinical Officer
Arch Systems, LLC

Amos J Shemesh, MD
Assistant Director of Clinical Services
NYP/Weill Cornell Medicine

Christopher Corbit, MD, FACEP
Facility Medical Director
Summerville Medical Center

Andrew S. Kanter, MD, MPH, FACMI, FAMIA
Chief Medical Officer
Intelligent Medical Objects

Todd B Taylor, MD, FACEP
Clinical Informaticist
Independent Consultant

Pawan Goyal, MD, MHA, FAMIA
Associate Executive Director, Quality
ACEP

Tamara Moores Todd, MD
Medical Director of Care Transformation and Information
Services
Intermountain Health