

Emergency Department COVID-19 Management Tool

August 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 (including differences in severity that may occur with evolving variants) is changing quickly and may alter recommendations.

A digitized version of this tool can now be found at [MDCalc](#)

Step 1 - Severity Classification

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

MILD	MODERATE	SEVERE	CRITICAL
<p>Individuals who have various signs and symptoms of COVID-19 (ANY):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Fever <input type="checkbox"/> Cough <input type="checkbox"/> Sore throat <input type="checkbox"/> Malaise <input type="checkbox"/> Headache <input type="checkbox"/> Muscle pain <input type="checkbox"/> Nausea, vomiting, diarrhea <input type="checkbox"/> Loss of taste and smell <p>BUT who do NOT have (ANY):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Shortness of breath <input type="checkbox"/> Dyspnea <input type="checkbox"/> Abnormal chest imaging (if obtained) 	<p>Individuals who show evidence of lower respiratory disease during (ANY):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Clinical assessment <input type="checkbox"/> Imaging <p>AND who have:</p> <ul style="list-style-type: none"> <input type="checkbox"/> SpO2 ≥94% on room air at sea level (in those with normal baseline SpO2 at rest) 	<p>Individuals who have (ANY):</p> <ul style="list-style-type: none"> <input type="checkbox"/> SpO2 <94% on room air at sea level (in those with normal baseline SpO2 at rest) <input type="checkbox"/> Ratio of arterial partial pressure of oxygen to fraction of inspired oxygen (PaO2/FiO2) <300 mm Hg (if ABG obtained) <input type="checkbox"/> RR >30 breaths/min <input type="checkbox"/> Lung infiltrates >50% 	<p>Individuals with (ANY):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Respiratory failure <input type="checkbox"/> Septic shock <input type="checkbox"/> Multiorgan dysfunction or failure
SEVERE and CRITICAL Severity - Skip to Step 4 (Diagnostic Testing) on Page 2			

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 pragmatic approach with variables that don't require diagnostic testing and don't overlap with medical conditions that are within the separate risk assessment section.

Variable	1 Point	2 Points	3 Points	4 Points												
Respiratory rate (per minute)	<input type="checkbox"/> 12-20	<input type="checkbox"/> 9-11	<input type="checkbox"/> 21-24	<input type="checkbox"/> <9 or >24												
Oxygen saturation (%)	<input type="checkbox"/> >95	<input type="checkbox"/> 94-95	<input type="checkbox"/> 92-93	<input type="checkbox"/> <92												
Heart rate (per minute)	<input type="checkbox"/> 51-90	<input type="checkbox"/> 41-50 or 91-110	<input type="checkbox"/> 111-130	<input type="checkbox"/> <41 or >130												
Systolic BP (mmHg)	<input type="checkbox"/> 111-219	<input type="checkbox"/> 101-110	<input type="checkbox"/> 91-100	<input type="checkbox"/> <91 or >219												
Temperature (°C)	<input type="checkbox"/> 36.1-38.0	<input type="checkbox"/> 35.1-36.0 or 38.1-39.0	<input type="checkbox"/> >39.0	<input type="checkbox"/> <35.1												
Alertness	<input type="checkbox"/> Alert			<input type="checkbox"/> Confused												
Inspired oxygen	<input type="checkbox"/> Room Air		<input type="checkbox"/> Supplemental Oxygen													
Sex	<input type="checkbox"/> Female	<input type="checkbox"/> Male														
Age (years)	<input type="checkbox"/> 16-49		<input type="checkbox"/> 50-65	<input type="checkbox"/> 66-80												
Performance status	<input type="checkbox"/> Unrestricted Normal Activity	<input type="checkbox"/> Limited strenuous activity, can do light activity	<input type="checkbox"/> Limited activity, can self-care	<input type="checkbox"/> Limited self-care												
				<input type="checkbox"/> >80												
				<input type="checkbox"/> Bed/chair bound, no self-care												
Total number of boxes checked in each column	x 0 =	x 1 =	x 2 =	x 3 =												
Add Subtotals	<input type="text" value="0"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>												
= Total Score	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>												
Score	0-1	2-3	4	5	6	7	8	9	10	11	12	13	14	15	16	17+
Risk %	1%	2%	3%	9%	15%	18%	22%	26%	29%	34%	38%	47%	48%	50%	55%	66%

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.

MILD	MODERATE	SEVERE	CRITICAL
<p>Based on clinician's judgement, diagnostic testing may not be necessary in patients with (ALL):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Mild Severity <input type="checkbox"/> PRIEST score ≤ 4 <input type="checkbox"/> 1 or less Risk Factors <p>Exertional SpO2 may have limited ability to identify adverse outcomes in otherwise well-appearing patients:</p> <ul style="list-style-type: none"> <input type="checkbox"/> $<3\%$ change in SpO2 	<p>Per the NIH...</p> <p>Imaging: the optimal imaging technique has not yet been defined for people with symptomatic COVID-19. Initial evaluation for these patients may include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Chest X-ray <input type="checkbox"/> Pulmonary Ultrasound <input type="checkbox"/> CT Chest (if indicated) <p>ECG: should be performed if indicated</p> <ul style="list-style-type: none"> <input type="checkbox"/> ECG <p>Labs:</p> <ul style="list-style-type: none"> <input type="checkbox"/> CBC w/ differential <input type="checkbox"/> CMP <p>While not standard of care, the following may have prognostic value:</p> <ul style="list-style-type: none"> <input type="checkbox"/> CRP <input type="checkbox"/> D-dimer <input type="checkbox"/> 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.

<p>Unfortunately, cutoffs used for abnormal lab values are heterogenous across studies and may need to be adjusted based on reference ranges at your facility.</p> <p>Lab Cutoffs:</p> <ul style="list-style-type: none"> <input type="checkbox"/> ALT (>40 U/L) <input type="checkbox"/> AST (>40 U/L) <input type="checkbox"/> Creatinine (>1.5 mg/dL) <input type="checkbox"/> CRP (>125 mg/L) <input type="checkbox"/> D-dimer (≥ 1 $\mu\text{g}/\text{mL}$) <input type="checkbox"/> Ferritin (>300 $\mu\text{g}/\text{L}$) <input type="checkbox"/> LDH (>250 U/L) <input type="checkbox"/> Lymphopenia ($<0.8 \times 10^9/\text{L}$) <input type="checkbox"/> Neutrophils ($>8,000/\text{mm}^3$) <input type="checkbox"/> Thrombocytopenia ($<150,000/\text{mm}^3$) <input type="checkbox"/> Troponin ($>99\%$) <input type="checkbox"/> WBC ($>10,000/\text{mm}^3$) 		
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Step 6 - Disposition

The following represents a pragmatic approach for disposition of patients depending on their disease severity. Clinician's may want to consider a patient's risk for progression of disease based on PRIEST Score, risk factors, imaging, and labs in their disposition decision.

MILD	MODERATE	SEVERE	CRITICAL
<ul style="list-style-type: none"> <input type="checkbox"/> Discharge Home <ul style="list-style-type: none"> <input type="checkbox"/> Supply patient with educational materials on precautions and items to be monitoring at home (CDC Patient Educational Materials) Consider <ul style="list-style-type: none"> <input type="checkbox"/> Home pulse oximetry In patients with PRIEST Score ≥ 5 and/or multiple Risk Factors <ul style="list-style-type: none"> <input type="checkbox"/> Clinicians should consider early follow-up with primary care physician or other health system access points. <input type="checkbox"/> Patient should be educated on their increased risk for severe disease and precautions to return to the ED. 	<ul style="list-style-type: none"> <input type="checkbox"/> Discharge Home, consider if ALL: <ul style="list-style-type: none"> <input type="checkbox"/> PRIEST Score ≤ 4 <input type="checkbox"/> 1 (or less) Risk Factors <input type="checkbox"/> No concerning Imaging or Lab results <input type="checkbox"/> Capability and resources to care for self at home <input type="checkbox"/> No other condition that warrants admission <input type="checkbox"/> Admission, consider if ANY: <ul style="list-style-type: none"> <input type="checkbox"/> PRIEST Score ≥ 5 <input type="checkbox"/> Multiple Risk Factors <input type="checkbox"/> Concerning Imaging or Lab results <input type="checkbox"/> Does NOT have the capability or resources to care for self at home Admission Location: Based on clinician's judgement <ul style="list-style-type: none"> <input type="checkbox"/> Observation <input type="checkbox"/> Inpatient Floor <input type="checkbox"/> Intermediate <input type="checkbox"/> At times of surge and capacity constraints some patient who would normally be admitted to the hospital, may need to be sent home:³²⁻³⁴ <ul style="list-style-type: none"> <input type="checkbox"/> Supply patient with educational materials on precautions and items to be monitoring at home (CDC Patient Educational Materials) <input type="checkbox"/> Follow-up visit arranged via PCP or tele-health <input type="checkbox"/> Consider home pulse oximetry <input type="checkbox"/> Consider home oxygen therapy 	<p>Admission Location: based on clinician's judgement</p> <ul style="list-style-type: none"> <input type="checkbox"/> Floor Bed <input type="checkbox"/> Intermediate <input type="checkbox"/> ICU <p>Transfer</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consider transfer if your facility does not have the resources or capacity to care for a critically ill COVID patient. 	<p>Admission</p> <ul style="list-style-type: none"> <input type="checkbox"/> ICU <p>Transfer</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consider transfer if your facility does not have the resources or capacity to care for a critically ill COVID patient. <input type="checkbox"/> Consider transfer to an ECMO facility for patients who may benefit from this after consultation with receiving facility.
<p>AMA</p> <ul style="list-style-type: none"> <input type="checkbox"/> 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 your patient's severity and risk of disease progression.

MILD	MODERATE	SEVERE	CRITICAL
<ul style="list-style-type: none"> <input type="checkbox"/> Consider home oxygen therapy (for those who may benefit) <input type="checkbox"/> Breathing exercises for breathlessness <input type="checkbox"/> Progressive ambulation as tolerated (if no contraindication) <input type="checkbox"/> Resting in the prone position if dyspneic <input type="checkbox"/> Adequate rest/sleep <input type="checkbox"/> Balanced diet <input type="checkbox"/> Adequate hydration 		<ul style="list-style-type: none"> <input type="checkbox"/> Oxygen support-nasal cannula, titrate up to 6L with an oxygenation goal of >92% <input type="checkbox"/> 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 <input type="checkbox"/> Non-Invasive Positive Pressure Ventilation (NIPPV) if HFNC not available <input type="checkbox"/> Consider trial of awake prone positioning if patient can be monitored or can self rescue. Awake proning is contraindicated in patients in respiratory distress. 	<ul style="list-style-type: none"> <input type="checkbox"/> Intubation is recommended for severe respiratory failure: <ul style="list-style-type: none"> <input type="checkbox"/> Oxygenation goal for ventilated patients should be 92-96%. <input type="checkbox"/> Consider low tidal volume (VT) ventilation (VT 4–8 mL/kg of predicted body weight) over higher VT ventilation (VT >8 mL/kg) (AI). <input type="checkbox"/> Target plateau pressures of <30 cm H2O (AII). <input type="checkbox"/> A higher positive end-expiratory pressure (PEEP) strategy is recommended over a lower PEEP strategy (BII). <input type="checkbox"/> For mechanically ventilated adults with refractory hypoxemia despite optimized ventilation, consider prone ventilation for 12 to 16 hours per day over no prone ventilation. <input type="checkbox"/> Consider using a conservative fluid strategy over a liberal fluid strategy (BII). <input type="checkbox"/> Insufficient Data to recommend for or against ECMO in these patients. <input type="checkbox"/> Against the routine use of inhaled nitric oxide (AI).

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	MODERATE	SEVERE	CRITICAL
<ul style="list-style-type: none"> <input type="checkbox"/> 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): casirivimab 600 mg plus imdevimab 600 mg IV (AIIa), or sotrovimab 500mg IV . - Bamlanivimab plus etesevimab no longer recommended due to the current circulation of COVID-19 variants of concern that have reduced susceptibility to this monoclonal Ab combination (AIII). - For casirivimab plus imdevimab, when IV infusion is not feasible or would lead to delay in treatment, subcutaneous (SQ) injection of casirivimab 600 mg plus imdevimab 600 mg can be used as an alternative route of administration (BIII) (2.5 ml X 4 injections at different sites). - 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. 		<p>Steroids and/or Remdesivir One of the following options is recommended for these patients:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Remdesivir* alone (e.g., for patients who require minimal supplemental oxygen) (BIIa). <input type="checkbox"/> Dexamethasone PLUS remdesivir* (e.g., for patients who require increasing amounts of oxygen) (BIII). <input type="checkbox"/> Dexamethasone alone (e.g., when combination therapy with remdesivir cannot be used or is not available) (BI). <p>*Remdesivir should be used only in patients requiring supplemental O2 but not O2 through a high-flow device, noninvasive ventilation, invasive mechanical ventilation, or ECMO.</p> <p>In the rare circumstances where corticosteroids cannot be used:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Baricitinib in combination with remdesivir (BIIa) (e.g., for patients who require increasing amounts of oxygen). Baricitinib should not be used without remdesivir. <p>If dexamethasone is NOT available:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Alternative corticosteroids such as prednisone, methylprednisolone, or hydrocortisone can be used (BIII) <p>Tocilizumab/baricitinib</p> <ul style="list-style-type: none"> <input type="checkbox"/> Tocilizumab OR baricitinib, either in combination with dexamethasone is recommended in select hospitalized patients who are exhibiting rapid respiratory decompensation due to COVID-19 (BIIa). Full details and dosage is available here: Tocilizumab / baricitinib 	
	<ul style="list-style-type: none"> <input type="checkbox"/> Anticoagulation Admitted nonpregnant adults should receive prophylactic dose anticoagulation (AIII) 		
<p>Insufficient Evidence At this time there is insufficient data to recommend either for or against the following medications for SARS-CoV-2 (COVID-19):</p> <ul style="list-style-type: none"> <li style="width: 25%;">- Budesonide <li style="width: 25%;">- Famotidine <li style="width: 25%;">- Herbal medications <li style="width: 25%;">- Nitazoxanide <li style="width: 25%;">- Vitamin D <li style="width: 25%;">- Colchicine (OutPt) <li style="width: 25%;">- Fluvoxamine <li style="width: 25%;">- Ivermectin <li style="width: 25%;">- Vitamin C 			
<p>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:</p> <ul style="list-style-type: none"> - Anti-interleukin-6 receptor monoclonal antibodies (except tocilizumab) or anti-IL-6 monoclonal antibody (siltuximab), except in a clinical trial (BI). - Azithromycin alone (AI) - Chloroquine or hydroxychloroquine with or without azithromycin (AI) - Colchicine (InPt) (AI) - Lopinavir/ritonavir (AI) or other HIV protease inhibitors (AIII) except in a clinical trial - Nitazoxanide (BIIa) - Zinc supplementation above the recommended daily dietary allowance for the prevention of COVID-19, except in a clinical trial (BIII) 			

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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.

MILD	<input type="checkbox"/> Based on the criteria present at the time of evaluation, the patient was determined to have MILD Severity.
MODERATE	<input type="checkbox"/> Based on the criteria present at the time of evaluation, the patient was determined to have MODERATE Severity.
SEVERE	<input type="checkbox"/> Based on the criteria present at the time of evaluation, the patient was determined to have SEVERE Severity.
CRITICAL	<input type="checkbox"/> Based on the criteria present at the time of evaluation, the patient was determined to have CRITICAL Severity.

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.

PRIEST Score	<input type="checkbox"/> Based on a PRIEST Score of _____ the patient is estimated to have a _____% risk.
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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.

0 Risk Factors	<input type="checkbox"/> Patient did not have any additional risk factors based on those included within this tool.
1 Risk Factor	<input type="checkbox"/> Patient was noted to have an additional risk factor.
2 (or more) Risk Factors	<input type="checkbox"/> Patient was noted to have 2 (or more) additional risk factors.

Step 4 - Diagnostic Testing

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

MILD... no additional testing obtained	<input type="checkbox"/> No diagnostic testing was obtained, because the patient was noted to have MILD severity, ≤ 4 on the PRIEST Score, and ≤ 1 additional risk factors.	
Exertional O2	Negative	<input type="checkbox"/> An O2 saturation was obtained after the patient exerted themselves for >1 minute. Their SpO2 stayed stable.
	Positive	<input type="checkbox"/> An O2 saturation was obtained after the patient exerted themselves for >1 minute. Their SpO2 dropped >3%.
Imaging / Labs Obtained	<input type="checkbox"/> Appropriate imaging and labs were obtained in the emergency department based on clinical assessment of the patient.	

Step 5 - Diagnostic Interpretation

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

NO Concerning Imaging/Labs	<input type="checkbox"/> There was no concern on imaging or labs.
Concerning Imaging	<input type="checkbox"/> There was a concerning finding discovered on imaging that may prognosticate an increase in the patient's risk of disease progression.
Concerning Lab	<input type="checkbox"/> There was a concerning finding discovered on lab testing that may prognosticate an increase in the patient's risk of disease progression.
Multiple Concerning Imaging/Labs	<input type="checkbox"/> There were multiple imaging and/or lab testing results that may prognosticate an increase in the patient's risk of disease progression.

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SMART PHRASES (continued)

Step 6 - Disposition

The most appropriate **Disposition** for the patient was determined based on the patient's severity classification and risk for disease progression.

MILD	Discharge Home	PRIEST ≤ 4 AND ≤ 1 Risk Factors	<input type="checkbox"/> Patients with MILD Severity, a low PRIEST Score, and ≤ 1 risk factors are appropriate for Discharge Home.
		PRIEST ≥ 5 OR ≥ 2 Risk Factors	<input type="checkbox"/> 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 be connected with early follow-up.
MODERATE	Discharge Home		<input type="checkbox"/> Patients with MODERATE Severity, a low PRIEST Score, and ≤ 1 risk factors may be Discharged Home based on an emergency physician's clinical judgement.
	Admission		<input type="checkbox"/> Patients with MODERATE Severity and an elevated PRIEST Score or the presence of risk factors for disease progression meet criteria for Hospital Admission.
	Reduced Capacity		<input type="checkbox"/> 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.
SEVERE	Admission		<input type="checkbox"/> Patients with SEVERE Severity meet criteria for admission the hospital.
	Transfer		<input type="checkbox"/> 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.
CRITICAL	Admission		<input type="checkbox"/> Patients with CRITICAL Severity meet criteria for admission to an ICU setting.
	Transfer		<input type="checkbox"/> 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.
	ECMO		<input type="checkbox"/> Transfer may be considered to an ECMO facility if, based on clinical judgement, it is determined that the patient may benefit from this procedure.
AMA			<input type="checkbox"/> 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.

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.

MILD / MODERATE	Discharged Home	<input type="checkbox"/> The patient was supplied with discharge instructions that includes activities (breathing exercises, balanced diet, etc.) they should consider at home.
	Home O2	<input type="checkbox"/> The patient was given a prescription for supplemental O2 at home.
	Home Pulse Oximetry	<input type="checkbox"/> The patient was given instructions for how to use a pulse oximeter at home to measure periodically their oxygen levels. They were given clear instructions on what measurements would warrant a return to the emergency department.
SEVERE	O2 via NC	<input type="checkbox"/> Supplemental oxygen was administered to the patient via nasal cannula. The patient was monitored for response to therapy.
	HFNC	<input type="checkbox"/> Additional oxygen was delivered via High-Flow Nasal Cannula (HFNC) per institutional protocol.
	NIPPV	<input type="checkbox"/> Additional oxygen was delivered via Non-Invasive Positive Pressure Ventilation (NIPPV) per institutional protocol.
	Awake Prone	<input type="checkbox"/> The patient was trialed on awake prone per institutional protocol.
CRITICAL	Intubation	<input type="checkbox"/> Due to the patient's CRITICAL Severity and compromised respiratory status, they were intubated.
	Prone Ventilation	<input type="checkbox"/> Prone ventilation was utilized per institutional protocol.
	Conservative Fluids	<input type="checkbox"/> Per NIH recommendations, a conservative fluid strategy was utilized.

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.

MILD / MODERATE	Monoclonal Antibodies	<input type="checkbox"/> Monoclonal antibodies may be considered for patients with MILD or MODERATE Severity who have risk factors for disease progression based on the current EUA criteria.
	Steroids	<input type="checkbox"/> Steroids are not recommended for patients with MILD or MODERATE Severity.
PATIENTS WHO ARE ADMITTED	Anticoagulation	<input type="checkbox"/> Prophylactic dose anticoagulation is recommended for all nonpregnant adults who are admitted to the hospital.
SEVERE / CRITICAL	Remdesivir	<input type="checkbox"/> Remdesivir may be given alone to admitted patients who require minimal supplemental oxygen.
	Dexamethasone PLUS Remdesivir	<input type="checkbox"/> Dexamethasone PLUS remdesivir should be considered for patients who require increasing amounts of oxygen.
	Dexamethasone	<input type="checkbox"/> Dexamethasone may be given alone when combination therapy with remdesivir cannot be used or is not available.
	Baricitinib PLUS Remdesivir	<input type="checkbox"/> In the rare circumstances where corticosteroids cannot be used, Baricitinib can be given in combination with remdesivir for patients who require increasing amounts of oxygen.
	Dexamethasone NOT available	<input type="checkbox"/> Alternative corticosteroids (such as prednisone, methylprednisolone, or hydrocortisone) can be used if dexamethasone is not available.
	Tocilizumab	<input type="checkbox"/> Tocilizumab in combination with dexamethasone is recommended selected hospitalized patients who are exhibiting rapid respiratory decompensation due to COVID-19.

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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.⁶

Step 2 - Risk Prognostication

- The [PRIEST Score](#): is a validated tool to predict a patient's risk for end organ failure and/or mortality.^{14,35}
- The PRIEST Score can be accessed on [MDCalc](#).

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 health care resources may affect outcomes⁷
- Economic Disparity:** has been shown to be an independent variable of risk¹¹
- Cancer⁸:** 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 care²
- Chronic Respiratory Disease:** OR 1.6¹¹ - 3.7² mortality
- Diabetes:** OR 1.9 mortality², 1.8-2.1 higher level of care²⁻³
- Down's Syndrome:** OR 10.4 mortality (independent of other variables)¹⁵
- Hypertension:** OR 2.5 mortality², 3 higher level of care²
- Immunosuppression / Asplenia:** OR 1.3 (asplenia) - 3.5 (immunosuppression) mortality¹¹
- Neurologic disease / Stroke / Dementia:** OR 2.2 (stroke / dementia) - 2.6 (other neurologic disease) mortality²
- 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)¹²
- Obstructive Sleep Apnea:** OR 2.9 hospitalization, 2.4 severe disease¹⁰
- 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 2.5¹¹ - 4.3 mortality²

Step 4 - Diagnostic Testing

- Exertional SpO2:** post-exertional SpO2 may provide modest prognostic information of adverse outcome at 30 days^{5, 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)⁵
 - 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-=0.22²¹
- 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 approach²² 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 CXR⁴ 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.²
- CRP (>125 mg/L)** is associated with increased mortality²⁷ and intubation within 48-hours.³¹
- D-dimer (≥1 μg/mL)** is associated with increased mortality.²
- Ferritin (>300 μg/L)** is associated with increased mortality and worsening oxygenation within 48-hours.^{27, 28}
- LDH (>250 U/L)** is associated with increased mortality²⁷ and worsening oxygenation²⁹ or intubation within 48-hours.³⁰
- Lymphopenia (<0.8 x10⁹/L)** is associated with increased mortality and higher level of care.²
- Neutrophils (>8,000/mm³)** is associated with increased mortality.²
- Thrombocytopenia (<150,000/mm³)** is associated within increased mortality and higher level of care.²
- Troponin (>99%)** is associated with increased mortality.²
- WBC (>10,000/ mm³)** 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.^{32,33,34}

The CDC maintains [Patient Educational Materials](#).

Helpful links from JAMA include:

- What does this mean for families?
 - <https://jamanetwork.com/journals/jamapediatrics/fullarticle/2763176>
- Masks
 - <https://jamanetwork.com/journals/jama/fullarticle/2764955>
- 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 admission³²

Studies in COVID and other viral illnesses²⁰, have shown the benefit of:

- Rest¹⁶
- Healthy diet¹⁷
- Adequate sleep¹⁸
- Exercise¹⁹

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.²⁶
- 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 to be as reliable in patients with pigmentation of their skin²⁵

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

- FDA Fact sheet for healthcare providers: emergency use authorization (EUA) of casirivimab and imdevimab. 2020. Available at: <https://www.fda.gov/media/143892/download>. Accessed February 16, 2021.
- FDA Fact sheet for healthcare providers: emergency use authorization (EUA) of sotrovimab. 2021. Available at: <https://www.fda.gov/media/149534/download>. Accessed July 11, 2021

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

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