

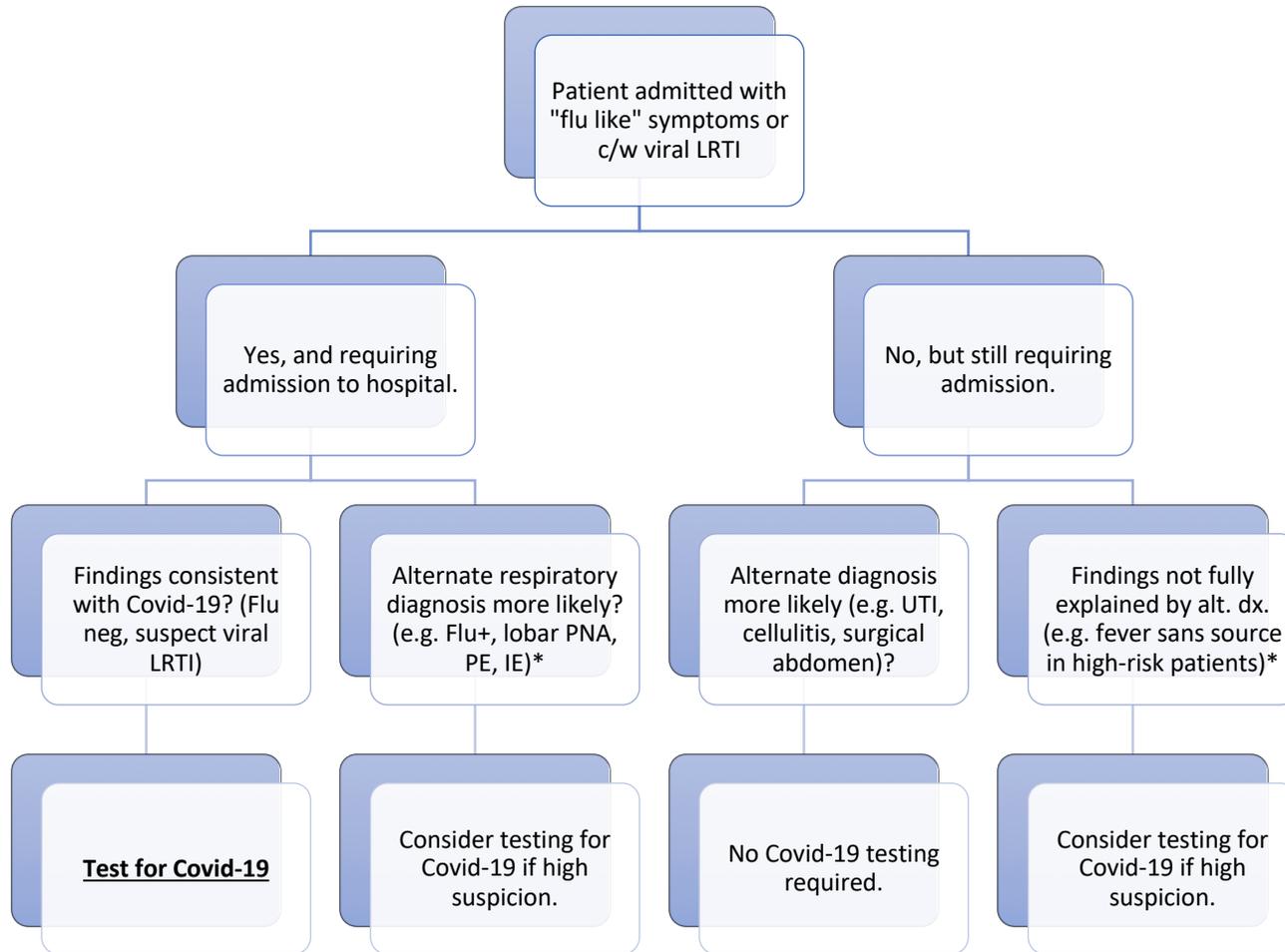
Legacy Covid-19 Management Guidelines v1.0

Updated: 3/26/2020



- Overview:** Table 1a Clinical features suggestive of Covid-19
- Table 1b Risk stratification and disposition (outpatient, inpatient, ICU)
- Table 1c Risk factors for severe Covid-19 disease (prognostics)
- Table 2 Diagnostic recommendations for ALL hospitalized patients with confirmed or suspected Covid-19
- Table 3 Clinical syndromes and complications of severe disease
- Table 4 General treatment recommendations for all hospitalized patients with confirmed or suspected Covid-19
- Table 5 Targeted pharmacotherapy for Covid-19 (ID consult required)

Figure 1: Algorithm for patients who require admission to the hospital¹



*For example, admitted patients with resp. symptoms and no clear explanation with risk factors (chronic disease, adv. age, immunosuppressed, SNF, etc. See Table 1a, 1b, 1c)

¹ For complete testing algorithm as recommended by Legacy EOC please see: https://mylegacy.lhs.org/inside/Documents/COVID%20flowchart_03-05-2020.pdf

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Table 1a: Clinical features suggestive of Covid-19 (consider testing, unless alternate microbiologic diagnosis more likely e.g. UTI, cellulitis, surgical abdomen, etc) ²		
<p>Epidemiology</p> <ul style="list-style-type: none"> Sick contacts (but not required) Median age 47 <p>Symptoms / vitals</p> <ul style="list-style-type: none"> Cough (48 - 68%) Fever on admission (44 - 52%) Dyspnea (18%) GI symptoms (10%) 	<p>Common lab findings*:</p> <ul style="list-style-type: none"> Lymphopenia <0.8 (44%) LDH >250 (41%) D-dimer >500 (46 - 68%) CRP >10 (61%) <p><i>*Not all of the above are recommended as part of initial workup (see Table 2), but included here for reference.</i></p>	<p>CXR imaging features:</p> <ul style="list-style-type: none"> Ground glass opacity (20%) Bilateral patchy infiltrates (37%) Any abnormality (59%) <p>CT imaging features (not required as part of initial workup)</p> <ul style="list-style-type: none"> Ground glass opacity (56%) Bilateral patchy infiltrates (52%) Any abnormality (86%) <p>POCUS performed by experienced operator</p> <ul style="list-style-type: none"> B-line pattern, subpleural consolidations, irregular pleural line³

Table 1b: Risk stratification & disposition		
<p>Low-risk = consider discharge home from ED</p> <ul style="list-style-type: none"> Lack of dyspnea & RR ≤ 20 Lack of hypoxia (O2 sat >94%) Lack of sepsis criteria Age < 55 	<p>Moderate Risk = consider admit to hospital</p> <ul style="list-style-type: none"> Dyspnea Hypoxia (O2 sat <92%) Suspected sepsis Risk factors for severe disease (Table 1c) 	<p>High-Risk = strongly consider ICU & early intubation due to risk for rapid decompensation</p> <ul style="list-style-type: none"> SpO2 ≤ 92% on NC/Mod-Flow ≥ 10 L/min RR ≥ 30 on NC/Mod-Flow ≥ 10 L/min Any patient on high flow (HFNC) or NIPPV

Table 1c: Risk factors for severe disease (negative prognostic factors for developing severe Covid-19 disease)		
<p>Epidemiologic factors in patients with <u>severe</u> Covid-19</p> <ul style="list-style-type: none"> Age > 55 Pre-existing pulmonary disease History of CKD, CAD, or HTN Immunocompromised (biologic agents, HIV, history of transplant, etc) 	<p>Vital sign abnormalities in <u>severe</u> Covid-19</p> <ul style="list-style-type: none"> RR > 24 HR > 125 SpO2 < 90% on ambient air 	<p>Lab abnormalities in <u>severe</u> Covid-19</p> <ul style="list-style-type: none"> D-dimer > 1000 ng/mL⁴ CK > 2x upper limit of normal CRP > 100 LDH > 245 U/L Elevated troponin Lymphopenia⁵ Neutrophil/Lymphocyte ratio⁶ ≥ 3.13

² Guan, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *NEJM*. Feb 2020. doi: [10.1056/NEJMoa2002032](https://doi.org/10.1056/NEJMoa2002032)

³ Peng, Q., Wang, X. & Zhang, L. Findings of lung ultrasonography of novel corona virus pneumonia during the 2019–2020 epidemic. *Intensive Care Med* (2020). doi: [10.1007/s00134-020-05996-6](https://doi.org/10.1007/s00134-020-05996-6)

⁴ Zhou F, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*. March 2020. doi: [10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)

⁵ Yang X, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *The Lancet Respiratory Medicine*. Feb 2020. doi: [10.1016/S2213-2600\(20\)30079-5](https://doi.org/10.1016/S2213-2600(20)30079-5)

⁶ Liu J, Liu Y, Xiang P, et al. *Neutrophil-to-Lymphocyte Ratio Predicts Severe Illness Patients with 2019 Novel Coronavirus in the Early Stage*. *Infectious Diseases (except HIV/AIDS)*; 2020. doi: [10.1101/2020.02.10.20021584](https://doi.org/10.1101/2020.02.10.20021584)

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<p>Initial labs on ED triage:</p> <ul style="list-style-type: none"> <input type="checkbox"/> CBC with diff <input type="checkbox"/> CMP <input type="checkbox"/> Flu/RSV PCR (note co-infection with Covid-19 is still possible) 	<p>Ongoing hospital labs (follow up as clinically appropriate)</p> <ul style="list-style-type: none"> <input type="checkbox"/> CBC with diff (trend lymphocyte count) <input type="checkbox"/> CMP
<p>Initial labs on admission:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Covid-19 NP swab (See MyLegacy COVID page for order protocols)⁷ <ul style="list-style-type: none"> ○ Note: NP swab PCR only ~70% sensitive by some estimates <input type="checkbox"/> Add on “Adult Respiratory Virus Panel PCR” <ul style="list-style-type: none"> ○ Order this as an “add on” to rapid flu to preserve swabs/media <input type="checkbox"/> CBC with diff & CMP (if not already done) <input type="checkbox"/> LDH⁸ <p>If suspected superimposed bacterial pneumonia on admission consider:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Blood & sputum cultures <input type="checkbox"/> Urine strep/legionella 	<p>Labs for in-hospital decompensation:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Blood & sputum cultures <input type="checkbox"/> CXR <input type="checkbox"/> EKG, Troponin & CK⁹ <input type="checkbox"/> LDH, D-dimer <input type="checkbox"/> LFTs
<p>Initial imaging on ED triage:</p> <ul style="list-style-type: none"> <input type="checkbox"/> CXR portable (usually CT does not significantly change management) • *Point of care ultrasound may be beneficial in select patients 	<p>Imaging for in-hospital decompensation:</p> <ul style="list-style-type: none"> <input type="checkbox"/> CXR portable (usually CT does not significantly change management) • *Point of care ultrasound may be beneficial in select patients
<p>Avoid:</p> <ul style="list-style-type: none"> • Avoid screening CT chest if possible 	<p>Avoid:</p> <ul style="list-style-type: none"> • Avoid diagnostic bronchoscopy if possible

Mild to moderate disease	Hypoxia	<ul style="list-style-type: none"> • O2 sat <92-94%
	Arrythmia	<ul style="list-style-type: none"> • Arrythmias reported in hospitalized patients with variable frequency
	Mild transaminase elevation	<ul style="list-style-type: none"> • Elevated AST/ALT common
Severe disease	ARDS/pneumonitis	<ul style="list-style-type: none"> • P:F ratio <300 • Bilateral opacities on CXR or CT • And not caused by heart failure or hypervolemia
	Cardiomyopathy/myocarditis	<ul style="list-style-type: none"> • Elevated troponin & CK • New cardiomyopathy on echocardiogram • Cardiogenic shock
	Cytokine storm syndromes, e.g. HLH (hemophagocytic lymphohistiocytosis) ¹⁰	<ul style="list-style-type: none"> • Elevated ferritin • Cytopenias (1, 2, or all 3 cell lines down) • Organomegaly
	DIC	<ul style="list-style-type: none"> • Abnormal “DIC Panel”¹¹ with JSTH score ≥ 5 <ul style="list-style-type: none"> ○ Thrombocytopenia, elevated D-dimer, low fibrinogen, prolonged PT

⁷ Legacy COVID-19 main page, under “TESTING”: <https://mylegacy.lhs.org/inside/Pages/COVID-19.aspx>

⁸ Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*. March 2020:S0140673620305663. doi:[10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)

⁹ Ruan Q, et al. Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. *Intensive Care Med*. March 2020. doi:[10.1007/s00134-020-05991-x](https://doi.org/10.1007/s00134-020-05991-x)

¹⁰ Mehta P, McAuley DF, Brown M, Sanchez E, Tattersall RS, Manson JJ. COVID-19: consider cytokine storm syndromes and immunosuppression. *The Lancet*. March 2020:S0140673620306280. doi:[10.1016/S0140-6736\(20\)30628-0](https://doi.org/10.1016/S0140-6736(20)30628-0)

¹¹ Tang N et al. Abnormal coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia. *J Thromb Haemost*. 2020 Feb 19. doi:[10.1111/jth.14768](https://doi.org/10.1111/jth.14768)

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For all inpatients, including mild to moderate severity disease:	<ul style="list-style-type: none"> <input type="checkbox"/> Droplet/Contact isolation (including surgical/procedure mask, gown, gloves, eye protection) <input type="checkbox"/> Start supplemental oxygen via nasal cannula for O2 sat <92% and maintain no higher than 96% ¹² <input type="checkbox"/> Close monitoring, trend labs (see Table 1) <input type="checkbox"/> Prefer MDI over nebulizers if indicated for reactive airway disease (if nebs required, needs airborne isolation for 2 hours afterward) <input type="checkbox"/> Low threshold for ID consultation if any questions regarding workup/management or guidance on Covid-19 testing
For severe disease	<p>Escalating respiratory support for refractory hypoxia: refer to Legacy Respiratory Protocol for PUI or confirmed Covid-19 for details ¹³</p> <ul style="list-style-type: none"> • Nasal cannula (not considered aerosol generating) • Moderate flow 1-10 L/min (not considered aerosol generating) • High flow (HFNC) ← potentially aerosol generating, requires *airborne* isolation • Noninvasive positive pressure (“NIPPV” = CPAP / BiPAP) ← aerosol generating, requires viral filter, *airborne* isolation • Advanced airway (invasive mechanical ventilation) ← requires viral filter, *airborne* isolation & transfer to ICU <p>Antibiotics for suspected post-viral bacterial pneumonia:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consider empiric antibiotics in patients sick enough to require mechanical ventilation
Avoid these therapies:	<ul style="list-style-type: none"> • Avoid excessive fluids due to risk of worsening respiratory failure (e.g. do not give 30 cc/kg IVF unless considering septic shock) • Avoid non-essential labs and nursing orders (e.g. nightly VS, CBGs in mild DM, batch meds as infrequently as possible) • Avoid aerosolizing procedures if possible unless in negative pressure and airborne precautions (intubation, bronchoscopy, NIPPV, nebs) • Avoid systemic or inhaled steroids unless otherwise indicated for asthma or COPD exacerbation • Consider discontinue home CPAP/BiPAP for mild/moderate OSA • No good data exists for or against avoiding NSAIDs completely, but usual contraindications apply (avoid in AKI, CAD, etc) ¹⁴ • Continue home ACEi/ARB but with low threshold to hold if any contraindications (AKI, hypotension, etc) ¹⁵

Non-ICU	No hypoxia or risk factors for severe complications	<ul style="list-style-type: none"> • Supportive care alone
	If hypoxic, or risk factors for severe complications	<ul style="list-style-type: none"> • If Covid-19 PCR pending: supportive care alone, initially • If Covid-19 PCR positive: consider hydroxychloroquine with ID consultation <ul style="list-style-type: none"> ○ Check QTc first via EKG or telemetry before starting hydroxychloroquine
ICU	For critically ill patients	<ul style="list-style-type: none"> • If Covid-19 PCR pending: consider ID consult to discuss initiation of treatment • If Covid-19 PCR positive: consult ID for consideration of remdesivir vs hydroxychloroquine <ul style="list-style-type: none"> ○ Consider sending HIV screen w/reflex differentiation
<p>* <i>Other therapies which are either not available or not being considered by ID include:</i></p> <ul style="list-style-type: none"> ○ <i>Tocilizumab, Lopinavir/Ritonavir, Ribavirin, IVIG, etc (see ID guideline document)</i> 		

¹² Surviving Sepsis Covid-19 Guidelines <https://www.sccm.org/getattachment/Disaster/SSC-COVID19-Critical-Care-Guidelines.pdf?lang=en-US>

¹³ Legacy Respiratory Protocol for PUI or confirmed COVID <https://mylegacy.lhs.org/inside/Documents/Respiratory%20protocols%20for%20PUI%20or%20confirmed%20COVID.pdf>

¹⁴ FDA Advisory on NSAIDs use for Covid-19 <https://www.fda.gov/drugs/drug-safety-and-availability/fda-advises-patients-use-non-steroidal-anti-inflammatory-drugs-nsaids-covid-19>

¹⁵ ACC/AHA Statement Re: Using RAAS Antagonists in COVID-19 <https://www.acc.org/latest-in-cardiology/articles/2020/03/17/08/59/hfsa-acc-aha-statement-addresses-concerns-re-using-raas-antagonists-in-covid-19>

¹⁶ See Legacy’s main Covid-19 EOC page (<https://mylegacy.lhs.org/inside/Pages/COVID-19.aspx>) under “TREATMENT AND MEDICATIONS” section, link to “LH ID Treatment Guidelines for SARS-CoV-2”