UC San Diego Health

Inpatient Management Guidelines for Patients with Confirmed COVID-19

Table 1: Initial Workup at Admission

- Admission Workup: CBC/diff, CMP, LDH*, CPK*, Procalcitonin*
  (D-dimer, IL-6, Ferritin, CRP)**
  2x Blood cultures. RPNA. Sputum cultures if producing.
  If LFTS elevated: HCV/HBV, HIV serologies
  PT/PTT, Fibrinogen
  Troponin/CK-MB if clinically indicated.
  Pregnancy test if reproductive age female.
- Imaging/Studies: ECG.
  Portable Chest X-ray. CT Chest is not recommended.
- Determine Severity of illness to determine Level of Care, Monitoring, and Management **(Table 2)**

*Unclear evidence to support, **For potential COVID-19 Specific Therapeutic Trials

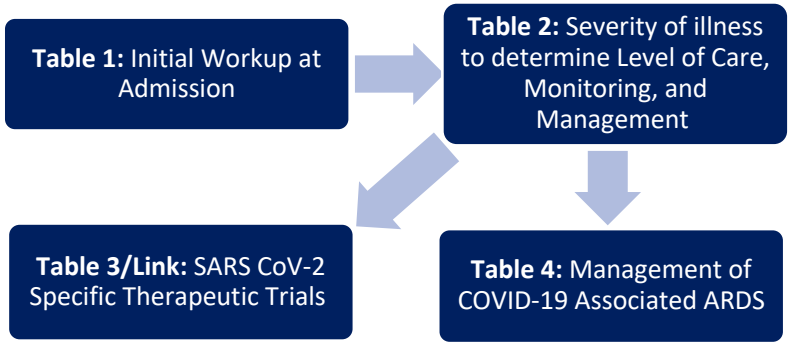

Table 2: Severity of illness to determine Level of Care, Monitoring, and Management

Severity of Illness	Admission Location and Labs	Management (All management should continue as severity of illness increases)

Mild
• No oxygen requirement
• No new dyspnea
• Normal chest x-ray* (patients with abnormal chest x-rays may require observation)
	May send home with close monitoring for 2 weeks
	• RTC if unable to tolerate PO, worsening fevers not resolving > 3 days, dyspnea
	• Strict Counseling: Patient should be masked at all times in public, strict isolation for 2 weeks plus 3 days of being asymptomatic
		• Supportive Care
		  ○ Oral hydration
		  ○ Acetaminophen for fevers >38.3 Celsius prn (D/c during remdesivir study)
		• Close monitoring emphasized for HTN, Chronic Lung/Heart Disease, CKD, or Immunosuppression comorbidities, Age ≥ 60
		May qualify for outpatient COVID-19 Specific Therapeutic Trials (Currently not enrolling)

Moderate • Oxygen Requirement: ≤ 6L NC for SaO2 ≥ 92%. • RR ≤ 30-35 without respiratory distress, use clinical judgement	**Admission to Inpatient Wards** • CBC/d, CMP, ABG, Procalcitonin as needed, not standing • Inflammatory Markers (D-dimer, IL-6, Ferritin, CRP)** • Chest X-ray as needed, not standing • Telemetry/Continuous oximetry • If treating bacterial pneumonia - Limit treatment 5-7 days	• Conservative Fluid Management: avoid fluid boluses and IV maintenance fluids unless hypotensive. Consider diuresis. • If >6L NC to maintain SaO2 ≥ 92%, or rapid increase in O2 requirement, consider severe illness start non-rebreather and consult ICU.* • All patients should be on DVT prophylaxis (SCDs + Heparin) if no contraindications • If bronchodilators clinically indicated, order MDI (not S.V.Neb) **See Table 3** COVID-19 Specific Therapeutic Trials (Interim Therapeutics Guideline)
Severe without Mechanical Ventilation • Greater 6L to maintain SaO2 >92% (non-rebreather) • RR ≥ 24 or respiratory distress • Rapid increase in O2 requirements	**Admission to ICU ***** • Standard ICU Care: ABCs/FASTHUGS • Check (Procalc, CRP, Pro-BNP, Troponin, ECG)*	• Non-Rebreather with reservoir up to 15Lpm; with expiratory filter if available • Consider Intubation if: severe cough / exposing staff, intubations done at UCSD by anesthesiology (see intubation protocol reference below) • **NIV and HFNC are not being used for COVID-19 patients at UCSD*** • Consider ID Consult
Severe with Mechanical Ventilation • Consider intubation with oxygen requirement <92% with NRB* (clinical judgement)	• (Fibrinogen, D-dimer, PT/PTT, Procalcitonin, CRP)* • Pneumonia panel (tracheal aspirate) - avoid bronchoscopy. • Chest X-ray as needed, not standing	**ARDS Management (See Table 4)** • Start broad spectrum antibiotics if clinically indicated, and deescalate as appropriate • Tracheostomy requires 2 negative COVID-19 NP/trach swabs separated by 24 hours • If patient dies, autopsy is strongly encouraged for research purposes. • If bronchodilators clinically indicated, may order nebulized Rx while intubated • **Critical Medication Shortage Mitigation (Sedation/Analgesia):** See UC San Diego Guidelines on https://pulse.ucsd.edu/tools/medication-resources

*Unclear evidence to support, ** For potential COVID-19 Specific Therapeutic Trials, *** Admission criteria subject to change depending on COVID-19 surge phase

UC San Diego Health COVID-19 Interim Therapeutics Guidelines: https://pulse.ucsd.edu/departments/supplychain/Documents/formDocs/WD1215.pdf

Table 3: SARS CoV-2 Specific Therapeutic Trials

Common between Trial Protocols • ≥18 years of age • Symptoms & Abnormal Imaging • No allergy to study drug	**Remdesivir** **(currently Hillcrest Medical Campus)**	**Tocilizumab** **(currently La Jolla Medical Campus)**	**Hydroxychloroquine** **(not currently recruiting at UC San Diego)**
	No pregnant patients. Must agree to either abstinence/contraception for 30 days	No pregnant or breastfeeding women	Pregnancy ok if documented during consent
	SpO2 ≤ 94% on room air	≤93% or PaO2/FiO2 < 300 mmHg	≥93% or PaO2/FiO2 > 300 mmHg No impending respiratory failure No mechanically ventilated patients
Monitoring, and Other Criteria	Cannot participate in any other COVID-19 treatment clinical trial	Exclude if progression to imminent and inevitable death in next 24 hours	Electrolyte imbalances must be corrected
	AST/ALT < 5x ULN EGFR <50 or dialysis excludes	ALT/AST < 10 x ULN ANC > 1000 Platelet > 50	GFR > 30 Hgb > 9.0 g/dL Platelet > 75 AST, ALT, and AP ≤ 3 ULN Total bilirubin ≤ 2.5 ULN
		No active TB or suspected active viral/bacterial/fungal infection	No QT prolongation. No significant abnormal ECG/Arrythmia. No impaired neuropsychological performance
	Adaptive Trial Design, placebo arm may be replaced by another promising anti-viral or agent	No tocilizumab in past 6 months Ok to be on Antiviral (Medical monitor must ok)	No remdesivir, lopinavir, ritonavir, chloroquine or hydroxychloroquine prior 30 days
Adverse Effects	Co-admin with CYP3A4 inhibitor should be avoided	LFT abnormalities (AST, ALT >3x ULN must d/c), injection site reactions, infection risks (esp. TB, fungal infections)	Severe hypoglycemia, myopathy/weakness, QTc elevation, Retinopathy, anemia (G6PD related), anxiety, possible bronchospasm
Study Members and Contact Information	Dan Sweeney (Co-PI) & Connie Benson (Co-PI) **Contact: Dan Sweeney, MD**	Atul Malhotra (PI), Aaron Carlin, Robert Owens, and Connie Benson **Contact: Pam DeYoung or DeeDee Pacheco**	Cathy Logan (PI), Lucy Horton, Davey Smith, Susan Little, Doug Richman, John Guatelli, Sam Penziner, Scott Johns, and Nina Haste Contact: Davey Smith, MD (not currently recruiting at UCSD)

SARS CoV-2 Specific Therapies outside of a clinical trials are currently not being offered at UCSD

Non-specific Therapies

Systemic Steroids: Routine use in setting of severe SARS CoV-2 infection is not routinely recommended; consideration should be given in the following scenarios.

- Refractory shock
- Chronic steroid use
- Patients with Asthma/ COPD
- Severe/refractory ARDS with persisting hypoxemia (1-2mg/kg/day methylprednisolone x5 days)

Future Therapeutic Trials (Guidelines will be updated in real time as recruitment starts)

- Hydroxychloroquine and Azithromycin (Outpatient)
- Convalescent Serum (Inpatient)
- Vaccine Trials

UC San Diego Health COVID-19 Interim Therapeutics Guidelines: https://pulse.ucsd.edu/departments/supplychain/Documents/formDocs/WD1215.pdf

Table : Management of COVID-19 Associated ARDS

Good COVID-19 Care = Good ARDS Care					
	Indications/Details	**Mortality Reduction**	**Evidence in COVID-19**	**Comments**	**Key Trials in ARDS**
Lung protective ventilation					
Low Tidal Volume	6 mL/kg IBW (range 4-8)	Yes	Expert recommendation	Increase RR up to 35 to maintain pH >7.15	ARMA (2000)
Plateau pressure	≤30 cm H2O	Yes	Expert recommendation		ARMA (2000)
Low Driving Pressure	(Plateau pressure – PEEP)	Yes*	Minimal data		Amato, *NEJM* (2015)
PEEP	Per PEEP ladder†	No	Expert recommendation		ALVEOLI (2004)
Positioning					
Proning	ARDS with PaO2/FiO2 < 150	Yes	Case reports	Consider earlier proning based on clinical discretion	PROSEVA (2014)
Head of bed 30-45°	Any intubated patient	No	Minimal data	Reduces VAP in ARDS	Cochrane review (2016)
Adjunctive therapy					
Neuromuscular Blockade	Ventilator dyssynchrony	No	Anecdotal	Consider as needed doses rather than continuous infusion	ROSE-PETAL (2019); ACURASYS (2010)
Pulmonary Vasodilators	Refractory hypoxemia	No	Anecdotal, RCT in progress	Preference INO: start at 20 ppm, (range 5-40) and 2nd line epo may also be considered. Not recommended for routine use.	Cochrane review (2016)
ECMO	Refractory hypoxemia or hypercarbia	No	Case reports	Notify ECMO team early Webpaging: "ECMO on Call" **SD County COVID-19 ECMO Guidelines**: pulse.ucsd.edu/ecmo	EOLIA (2018); CESAR (2009)
Recruitment maneuvers	Refractory hypoxemia	No	Not routinely recommended	Not recommended for routine use.	ART group, *JAMA* (2017)
APRV mode	Refractory hypoxemia	No	No data	Increases CO2 & dys-synchrony. Not recommended for routine use.	Zhou, *Int Care Med* (2017)
General Considerations					
Conservative fluid Management	ARDS	No	Expert recommendation	Reduces ventilator days in ARDS	FACTT (2006)
FASTHUGS/ABCDEF	Any ICU patient	Yes	Expert recommendation	Quality care bundles should be used in every ICU patient	Various
Minimize sedation	Any ventilated ICU patient	No	Expert recommendation	Shortens ventilator days	Various
Early Mobilization	Any ICU patient	No	Expert recommendation		Various
Pregnancy					
Positioning	-	-	Minimal data	Ability to prone patient dependent on gestational age in discussion with high risk OB team	-
General management	-	-		Recommend high risk OB consult for any pregnant patient in ICU	-
*Associated with lower mortality, though causal relationship not definitively established					

†PEEP Ladder (Consider starting with low PEEP ladder first)

LOW PEEP LADDER	**FiO2**	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1
	PEEP	5	5	8	8	10	10	10	12	14	14	14	16	18	18-24
HIGH PEEP LADDER	**FiO2**	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5-0.8	0.8	0.9	1.0	1.0
	PEEP	5	8	10	12	14	14	16	16	18	20	22	22	22	24

UC San Diego Health **Inpatient Management Guidelines for Patients with Confirmed COVID-19**

UC San Diego COVID-19 Pulse-Website	https://pulse.ucsd.edu/coronavirus/	
PPE Guidelines	Code Blue Policy	ICU Care Policy
Intubation Policy	Drive-Up Testing	Women and Infants Services
COVID-19 Interim Therapeutics Guidelines	Epic Resources	Ambulatory In-Clinic Testing Process and Care

Other Resources

CDC:	https://www.cdc.gov/coronavirus/2019-ncov/
WHO COVID-19 situation reports:	https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports
PubMed COVID-19 Publications (LitCovid):	https://www.ncbi.nlm.nih.gov/research/coronavirus/
Infectious Disease Society of America:	https://www.idsociety.org/public-health/COVID-19-Resource-Center/
UW COVID-19 Policies/Resources:	https://covid-19.uwmedicine.org/Pages/default.aspx
Johns Hopkins COVID-19 Global Map:	https://coronavirus.jhu.edu/map.html
SD County Coronavirus Cases:	https://www.sandiegocounty.gov/content/sdc/hhsa/programs/phs/community_epidemiology/dc/2019-nCoV/status.html
California Department of Public Health:	https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/nCOV2019.aspx
ELSO ECMO COVID-19 Guidelines	https://www.elso.org/COVID19.aspx

References (Not comprehensive)

- Treatment Protocol for Hospitalized PATIENT with Non–Severe COVID-19. Yale New Haven Health System.
- Treatment Guidelines for SARS-CoV-2 Infection (COVID-19). Mount Sinai Health System.
- World Health Organization. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected: interim guidance, 13 March 2020. World Health Organization; 2020. https://www.who.int/docs/default-source/coronaviruse/clinical-management-of-novel-cov.pdf
- Matthay MA, Aldrich JM, Gotts JE. Treatment for severe acute respiratory distress syndrome from COVID-19. The Lancet Respiratory Med. 2020 Mar 20. https://doi.org/10.1016/S2213-2600(20)30127-2
- Lei C, Su B, Dong H, Bellavia A, Di Fenza R, Fakhr BS, Gianni S, Grassi LG, Kacmarek R, Morais CC, Pinciroli R. Protocol of a randomized controlled trial testing inhaled Nitric Oxide in mechanically ventilated patients with severe acute respiratory syndrome in COVID-19 (SARS-CoV-2). medRxiv. 2020 Jan 1.
- Murthy S, Gomersall CD, Fowler RA. Care for critically ill patients with COVID-19. JAMA. 2020 Mar 11. https://doi.org/10.1001/jama.2020.3633
- Pan C, Chen L, Lu C, et al. Lung Recruitability in SARS-CoV-2 Associated Acute Respiratory Distress Syndrome: A Single-center, Observational Study. American Journal of Respiratory and Critical Care Medicine. 2020 Mar 23(ja). https://doi.org/10.1164/rccm.202003-0527LE
- Alhazzani W, Møller MH, Arabi YM, Loeb M, et al. Surviving sepsis campaign: guidelines on the management of critically ill adults with Coronavirus Disease 2019 (COVID-19). Intensive Care Med. 2020 March 28. https://doi.org/10.1007/s00134-020-06022-5

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