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Intensive Care Management of Covid-19 Patients

Objective: To explore the key areas in intensive care management of Covid-19 patients, according to preexisting evidence-based and emerging knowledge in a safe working environment for both health care workers and patients.

ICU environment and infection control:

For health care workers (trained in infection control practice) who are taking care and performing aerosol-generating procedures on patients with COVID-19, using an N95 respirator (or equivalent or higher-level respirator) in addition to other personal protective equipment (i.e., gloves, gown, and eye protection such as a face shield or safety goggles) in a negative pressure room. The ICU should have a dedicated donning and doffing area. An adequate system of waste handling and disposal, adequate Air exchange mechanisms should be in place.

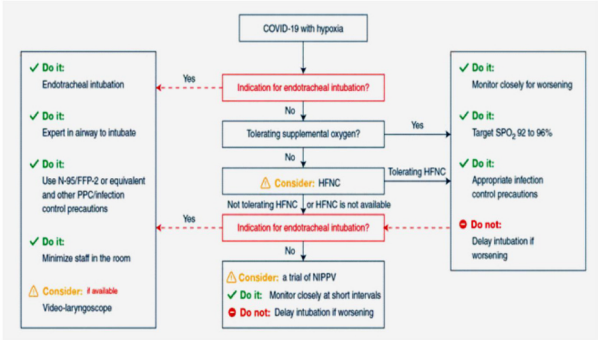


Figure 3. Summary of clinical practice recommendations for the management of patients with Coronavirus Disease 2019.

COVID-19 with mild ARDS	COVID-19 with Mod to Severe ARDS	Rescue/Adjunctive therapy
<div>✓ Do it: VT 4-8 ml/kg and P_{plat} < 30 cm H₂O</div> <div>✓ Do it: Investigate for bacterial infection</div> <div>✓ Do it: Target SpO₂ 92% - 96%</div> <div>⚠ Consider: Conservative fluid strategy</div> <div>⚠ Consider: Empiric antibiotics</div> <div>⊕ Uncertain: Systematic corticosteroids</div>	<div>⚠ Consider: Higher PEEP</div> <div>⚠ Consider: NMBA boluses to facilitate ventilation targets</div> <div>⚠ Consider: if PEEP responsive Traditional Recruitment maneuvers</div> <div>⚠ Consider: Prone ventilation 12-16 h</div> <div>⚠ Consider: if proning, high P_{plat}, asynchrony NMBA infusion for 24 h</div> <div>⛔ Don't do: Staircase Recruitment maneuvers</div> <div>⚠ Consider: Short course of systemic corticosteroids</div> <div>⊕ Uncertain: Antivirals, chloroquine, anti-IL6</div>	<div>⊕ Uncertain: Antivirals, chloroquine, anti-IL6</div> <div>⚠ Consider: if proning, high P_{plat}, asynchrony NMBA infusion for 24 h</div> <div>⚠ Consider: Prone ventilation 12-16 h</div> <div>⚠ Consider: STOP if no quick response A trial of inhaled Nitric Oxide</div> <div>⚠ Consider: follow local criteria for ECMO V-V ECMO or referral to ECMO center</div>

Two phenotype ARDS. L type and H type. H (high lung elastance) responds to higher PEEP

Pharmacologic Interventions:

1. Remdesivir IV for 5 days (can be given up to 10 days in pt. with poor clinical response)

2. Methylprednisolone / Dexamethasone for at least 7 days / consider dose increase in pt with poor response

3. Ascorbic acid (Vitamin C) 1.5 g IV q 6 hourly for at least 7 days.

4. Anticoagulation with LMWH.(HASBLED score to rule out bleeding risk)

5. Empiric antimicrobials/antibacterial agents and assess for de-escalation daily.

6. Ivermectin 150-200 mcg/kg daily for two doses

7. Vitamin D3 60000 IU weekly.

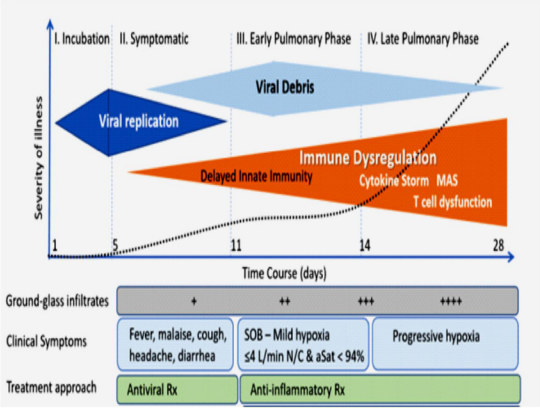
8. Thiamine 200 mg IV q 12 hourly

9. B complex vitamin

10. Zinc 50-100 mg/day

11. Paracetamol for temperature control

12. Maintain EUVOLEMIA
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	Pre-exposure/ Post-Exposure/ Incubation	Symptomatic Phase	Pulmonary/ inflammatory phase
Hydroxychloroquine	Unclear benefit	No benefit	/Trend to harm
Remdesivir	n/a	// Reduced time to recovery No mortality benefit	No benefit
Lopinavir-Ritonavir	n/a	No benefit	No benefit
Interferon α/β	Inhaled ? Benefit	No benefit	/Trend harm
Tocilizumab	n/a	n/a	No Benefit
Convalescent Serum	n/a	Unlikely	No Benefit
Corticosteroids	n/a	Trend to harm	BENEFIT
Ivermectin	BENEFIT	BENEFIT	BENEFIT

Salvage Treatments

High dose corticosteroids; Bolus 250- 500mg/ day methylprednisolone, Ulinastatin* , (30 lac IU over 3 days)
Tocilizumab*(criteria <13 days of illness/ il-6>20/ CRP>30/LDH>300/Ferritin>600 and rapid clinical deterioration, no active bacterial sepsis)
Barcetinib*(in adjunct with remdesivir) , Thymocin Alfa * (early in disease course when lymphocyte <5%)(* evidences lacking)
ECMO as bridge to lung transplant.
SSC panel recommend against Intravenous immunoglobulins (IVIG), Convalescent plasma, HCQ, lopinavir/Ritonavir

Monitoring: Standard intensive care monitoring and charting. Suggested lab monitoring: PCT, CRP, BNP, Troponins, Ferritin, N/Ratio, D-dimer and Routine. CRP and Ferritin track disease severity closely (although Ferritin tends to lag behind CRP).

Hemodynamic Support: In acute resuscitation of adults with COVID-19 and shock, buffered/balanced crystalloids using a conservative fluid strategy and dynamic parameters (skin temperature, capillary refilling time, and/or serum lactate measurement) in order to assess fluid responsiveness. Norepinephrine as the first-choice vasopressor to target a MAP of 60-65 mmHg. Low-dose corticosteroid therapy in refractory shock. With the evidence of cardiac dysfunction and persistent hypo perfusion despite fluid resuscitation and norepinephrine, add dobutamine.

Acute Kidney Injury and Renal Replacement Therapy: For critically ill patients with COVID- 19 who have acute kidney injury and who develop indications for renal replacement therapy, CRRT is preferred, and if CRRT is not available or not possible due to limited resources, then prolonged intermittent renal replacement therapy (SLED) over Intermittent HD.

Liberation and weaning: Daily sedation hold, spontaneous breathing trial in recovery stage. Percutaneous tracheostomy in difficult weaning. High incidence of delirium in COVID-19. Reassurance, family video calling, out of bed mobilization, physiotherapy, audio visual aids and pharmacotherapy.

Post ICU management: Judicious use of anticoagulation, steroids, multivitamins.

Post-COVID-19 syndrome: Fibrotic sequel is common, judicious use of antifibrotic medication, chest physiotherapy, NIV support frequently needed. Consider a tapering course of corticosteroids (guided by CRP), Omega-3 fatty acids, statins, multivitamins including B complex and Vitamin D.