

ICU Management of COVID Patients

All this information is subject to change. Goal is to homogenize and cohort the knowledge available. This was generated and peer-reviewed by our MICU staff on the week of March 13, 2020.

Prevention

Level of isolation (evolving, latest recommendation for ICU level care)

- PUI or COVID + critically ill: Airborne (PAPR or N95), face shield/goggles AND contact isolation.
- If possible use negative pressure room for patients with high risk for aerosol generation (e.g. NIV, intubation, extubation, HFNC, Nebulizer).

Clothing:

- Primary caregivers (not consultants) in the MICU will avoid use of coats and ties.
- Scrubs and changing rooms to be provided for our caregivers
- Use single use stethoscope

Buddy system

- When doffing, caregivers will have a buddy observe them to ensure best practices are kept

Stop the line

All caregivers are expected to maintain highest standard for infection prevention, we will stop ANY caregiver that is not following our practice

Diagnosis

Key to obtain full history (travel, contacts, timing of symptoms)

Signs and Symptoms (Guam et al. 2-28-20 and Huang et al. *The Lancet* 1-24-20)

- Fever (89%)
- Dyspnea (76%)
- Cough (68%)
- Fatigue (38%)
- Sputum production (34%)

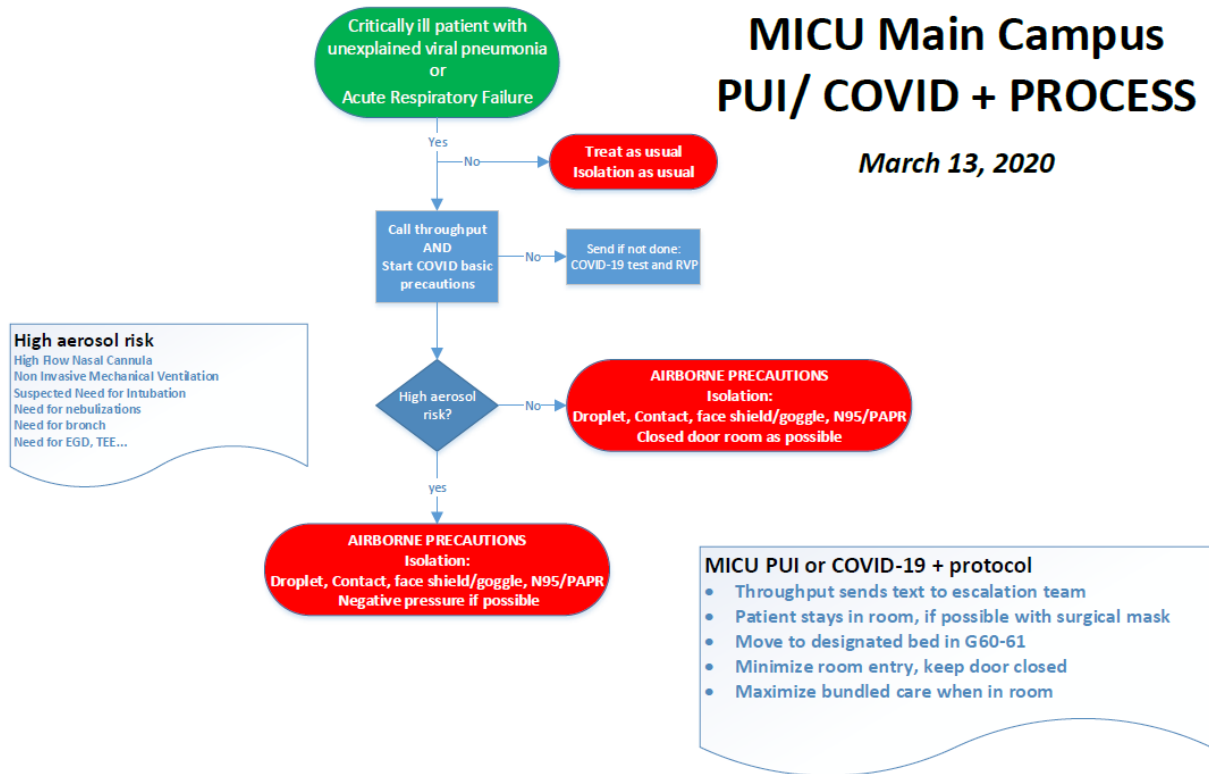
General Labs

- Lymphopenia (83%)
- Mild thrombocytopenia (36%)
- Leukopenia (34%)
- Normal procalcitonin (95%)
- Elevated CRP (61% with CRP > 10 mg/L)
- Respiratory viral panel will NOT be positive for coronavirus
- Elevated troponin

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COVID-19 diagnostic algorithm



Critically ill patient in ICU with unexplained viral pneumonia or acute respiratory failure regardless of history of travel or close contact of suspected/confirmed COVID-19 case

Place in isolation with use of gowns, gloves, surgical mask, eye shield

- **Order COVID19 test and RVP panel**– this will test for rapid Flu/RSV first, then will reflex to COVID19 if flu/RSV negative
 - Swab needs to include nasopharyngeal x2 and oropharynx swabs (3 total)
 - Use N95 mask during swabbing
- Visitor restriction per Enterprise procedures – **no visitors for COVID + or suspicion**

Testing

- RT-PCR performed on nasal swabs depends on obtaining a sufficiently deep specimen. Poor technique will cause the PCR assay to under-perform.
- Sicker patients with higher viral burden/higher chance of having positive assay. Likewise, sampling early in the disease course may reveal a lower sensitivity than sampling later on.
- A negative sample AND high clinical suspicion should be treated as positive and retested.
- **If suspicion is moderate to high**, tracheal aspirate can be sent.

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Bronchoscopy

- **If needed perform** tracheal aspirates or mini BAL before a bronchoscopy.
- Bronchoscopy **should not be done for sole purpose** of ruling COVID-19 in or out.
- Bronchoscopy **should only be done if it will change clinical management (outside of COVID disease)**.
- Bronchoscopy will be done with a standalone AMBU scope unit (or similar) and AIRBORNE precautions.

CT SCAN

Role of CT Chest as a surrogate diagnostic test in the diagnosis of COVID 19

- CT findings have been used as a surrogate diagnostic test. Empirical evidence is minimal.
- Largest cohort- reported sensitivity of CT was 97 % (probable over estimation of sensitivity) and **specificity of 25%**.
- **Should not be used to diagnose COVID.**
- **CT should ONLY be done if it will lead to changes in clinical management, and other diagnostic methods are unreliable.**

Transfer for procedures

- Minimize any movements out of the unit unless the test will change management or is essential.
- If it is needed to move a patient follow infection control guidelines.

Procedures

Hand hygiene before/after all procedures is paramount.

Intubation protection

- **Avoid BMV as possible**, if needed use a HEPA filter between bag and mask.
- COVID airway kit to minimize leaving room for additional equipment (see appendix)
- Max 4 people in room (Staff, fellow, RN, RT)
- This patients, if possible, have in negative pressure room.
- Must use N95/PAPR, gown, double gloves
- Preferred video laryngoscopy
- Additional preoxygenation to minimize bagging
- Avoid fiberoptic intubation **if possible**
- **Assume a difficult airway to ensure all team there**
- **Involve 2DART if risk is very high so they can be available and ready**
- Limit entrance/exit
 - Consider bringing extra doses of RSI meds/push pressors if the situation warrants
 - Bring sedation gtt/ analgesic gtt
 - Place gastric access and foley after intubation to minimize subsequent trips
 - Suggest the unit to follow a checklist before entry to ensure all equipment moves in at the same time.

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Oxygen therapy

Nasal/Face cannula

- Apply surgical mask over patient's mouth/nose

HFNC

- When needed, providers in the room **must use a respirator (PAPR, N95)**
- Limit flow to no more than 30 LPM
- After initiation of NIV, evaluate at 2 hours, if patient improved and meeting safe ventilation criteria (Criteria: ROX score (Spo₂/Fio₁)/RR ≥ 4.88 at 2, 6 and 12 hrs is a good predictor of no need for intubation and <3.85 is high risk for need for intubation)

NIV

- When needed, providers in the **room must use a respirator (PAPR, N95)**
- In ARDS, invasive ventilation is preferred.
- Do not use NIV in patients in shock.
- After initiation of NIV, evaluate at 2 hours, if patient improved and meeting safe ventilation criteria (Criteria: VT <8 mL/kg/IBW, no overt symptoms of respiratory failure or escalating FIO₂/PEEP) then continue and reassess in 2 hrs.
- Consider using mechanical ventilator to provide the NIV (rather than BIPAP device to limit aerosolization).
- **Do not transfer on NIV.**

Bronchodilators

- Use MDI rather than nebulization

Procedures

- Ultrasound use - Use long sheath cover
- Wipe down ALL cart inside room and outside room with Grey Top wipes.
- Wipe down all reusable equipment before and after exiting room.
- Limit unnecessary procedures
- Recommend primary team performing procedures to limit additional personnel exposure
- Minimize trips into patient room (if placing CVC for vasopressors, perform A-line simultaneously)

Strategies for ARDS management

- Use the Cleveland Clinic MICU ARDS guidelines and white paper.
- Follow the recommendation of Low tidal volume strategies (Vt: 6 ml/kg; Pplat<30, and allowance for permissive hypercapnia)
- Based on SARS-1 and MERS-COV, high PEEP table should be used for ARDS

Adjunctive therapies/ Rescue therapies should be implemented based on the recommendations in the MICU ARDS guidelines. See MICU guideline document and algorithm.

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- **Prone Position Ventilation:** as per protocol, consider once optimization and P/F ratio <150
- **Neuromuscular blockade**(PF<150) –may be employed to facilitate vent management(asynchrony) and adjunctive therapy (prone ventilation)
- **Involve medical ECMO team** for all these patients. (See workflow in the appendix)

Volume Status

- Ensure euvolemia or cautious volume depletion: hemodynamics and clinical condition permitting we should aim for de-resuscitation strategies after 24-48 hours of stabilization.
 - o FACTT Lite protocol must be instituted (see MICU guideline document and algorithm)
- 30% of the patients developed AKI- so a large number of these patients will need CVVHD

Cytokine Storm

- A subset of patients will develop a cytokine storm / multiorgan failure picture
- Steroids likely are associated with HARM. This comes from MERS and SARS-1 data, and we should most likely NOT use them.

Cardiomyopathy

Acute Cardiac Injury/ Myocarditis

- 25% of the critically ill patients develop cardiomyopathy
- Troponin Leak is seen- these patients need serial troponin checks
- High suspicion for cardiomyopathy when recurrent shock

Echocardiogram (POC)

- Perform at the time of ICU admission
- Repeat ECHO if there are increases in high dose pressors, or rapid change in perfusion status

Medications

All COVID positive patients require an ID consult. The following regimen is what they may recommend at this time. Consider treating all patients for CAP/VAP as appropriate as well.

Investigational use or compassionate use of remdesivir on a case by case basis. Contact ID for further details.

Kaletra plus hydroxychloroquine

Drug	dose	Duration	Ref
<u>lopinavir (200mg) and ritonavir (50mg)</u>	400mg/100mg q12hrs	14 days	https://clinicaltrials.gov/ct2/show/NCT04252885?cond=coronavirus&draw=2&rank=12
<u>Hydroxychloroquine sulfate</u>	400 mg q12hrs x 1 day followed by 200mg q12hrs x 4 days	5 days	<u>Clin Infect Dis.</u> 2020 Mar 9. pii: ciaa237. doi: 10.1093/cid/ciaa237. [Epub ahead of print]
No roles for steroids			<u>Lancet.</u> 2020 Feb 6; S0140-6736(20)30305-6.

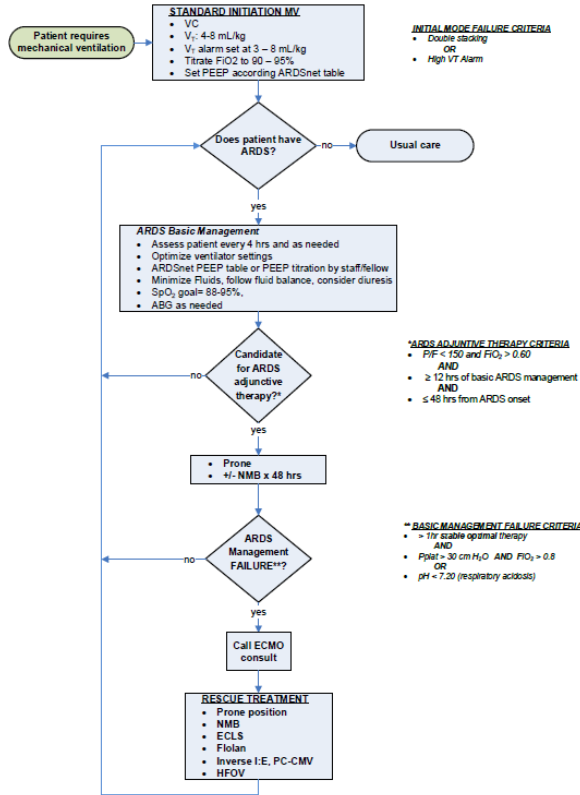
Cardiac arrest and ethics

- Cases of COVID-19 with critical illness should be evaluated whether cardiopulmonary resuscitation is indicated case-by-case basis.
 - o In addition to clinical factors, protection and safety of caregivers should also be considered when doing such assessment.
 - o Physicians are not ethically obligated to deliver care that, in their best professional judgment, will not have a reasonable chance of benefiting their patients.
- CPR for patients with COVID-19 related critical illness should follow standard of care applicable to a patient with Severe Acute Respiratory Syndrome
- CPR procedure
 - o If CPR is decided and expected. Use of LUCAS device will be the main method for CPR. Will follow our MICU protocol.
 - o All caregivers MUST be donned to enter room even if cardiac arrest occurs.
 - o A HEPA must be placed on the BMV or use MV with a rate of 10.
 - o Securing the airway, if not present before, should be the priority.
- In cases that DNR is recommended by the medical team, the clinical basis for the decision should be documented in the EMR and discussed with the patient and/or his/hers/theirs surrogates as soon as possible. If a DNR is recommended and is not agreed upon with the patient or surrogate, then a two physician DNR can be invoked. An Ethics Consult is required.

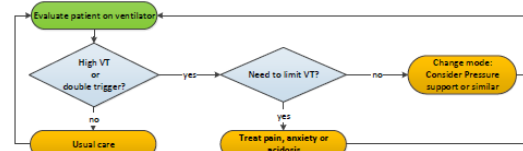
APPENDIX

MICU ARDS guidelines

MICU ARDS Management Guidelines ^{V12}



Mode Failure algorithm



Ideal Body Weight Table

		IDEAL BODY WEIGHT																	
HT, (cm)	WT, (kg)	132	145	147	160	162	165	167	169	173	175	178	180	183	185	188			
160	41	43	45	48	50	52	55	57	59	62	64	66	68	71	73	75	78	80	82
165	38	39	41	43	46	48	50	52	55	57	59	62	64	66	69	71	73	76	78
170	35	37	38	40	43	45	47	50	52	55	57	60	62	64	67	70	71	72	74

ARDSnet LOW PEEP/FiO₂ Table

FiO ₂	0.3	0.4	0.4	0.5	0.5	0.6	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	18-24

ARDSnet HIGH PEEP/FiO₂ Table

FiO ₂	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

PaO₂/FiO₂ Table

PaO ₂	FiO ₂													
	0.21	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1					
40	190	133	100	80	67	57	50	44	40					
50	238	167	125	100	83	71	63	56	50					
60	286	200	150	120	100	86	75	67	60					
70	333	233	175	140	117	100	88	78	70					
80	381	267	200	160	133	114	100	89	80					
90	429	300	225	180	150	129	113	100	90					
100	476	333	250	200	167	143	125	111	100					
110	524	367	275	220	183	157	138	122	110					
120	571	400	300	240	200	171	150	133	120					
130	619	433	325	260	217	186	163	144	130					
140	667	467	350	280	233	200	175	156	140					
150	714	500	375	300	250	214	188	167	150					

Recruitment Maneuver

- Maneuver
 - Ensure Cuff is well inflated and patient hemodynamically stable
 - Set PEEP according to ARDSnet table
 - Switch to CPAP at 40 cm H₂O for 10 – 15 seconds
 - Return to original settings and PEEP
- STOP if hypotension, arrhythmias or desaturation <85%
- Recruitable criteria
 - SpO₂ increase > 5% Or compliance increase > 10%
- Contraindications
 - Obstructive lung disease (bullous disease, COPD, Asthma)
 - Unilateral disease
 - Pneumothorax
 - Hemodynamic instability
 - Increased Intracranial pressure

Fiolan Responsiveness in ARDS

- Response criteria
 - PaO₂ increase > 20% after 30 minutes of using maximum dose (0.05 mcg/kg/min)



COVID AIRWAY KIT contents

Intubation kit contents:

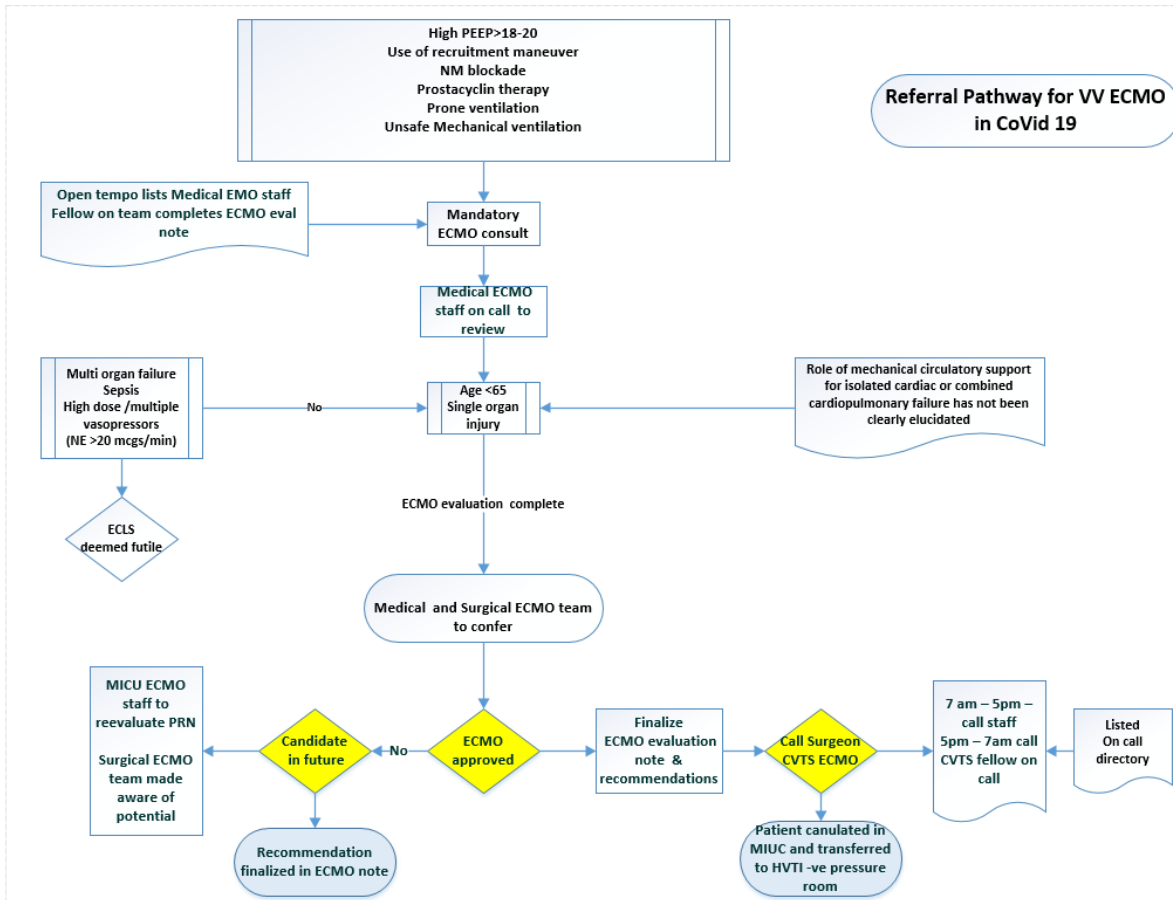
1. Bougie
2. Peep valve
3. Filter
4. Magill
5. 10 mL syringe
6. CO2 detector
7. Tube holder
- 7.5 Parker
8. 6.5, 7.5, 8.0 ETT.
9. Mac 3, Mac 4 and handle
10. LMA

Checklist preentry to room for intubation

COVID+ Intubation Procedure Checklist This does NOT replace pre-intubation time out

OUTSIDE OF THE ROOM (airborne isolation room)	
	Hand Hygiene
	FULL PPE (gloves, gown, full face shield, N95, or PAPR)
In Room Providers	Staff, Fellow RN, RT - with assigned roles,
Outside	runner
Airway Kit	
	ET-Tubes –(8.0, 7.5, 6.5 and 7.5 Parker tube) and Glide scope
	Mac 3, Mac 4 and handle (back-up)
	LMA
	Oral airway
	HIPA filter x2
	PEEP valve
	CO2 detector
	Tube holder
	10ml syringe
	<u>Bougie</u>
	Magill
Drugs	
	RSI – induction agent, paralytic
	Post indication sedation
	Vasopressors – push dose /drip
	IV fluids
Patient	
	IV access
	Pre- oxygenation
	Monitoring (Spo2/CO2/BP/EKG)
	Airway assessment – anticipate difficult airway
Post	
	Trash bag (disposal of soiled equipment)
	Escalation plan

ECMO referral pathway for ARDS COVID 19–Main campus and Regional hospitals



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Infection prevention recommendations for COVID patient transfer

Consult Infection Prevention prior to transport If patient must go to another unit or location within the hospital: Notify receiving department Place clean sheet over wheelchair or cart Use barriers (linens, under pad, etc.) to prevent leakage of stool or other body substances onto wheelchairs and carts Place surgical mask (not N95) on patient . If patient is masked, caregivers do not wear PPE during transport Clear elevator before use After patient transport, clean and disinfect tables, carts, and wheelchairs with a hospital-approved disinfectant wipe after patient use (Super Sani-cloth® or bleach wipe) per routine protocol

draft

COVID CT Changes

Primary Findings (non-specific and could be secondary to other pathogens)

- 75% of cases have presented with bilateral pneumonia
- Round Ground-glass opacities (GGO) in all hospitalized patients- 46%
- Air space consolidation -50%
- Crazy paving appearance (GGOs and inter-/intra-lobular septal thickening)- 1%
- Normal- 12%
- Bilateral consolidative opacities with relative peripheral sparing has been the most frequently reported pattern
- Vascular enlargement in the lesion
- Traction bronchiectasis

Atypical findings (suggestive of super added bacterial infection)

- Mediastinal lymphadenopathy-17%
- Pleural effusions
- Multiple tiny pulmonary nodules
- Unlike many other viral pneumonias

EXTRA CORPOREAL LIFE SUPPORT- ARDS COVID19

Decision Tree

