Critical Care Management of COVID-19

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Recommendations apply to two groups of patients (refer to current guidelines for additional descriptions):
1) *Person Under Investigation (PUI)*: Patient requiring SARS-CoV-2 testing or awaiting results
2) *Confirmed COVID-19 case*

Recommendations below supplement standard ICU care. Evidence and recommendations regarding the care of patients with potential, suspected, or confirmed COVID-19 is expected to evolve very rapidly in coming months. Clinicians treating COVID-19 patients should review CDC's updated recommendations frequently and consult with ICU leadership and/or infectious disease specialists as needed.

	COVID-19 suspicion		Recommendation
	PUI	Confirmed COVID-19	
Level of care	X	X	Level of care is dictated by patient clinical condition, resources and GOC.
	X	X	Low ICU admission/transfer threshold. Consider risk factors for worse disease (age >60, hypoxia/dyspnea, comorbidities).
	X	X	**Establish goals of care (i.e. code status, ICU support) early**, which may dictate available modes of oxygen delivery and disposition.
	X	X	Consider Palliative Care consultation early.
Room Placement	X	X	Negative pressure room for critically ill, if available
		X	Cohorting proven COVID-19 patients acceptable in accord with surge plan.
	X	X	Droplet precautions for non-critically ill
Nursing Ratio	X	X	Use 1:1 nursing ratio.
Staffing	X	X	Minimize number of clinical staff who enter patient room.
	X	X	Staff should sign in daily. (Visitors restricted, but must sign in if present.)
	X	X	No students. Consider appropriateness of resident/fellow involvement.
PPE	X	X	Airborne (PAPR) or N95 with face shield plus contact precautions.
	X	X	Wear gown outside PAPR. Ensure glove cuffs extend over gown cuffs.
	X	X	**Dedicated observer monitors/assists all PPE donning/doffing.**
	X	X	Ensure hand sanitizer dispenser is available inside patient room near door.
	X	X	Place a clean PPE table and a dirty PPE table outside room for PAPR cleaning.
Patient visitors	X	X	Visitors restricted. Consider remote visitation.
Physical Therapy	X	X	Therapist to assess patient as per current standards. Recommendations for therapy should account for limiting HCW exposure / PPE utilization. No ambulation outside room.
Patient Transport	X	X	Necessity should be confirmed by attending physician prior to transport.
	X	X	Non-intubated patients should wear a face mask during transport.
	X	X	Intubated patients should be transported on the ventilator (no BMV).
	X	X	Avoid transporting patient on BiPAP or face mask oxygen.

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Clothing and Equipment	X	X	Use only disposable stethoscope.
	X	X	Do not bring personal items (e.g., stethoscope, pager, jewelry) into room.
	X	X	Clean communication devices (e.g. phone, pager) often with germicidal wipes.
	X	X	Wear scrubs only and change to clean/street clothes before departure
	X	X	Wipe with Sani-wipes all equipment that enters room (e.g., ultrasound, Glidescope, etc.) per Infection Control guidelines.
CLINICAL EVALUATION			
Laboratory Testing	X		Call COVID Operations RN/MD in all PUI to verify need for testing.
	X		Send COVID-19 and influenza/RSV PCR tests, CBC/diff (absolute lymphocyte count), CRP, LDH, CK, D-dimer.
	X	X	Minimize and batch lab testing to minimize HCW exposure risk.
	X	X	Consider endotracheal aspirate (preferred) or mini-BAL to obtain lower respiratory tract sample if needed.
Imaging and diagnostic testing	X	X	Consider utility of bedside and other diagnostic studies in context of personnel exposure and potential for equipment contamination.
	X	X	Ensure careful cleaning of equipment (e.g. ultrasound) brought into room with purple top Sani-Wipes per Infection Control guidelines.
	X	X	Chest radiographs can be obtained through glass panes in doors.
	X	X	Routine / serial CT scans unnecessary. If CT necessary, coordinate with other travel (e.g. from ED to ICU).
	X		CT imaging unlikely to change management unless alternative diagnosis suspected (e.g. PE).
	X		CT imaging *may* identify findings to guide repeat testing for SARS-CoV-2.
Bronchoscopy	X	X	Recommend against aerosol-generating diagnostic procedures, particularly bronchoscopy, unless specific clinical question that cannot otherwise be answered.
	X	X	For [rare] instances when bronchoscopy needed, use disposable bronchoscope if available.
Ventilatory and oxygen support	X	X	**Consider early intubation rather than HFNC/NIPPV if unlikely to avoid intubation and consistent with goals of care**. (1) HFNC/NIPPV may not prevent intubation; (2) initial NIPPV may yield worse outcomes; and (3) open systems may increase droplet dispersion (risk to HCW) with poorly fitting interface**.**
	X	X	**HFNC may be used if FiO2 ≤ 60-70% and Flow ≤ 30 L/min**; reevaluate within 1-2 hours for clinical improvement (e.g. improved ROXI). Lack of clinical improvement, should prompt consideration of intubation if consistent with GOC and resources available. DNI patients may trial increased FiO2/flow and consider transition to comfort measures if failing. **Must be in appropriate isolation (negative pressure room, airborne/droplet PPE).**
	X	X	If BiPAP utilized (e.g., COPD exacerbation, OHS/OSA), use closed expiratory circuit mask/device with HEPA filter and ensure good mask seal with appropriate isolation (negative pressure room, airborne/droplet PPE)
	X	X	Proceed with early intubation if deteriorating respiratory, hemodynamic, or mental status to avoid emergent procedure.

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Endotracheal intubation (personnel, location, PPE)	X	X	Intubation by an experienced operator (options will vary by hospital). See COVID intubation guideline.
	X	X	Perform intubation in negative pressure room if possible. If going to OR, intubate in negative pressure room first before transport to OR.
	X	X	Minimize the number of staff in the room but consider having a qualified backup physician nearby (outside room) for support.
	X	X	Wear PAPR with shroud, gown, and gloves that extend over gown cuffs.
Endotracheal intubation (preparation)	X	X	Perform pre-intubation timeout. Identify 1st to 4th intubation equipment.
	X	X	**Avoid BVM, HFNC, and NIPPV.** If BVM unavoidable, use small tidal volumes, two-person technique to achieve tight mask seal, and ensure HEPA filter in place.
	X	X	Maximize pre-oxygenation with NC, simple face mask, or non-rebreather.
	X	X	Recommend apneic oxygenation with 6L NC only if needed.
Endotracheal intubation (equipment)	X	X	**Prefer video laryngoscopy.** (Added distance from oropharynx and visualization through PAPR hood)
	X	X	Keep backup equipment and extra supplies outside the room.
	X	X	**Ensure BVM & vent have appropriate HEPA filter placed on endotracheal tube proximal to sidestream capnography adapter.**
	X	X	Ensure cleaning/transport protocol followed for reusable dirty equipment.
Endotracheal intubation	X	X	Use RSI procedure to avoid aerosol generating bag/mask ventilation *if possible*.
Ventilator management	X	X	Initiate lung protective/low-tidal volume ventilation if ARDS.
	X	X	Consider high-PEEP strategy for severe ARDS if oxygenation inadequate with standard PEEP ladder.
Proning	X	X	Consider early proning for patients with P/F ratio <150. Incorporate staff exposure in risk/benefit ratio. Huddle outside room before proning.
	X	X	Usual proning protocol (Tortoise system); goal ≥ 18h/day prone. Consider placing arterial line prior to proning.
Neuromuscular blockade	X	X	*Routine* neuromuscular blockade has not shown benefit in ARDS and is not recommended. Individual patients with severe/refractory hypoxemia, hypercarbia or dyssynchrony may benefit from non-depolarizing paralytic.
Sedation	X	X	Ensure adequate sedation with RASS goal 0 to -2 to reduce anxiety and ventilator dysynchrony requiring increased RN interactions.
Fluid management	X	X	Consider conservative fluid management strategy.
ECLS	X	X	Apply usual patient selection criteria for in-house patients (ideal: younger patient with single organ failure); no external facility transfers for ECMO. Consider staff exposure, between-unit transfer, and availability of negative pressure rooms.
	X	X	Perform cannulation and ECMO in negative pressure room

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PHARMACOLOGIC TREATMENT			
Treatment of bacterial pneumonia	X	X	Imaging appearance, symptoms, or exam findings consistent with bacterial PNA should be treated for CAP/HAP. Recommend obtaining cultures prior to antibiotics.
		X	Consider stopping empiric antibiotics after 48-72 hours if no suggestive culture data or low clinical concern.
Systemic corticosteroids		X	Not recommended for treatment of COVID-19 due to risk of prolonged viral shedding and possible harm. Consider if COPD or asthma in exacerbation.
Stress-dose steroids	X	X	Clinician discretion for refractory hypotension
ID consultation		X	Consult infectious disease based on resource availability.
Anti-viral therapy		X	See attached medication chart in consultation with infectious disease
• **Remdesivir**		X	Contact ID/Pharmacy to discuss trial enrollment or compassionate use application.
• **Hydroxy-chloroquine**		X	Consider/clinician judgment in consultation with infectious disease.
• **Lopinavir/ Ritonavir**		X	Consider/clinician judgment in consultation with infectious disease.
• **IVIg**		X	Consider/clinician judgment in consultation with infectious disease.