

Case Study: Long Haul COVID

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Clinical Case Scenario

- 65 y/o male
- Pre-diabetes, not on any medications
- Never smoker



COVID-19 Presentation

- Presented to the ER at Emory Johns Creek Hospital
- Symptoms began 2 weeks prior to presentation
 - Cough
 - Fevers
 - Loss of smell and taste
 - Nausea
 - Dyspnea
 - Chest pain



Acute COVID-19

- In the ER –
- Awake, alert and oriented x3
- Mild use of accessory muscles with any exertion or speaking
- T 36.4, HR 99 regular, BP 166/73, RA sats 84-86% improved to 92% on 5L supplementation
- Bilateral rales noted
- S1 S2 reg with no murmurs
- No skin rash



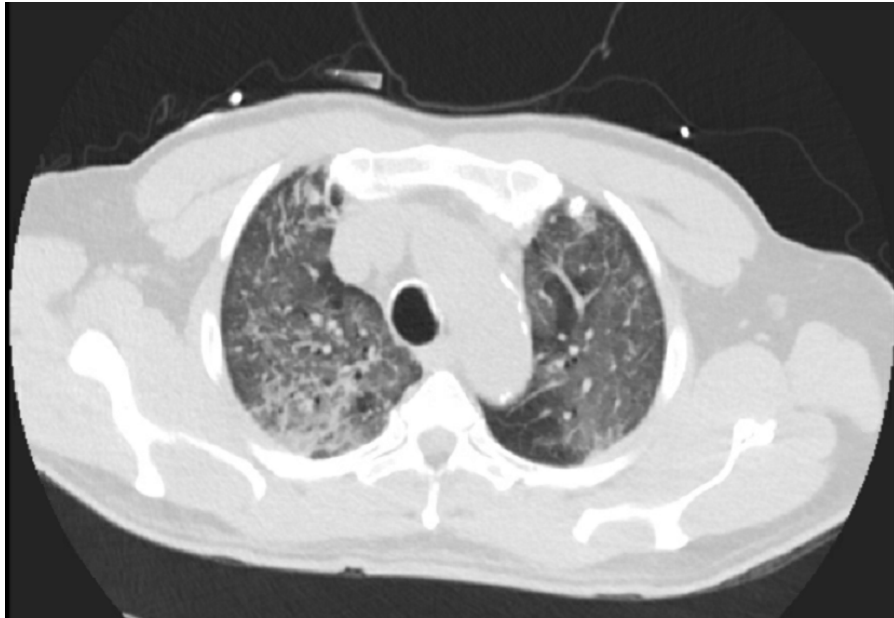
Acute COVID-19 – Chest Xray

- COVID PCR positive on Day 1



Acute COVID-19- Day 2 hospital stay

- Worsening oxygen requirements- 40L/50%
- Transferred to ICU



Acute COVID-19- Hospital Course Labs

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
WBC	9.6	7.8				
Ferritin		624				
D-dimer	405	321		865		
CRP	68	108	82	46	20	18
Fibrinogen		573			703	519
BNP	92					
LDH	322	361				
Pro cal	0.12					
Na	132	133	135	134	138	



Acute COVID-19 Care

- CTX and Azithromycin x 3 days
- Remdesivir x 5 days
- Dexamethasone/methyl-prednisolone 60 mg x 7 days
- Convalescent plasma on Day 5
- Improvement in O2 status
- Discharged on Day 8, with 2L O2 on exertion and during sleep



Acute COVID-19 – Day 15

- Presented to an OSH with worsening hypoxemia and shortness of breath
- SARS 2 COV PCR positive
- High flow O2 up to 15L
- Another 8 days hospital stay with supportive care
- CT PE protocol negative, worsening infiltrates noted
- Solumedrol 20 mg iv Q 8 hours for OP versus fibro proliferative phase of ARDS
- Transition to 40 mg daily PO prednisone for 2 weeks and taper
- Discharged Day 22 on 4L O2 supplementation

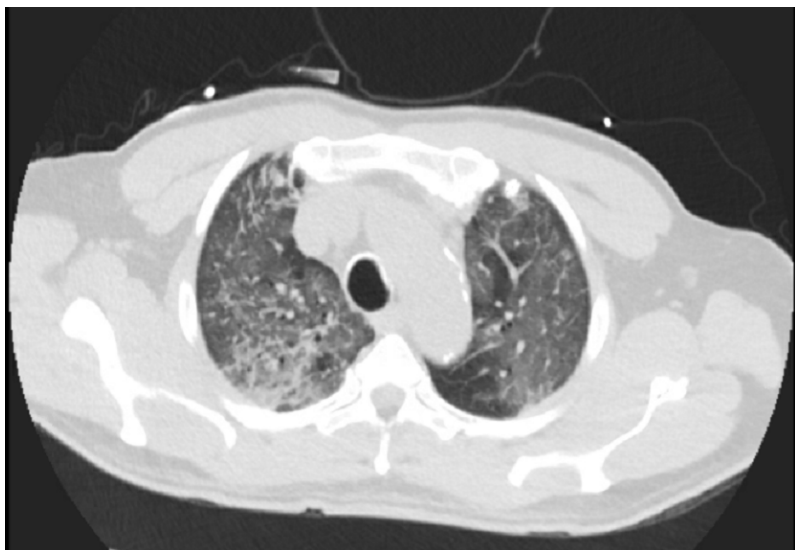


Acute COVID-19- Second Hospitalization

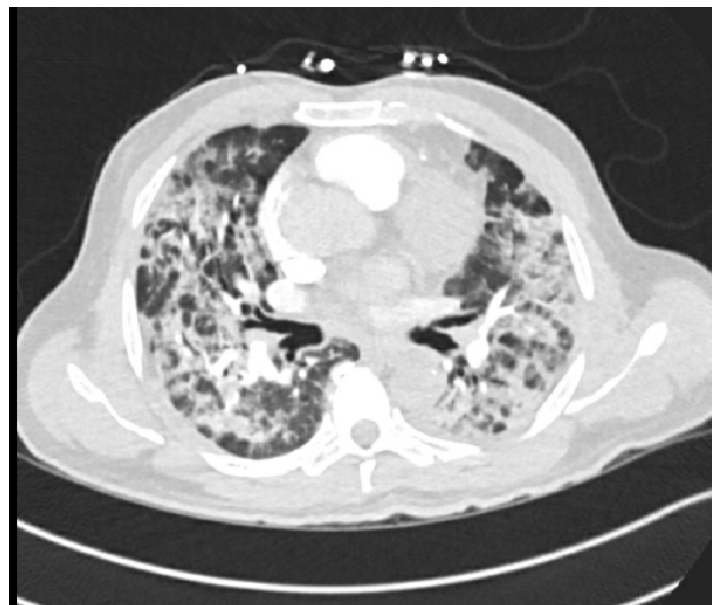
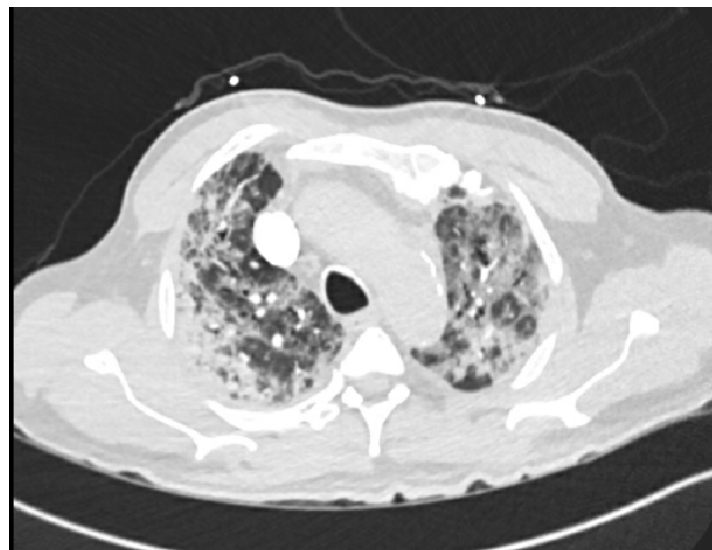
	Day 15	Day 16	Day 17	Day 18	Day 19	Day 20
WBC	9.6	7.8	14.8	10.1		
Ferritin		478				
D-dimer	603	344		252		<215
CRP (mg/L) (0-8)	50.8		18.3	11.3	5.2	3.3
Fibrinogen						
Pro BNP	149					
LDH						
Pro cal (ng/ml)	< 0.1					
Na	134	134	135	134	138	



Acute COVID-19- Day 2



Day 20 post COVID-19



Post Acute COVID Syndrome

- Seen in our Post COVID clinic on Day 62 post diagnosis of COVID
- Completed his course of steroids just prior to coming to our clinic
- Breathing slightly better, with significant lingering cough- spasms
- Dyspnea with exertion, chest pain, chest tightness, and palpitations
- Still requiring O2 at 2-3 L with exertion, drops to mid 80's on exertion
- Sense of smell and taste not back as yet
- Symptoms of “brain fog”- inability to find words, and decreased memory
- Severe fatigue- unable to do anything on certain days
- Weight loss and loss of appetite- slowly improving
- Unable to resume job due to O2 requirements and symptoms
- Decline in quality of life



Post Acute COVID Syndrome –

Day 62 post diagnosis of COVID

- Chest X ray
- Labs- CBC with diff, CMP and BNP
- Inflammatory markers – D-dimer, Fibrinogen, CRP
- 6MW test – showed persistent exercise desaturation with significant tachycardia on mild levels of exertion, required 2L supplementation
- Montreal Cognitive Assessment (MOCA) score 26/30
- Echocardiogram- Normal LV function with estimated PASP of 30 mmHg



Post Acute COVID Syndrome –

Day 62 post diagnosis of COVID

- Persistent bilateral airspace opacities
- Persistent O2 requirement
- Prednisone
 - 50 mg x 10 days
 - 40 mg x 10 days
 - 30 mg x 10 days
 - Taper over another 2 weeks
 - Bactrim PJP prophylaxis



Post Acute COVID Syndrome – Day 120 post diagnosis of COVID

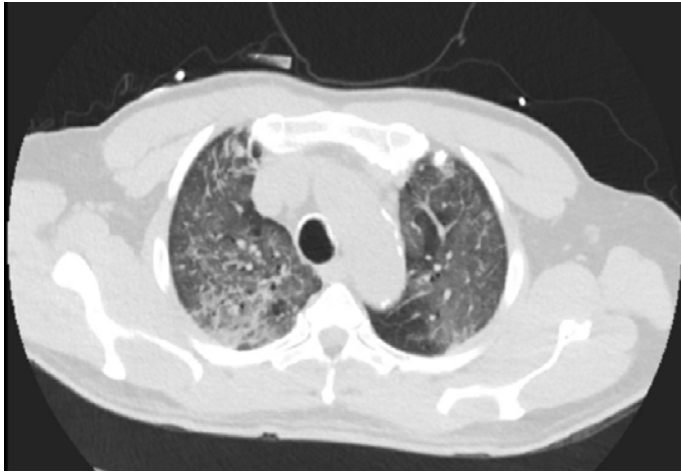


Post Acute COVID Syndrome – Day 120 post diagnosis of COVID

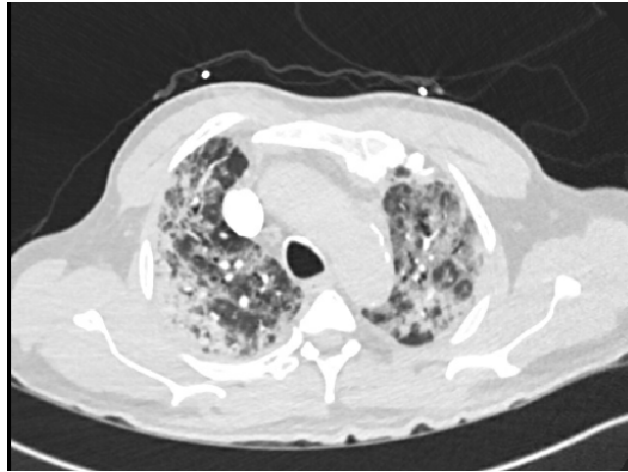
- Persistent memory difficulties
- Taste sensation still not back to normal
- Improved functional tolerance and off O2
- Persistent fatigue- still unable to return to work
- 6MW showed no exercise desaturation
- PT referral for continued rehab
- Referral to Neuropsychological testing
- CT chest and PFT



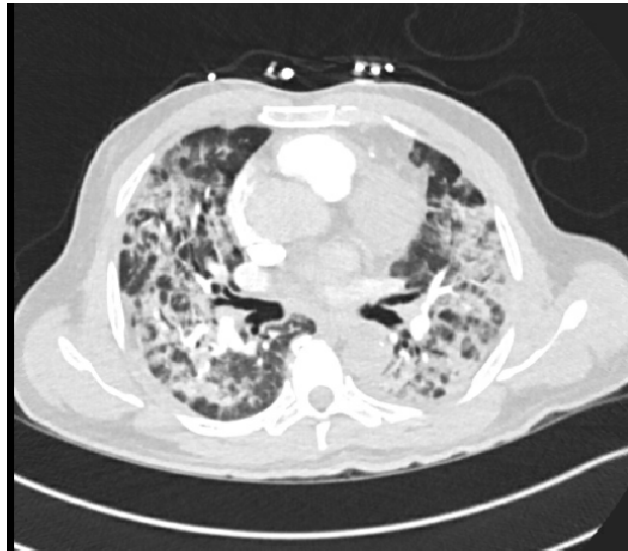
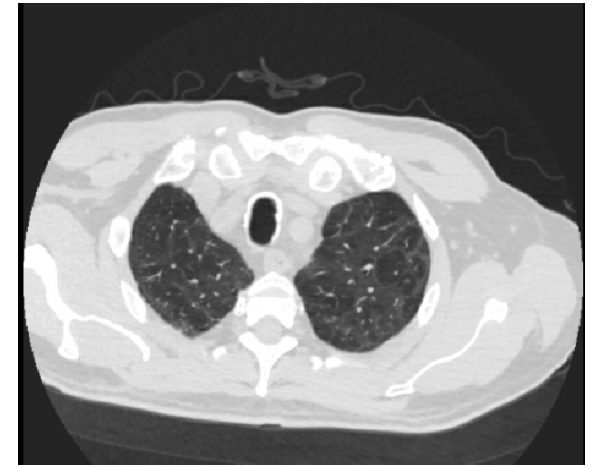
Acute COVID-19- Day 2



Day 20 post COVID-19



Day 150 post COVID-19



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Didactic: Long Haul COVID

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Post-Acute Sequelae of SARS-CoV-2 infection (PASC)

- Persistent symptoms 3wks or more after infection
- Multi-organ symptom presentation
- Lack of consensus of definition



Epidemiology

- Unclear if it's related to severity of initial symptoms
- Approximately 10-30% of all patients have prolonged symptoms
- 65% return to previous level of health after 14-21 days.
- 125/134 (93%) patients had persistent sx's after 2 months
 - 19-84yo (average age 40)
 - All hospitalized
 - 20% required MV
 - Women:men 4:1



BMJ 2020;370:m3026

MMWR Morb Mortal Wkly Rep 2020;69:993-8

JAMA. 2020;324(6):603-605. doi:10.1001/jama.2020.12603

Symptoms

- Fatigue (58%)
- Headaches (44%)
- Attention disorder (27%)
- Hair loss (25%)
- SOB/DOE (24%)
- Joint pains
- Chest pain
- Brain fog (suggestive of myalgic encephalomyelitis/chronic fatigue syndrome-ME/CFS)
- GI issues
- 44% had worsened QoL



Post-Acute Sequelae of SARS-CoV-2 infection (PASC)

- Similar elements to Lyme infection with chronic fatigue and nonspecific pain syndromes.
- “disease of the nervous system” – WHO
- PASC symptoms similar to post-MERS, post-SARS, and post-ARDS
- Difficult to differentiate between post critical illness syndrome vs. PASC
- Inflammation related? Immune mediated?



Patterns and syndromes

- Dyspnea NOS
- Organizing pneumonia and pulmonary fibrosis
- Chronic pain syndromes
- Brain fog/memory loss
- Postural orthostatic tachycardia syndrome (POTS)
- Autonomic dysfunction



Dyspnea NOS

- Dyspnea in light of normal imaging, PFTs, TTE and VTE workup
- No hypoxia or desaturations
- May be associated with airway inflammation given response to ICS/SABA
 - Despite lack of obstruction or bronchodilator response on PFTs
- May be associated with inappropriate tachycardia

21% (Forehead Probe)

99% (PR 82)

559 meters in 6 mins

Ex: 98% (PR 116)

2 min rec; 98% (PR 59)

708 meters or 2322 feet.)



Organizing pneumonia/pulmonary fibrosis

- May occur in 5-10% of patients
- Related to post infectious organizing pneumonia that can lead to fibrosis.
- Seems responsive to 1mg/kg/day prednisone for 1 month



Chronic pain syndrome

- Headaches, nonspecific chest pain, pleurisy, myalgia and arthralgias
- May be secondary to continued cytokine activation, though no consistent elevation in inflammatory markers seen
- Txt: NSAIDs and occasionally prednisone



Brain fog/memory loss

- Memory loss
- Word finding difficulties
- Difficulties concentrating
- Unclear how much of is directly related to COVID infection vs. critical illness
- Possible encephalomyelitis
 - Autoimmune related?
 - Antigen activation?
- Txt: ?



POTS

- CC: light headedness, fainting, and tachycardia associated with positional changes (laying to standing)
 - Tachycardia without hypotension with postural changes.
- Dx: Orthostatics or tilt-table tests
- Txt: Beta-blockers?



Autonomic dysfunction

- Related to cytokine storm resulting in sympathetic activation, alternating with vagal stimulation resulting in anti-inflammatory response
- CC: dyspnea, hypertension, and tachycardia
- Dx: hx
- Txt:
 - Education and lifestyle changes
 - Exercise
 - Hydration and salt intake
 - Medications: fludrocortisone, midodrine, clonidine, or methyldopa



J Cardiovasc Transl Res 2020, in press (doi: 10.1007/s12265-020-10031-6).

J Clin Invest 2020;137:3345–7.

Nature 2018;564:273–7

Clin Med 2021; DOI: <https://doi.org/10.7861/clinmed.2020-0896>

Post-COVID Clinic

- Started in 08/2020
- Every Wednesday (EMUH) and Friday (Emory Executive Park)
- Average age: 50.9yrs
- 63.4% females
- Visits at 1, 3, 6, and 12 months after infection, as well as prn.
- All patients receive
 - MOCA screening,
 - PROMIS surveys for fatigue, cognition, and dyspnea
 - Screening labs for inflammation
 - PFTs and 6MW



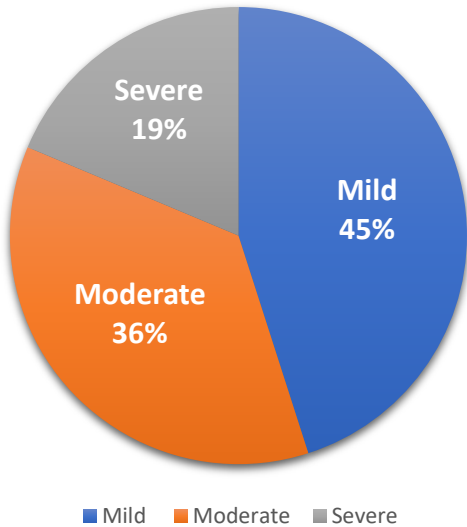
Symptoms

Dyspnea	78.30%
Fatigue	50.00%
Cough	43.50%
Brain Fog	40.20%
Palpitations	25.00%
Chest Pain	19.60%
Arthralgias	18.50%
Myalgias	14.10%
Anxiety	10.90%
Depression	8.70%

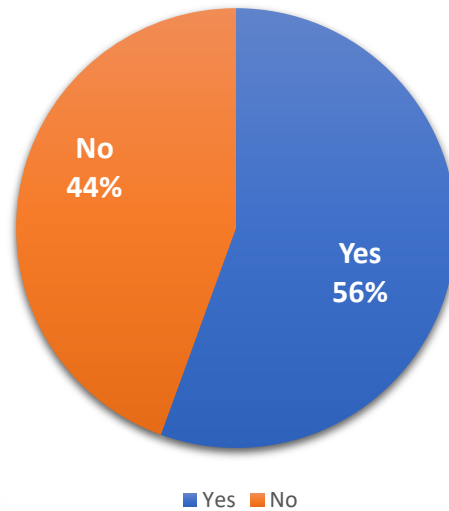


Severity of disease

Severity of illness



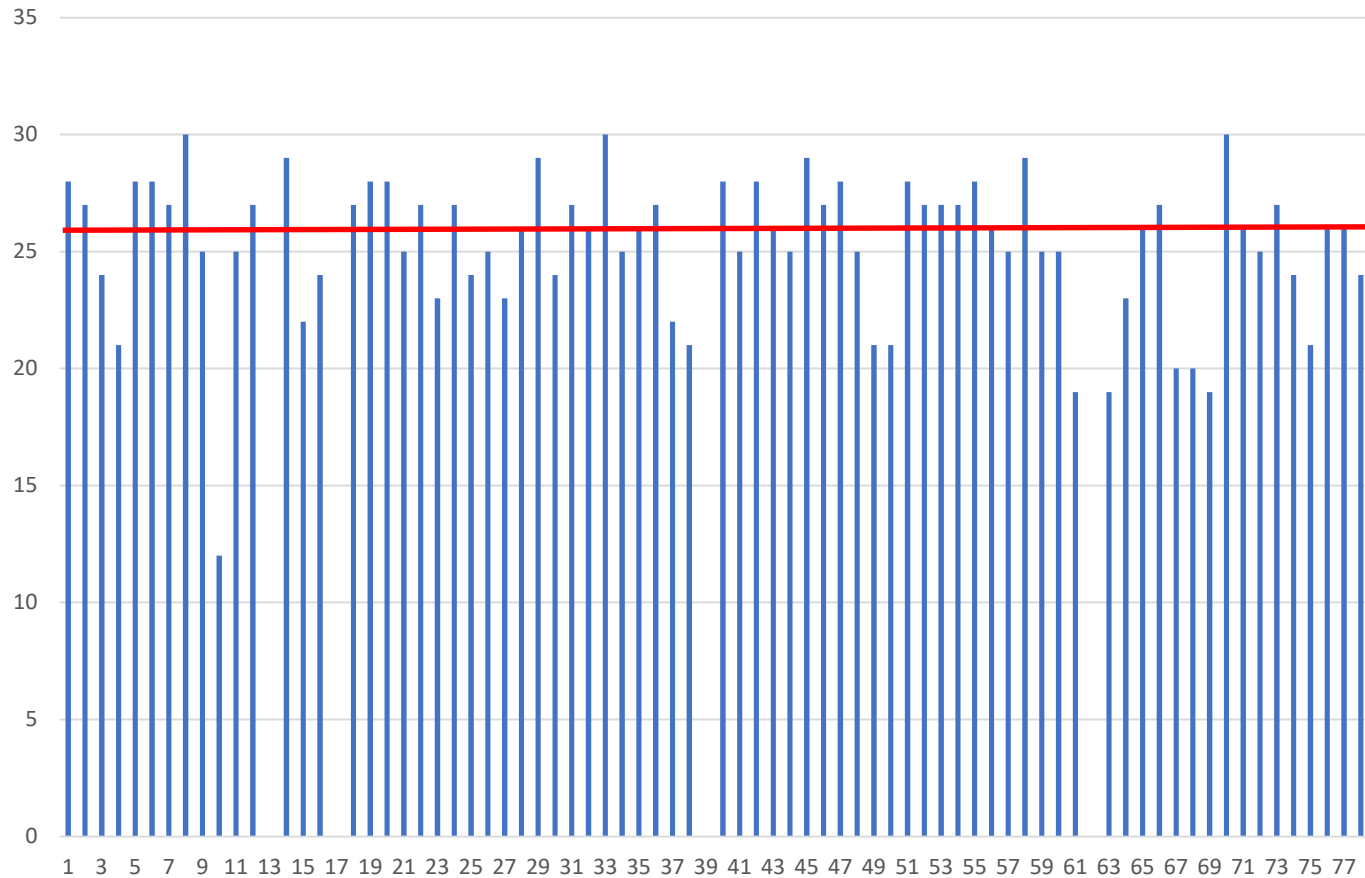
Hypoxia



Treatment	# of pts	Percentage
Remdesivir and steroids	36	42.90%
None	27	32.10%
Steroids	14	16.70%
Remdesivir, steroids and interferon beta	1	1.20%
Monoclonal abs	1	1.20%
Remdesivir, steroids convalescent plasma	1	1.20%
Remdesivir, steroids, convalescent plasma	1	1.20%
Hydroxychloroquine and steroids	1	1.20%
Remdesivir	1	1.20%
Convalescent plasma	1	1.20%



Montreal Cognitive Assessment



Treatment



Treatment

- Best intervention seems to be time
- ICS and SABA for bronchospasm and as empiric txt for SOB/DOE
- Prednisone for 2-4wks for pulmonary infiltrates consistent with organizing pneumonia
- Screening, treatment and titration of anticoagulation for DVT/PE
- Beta-blockers for idiopathic tachycardia and POTS
- Possible use of antihistamines in patients with autonomic dysfunction
- Referral to neurology vs. neuropsychiatry for brain fog and memory loss



Consultants

- Alexis Cutchins (cardiology)
- Kelly Kayson (rheumatology)
- Leslie Ann Cassidy (rheumatology)
- Samir Belagaje (neurology and rehab medicine)
- Angelica Silva (neurology)
- Michelle Haddad (neuropsychology)



POST- COVID CLINIC

WHAT

To provide follow up care for patients who are recovering from COVID-19 infection

WHERE

Emory Executive Park
1605 Chantilly Dr. NE

Emory Midtown Hospital
550 Peachtree St. NE

TO REFER PATIENTS: CALL THE NUMBER BELOW OR PLACE MESSAGE TO "PULMONARY ADMIN" IN EEMR WITH TITLE "COVID CLINIC" IN THE SUBJECT LINE.

REFERRALS: CALL 404-778-3261

FOR ALL
PATIENTS WITH
DOCUMENTED
COVID-19
INFECTIONS
WHO REQUIRE
CONTINUED
CARE FOR
LINGERING
SYMPTOMS

Questions?

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