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

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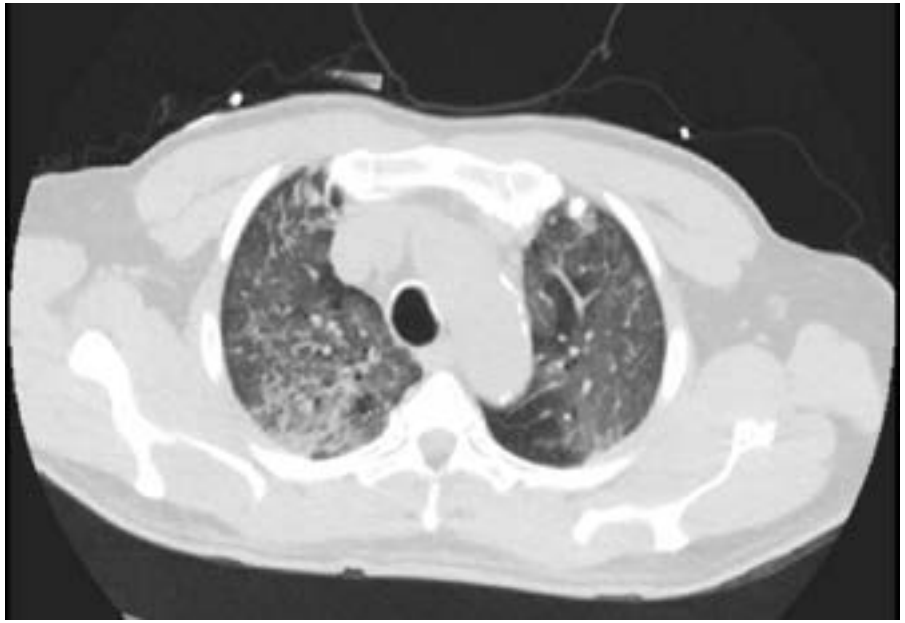
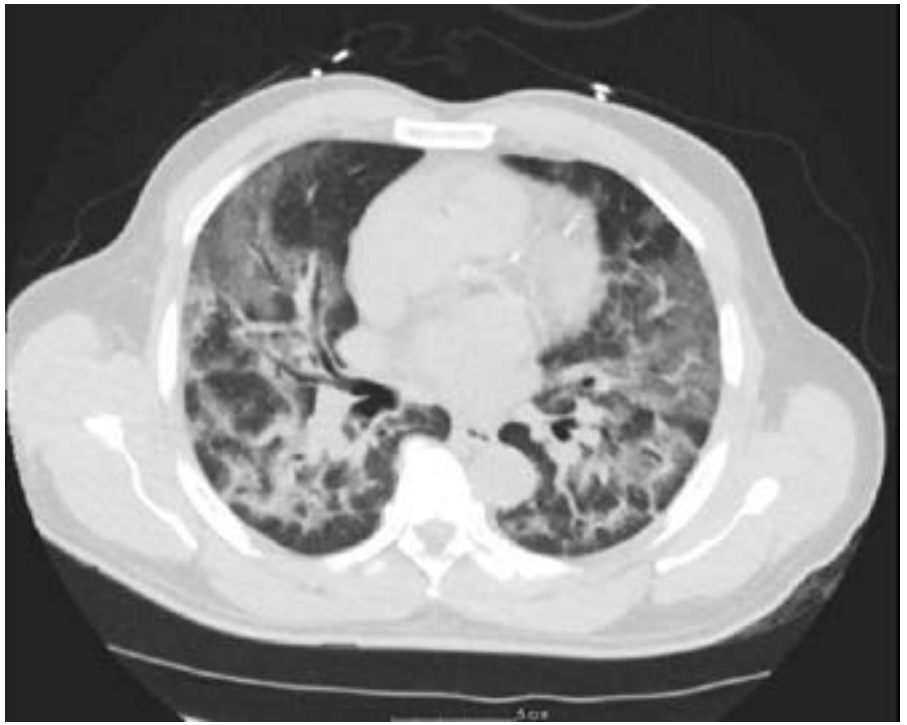
Acute COVID-19- Day 2 hospital stay

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





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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	

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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

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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	

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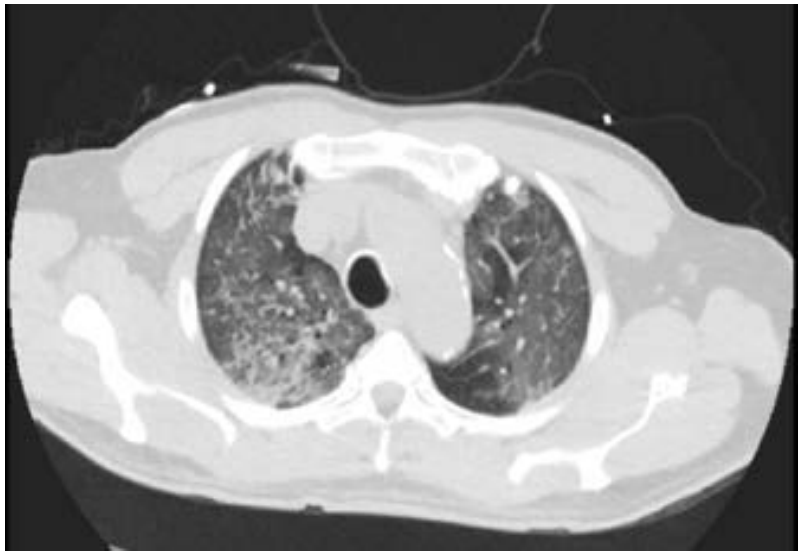
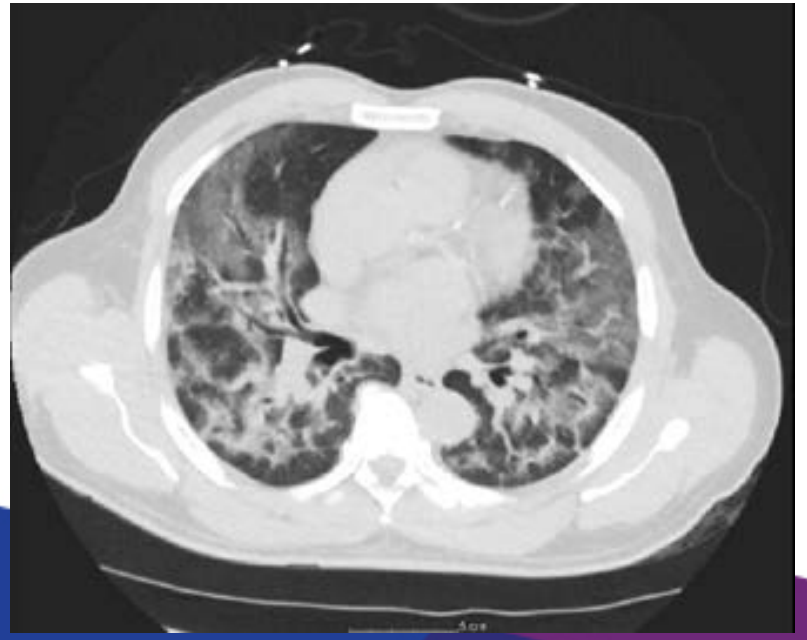
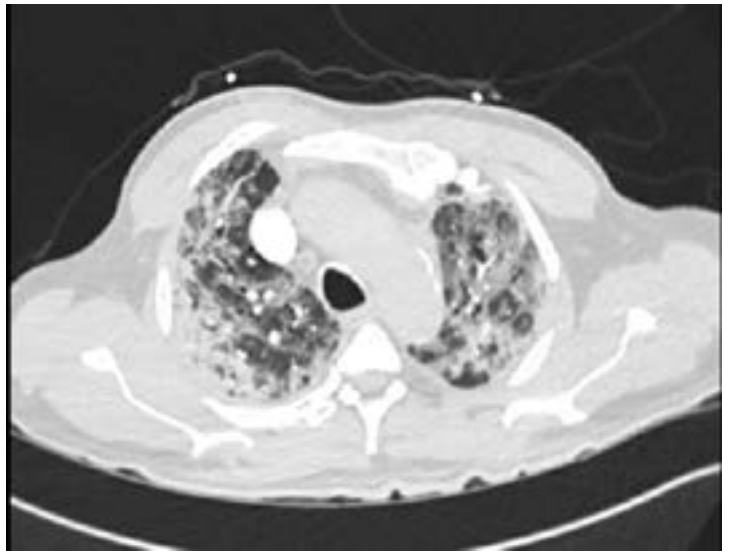
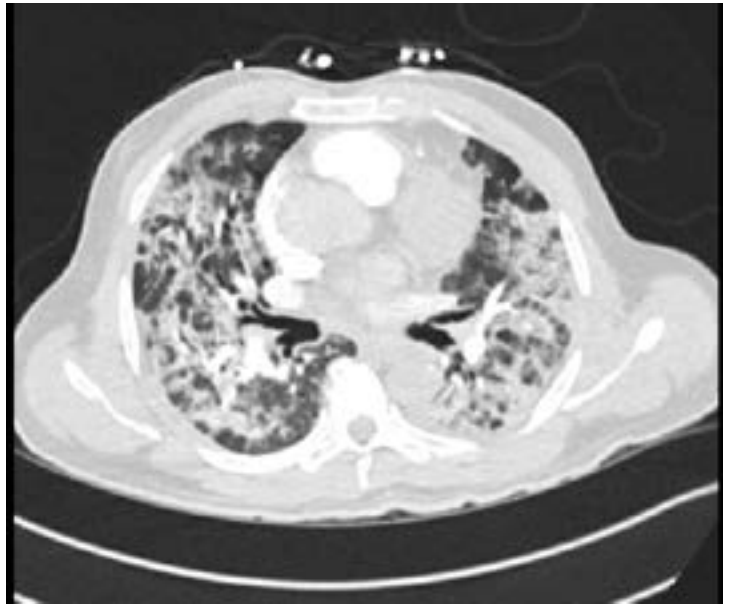
Acute COVID-19- Day 2





Day 20 post COVID-19





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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

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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

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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

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Post Acute COVID Syndrome –

Day 120 post diagnosis of COVID

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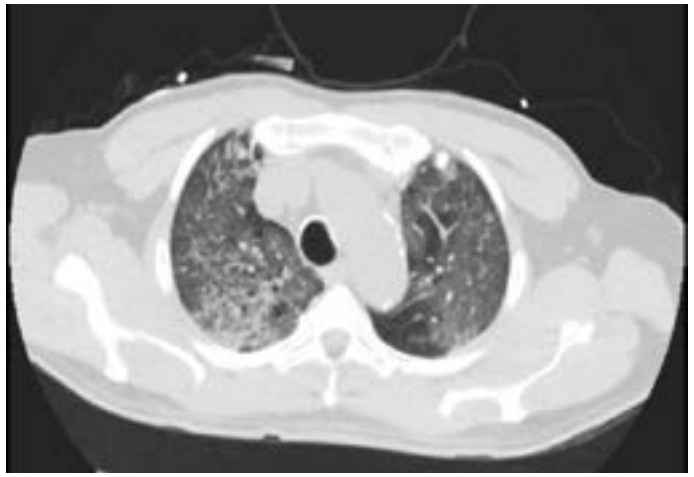
Post Acute COVID Syndrome –
Day 120 post diagnosis of COVID

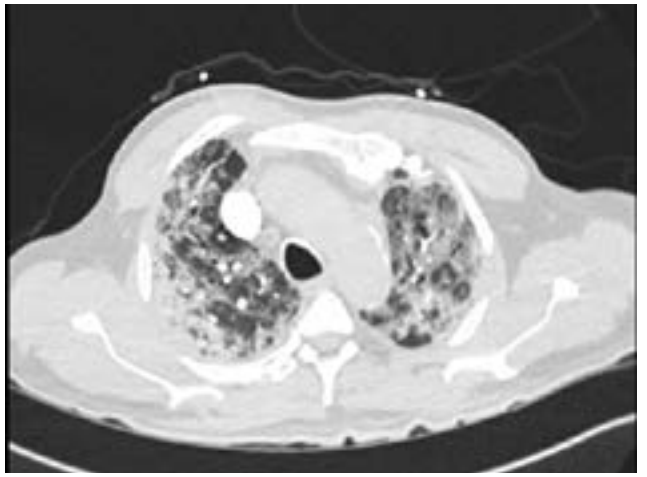
- Persistent memory difficulties
- Taste sensation still not back to normal
- Improved functional tolerance and off O2
- Persistent fatigue- still unable to return to work
- 6MW showed no exercise desaturation
- PT referral for continued rehab
- Referral to Neuropsychological testing
- CT chest and PFT

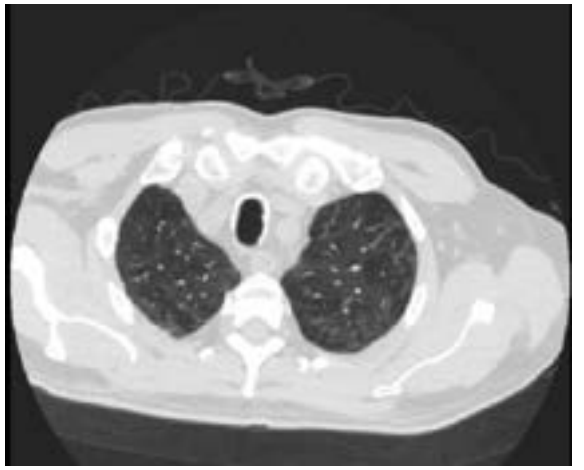
Acute COVID-19- Day 2

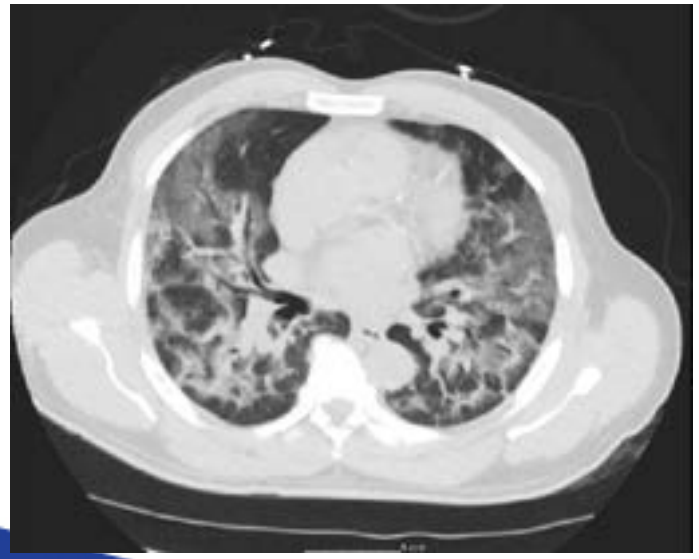
Day 20 post COVID-19

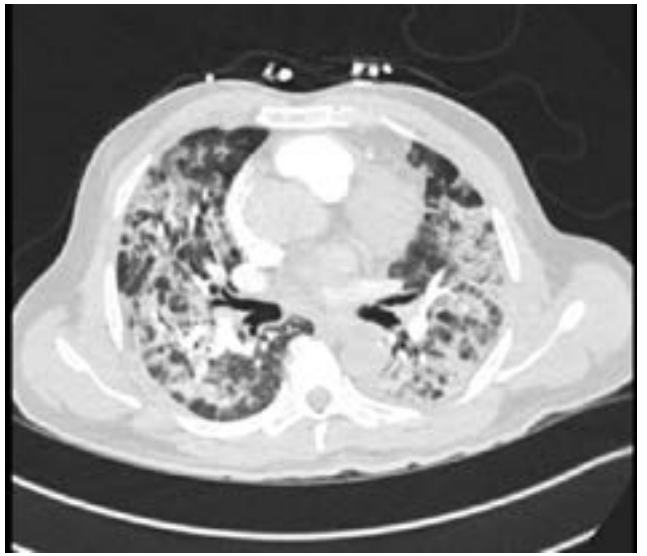
Day 150 post COVID-19











Didactic:
Long Haul COVID

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

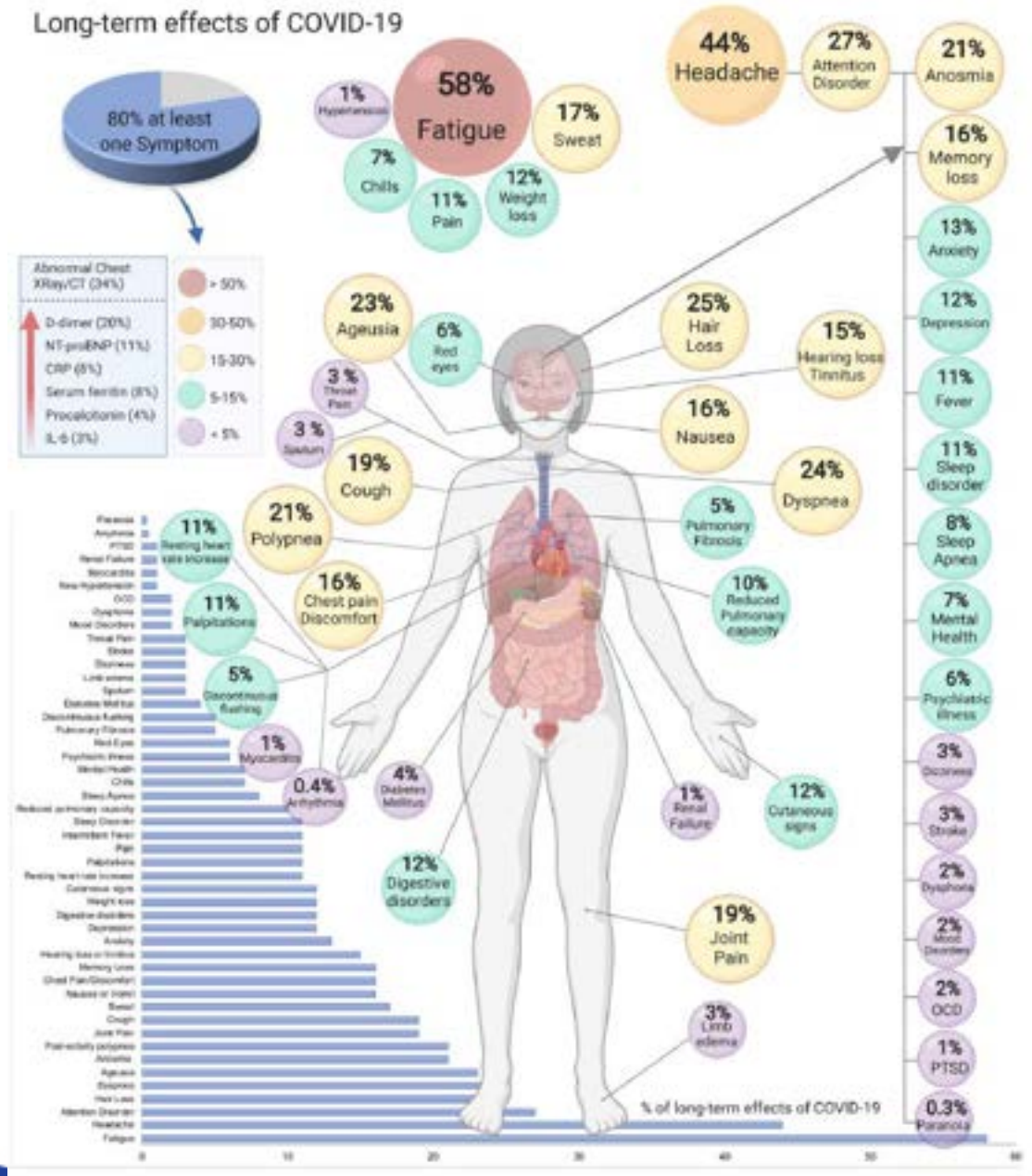
- Persistent symptoms 3wks or more after infection
- Multi-organ symptom presentation
- Lack of consensus of definition

ORCID iD: 0000-0003-0626-216X

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 sxs after 2months
  - 19-84yo (average age 40)
  - All hospitalized
  - 20% required MV
  - Women:men 4:1

BMJ 2020;370:m3026
MMWR Morb Mortal Wkly Rep2020;**69**:993-8
JAMA. 2020;324(6):603-605. doi:10.1001/jama.2020.12603



medRxiv 2021 Jan 30;2021.01.27.21250617.doi: 10.1101/2021.01.27.21250617

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

JAMA. 2020;324(14):1381-1383. doi:10.1001/jama.2020.17709
medRxiv 2021 Jan 30;2021.01.27.21250617.doi: 10.1101/2021.01.27.21250617

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?

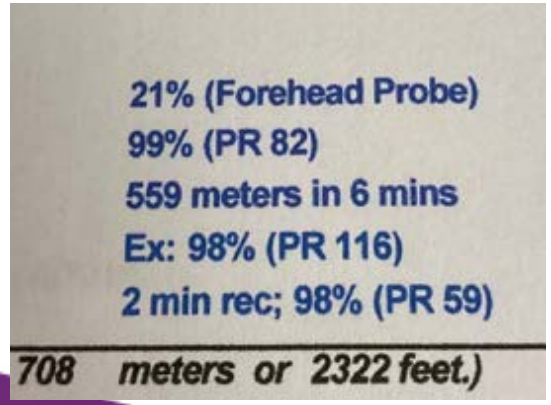
Clinical Med 2021;21(1):e68-70

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



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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

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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%

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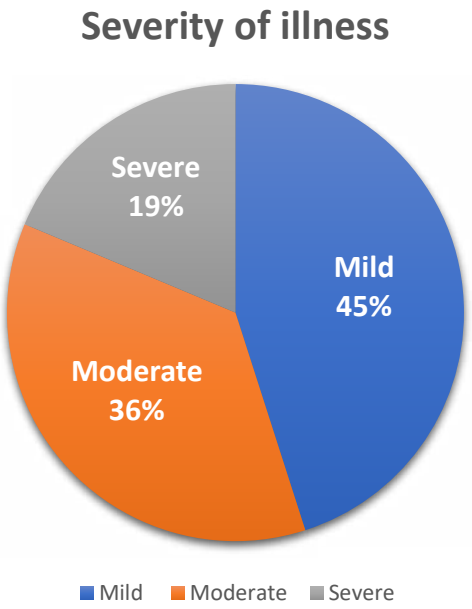
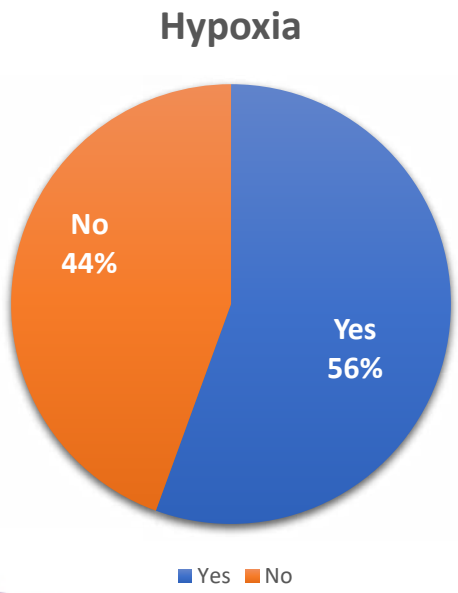
Severity of disease





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%

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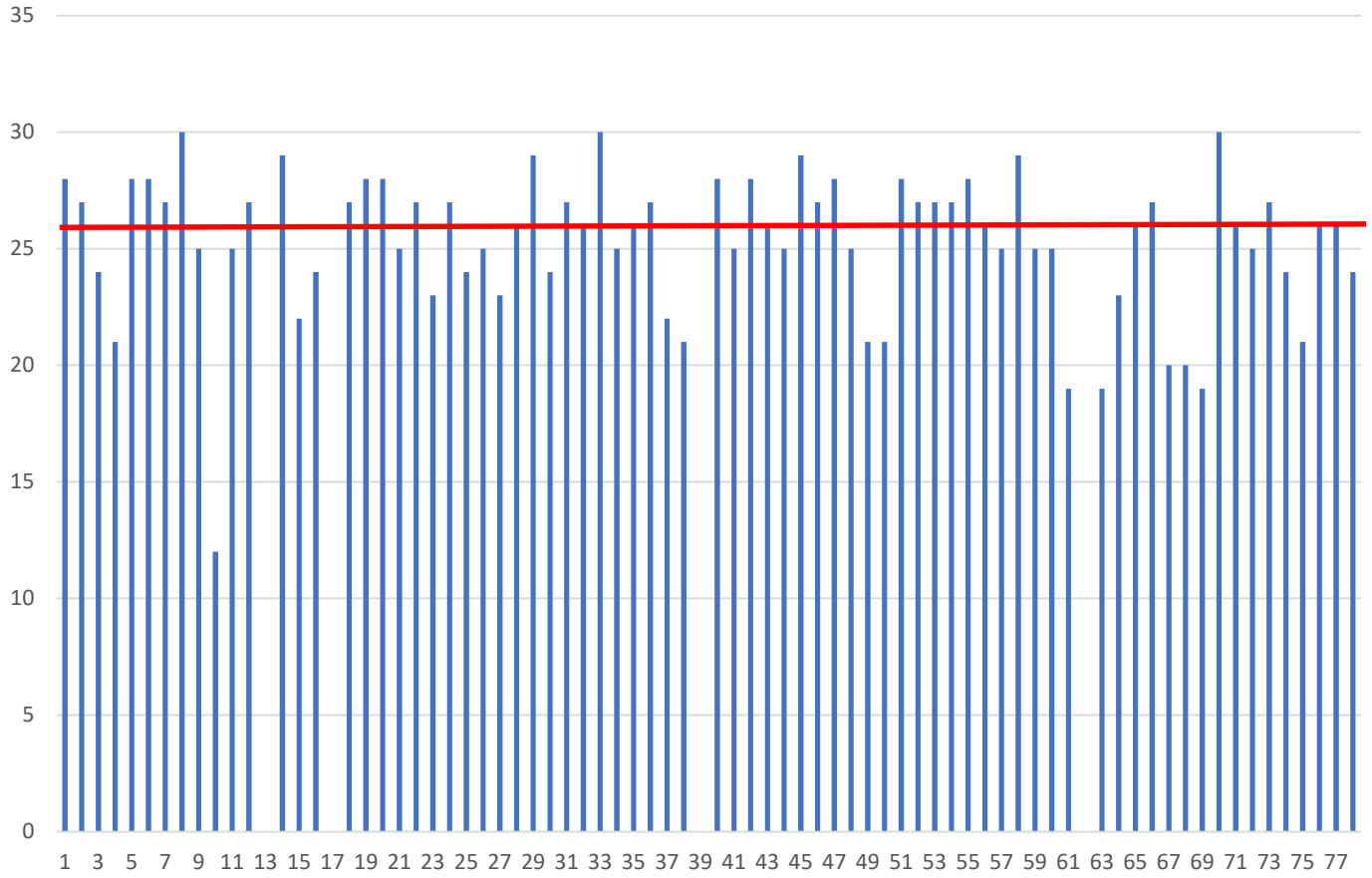
Montreal Cognitive Assessment



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Treatment

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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

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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

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

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

Questions?
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