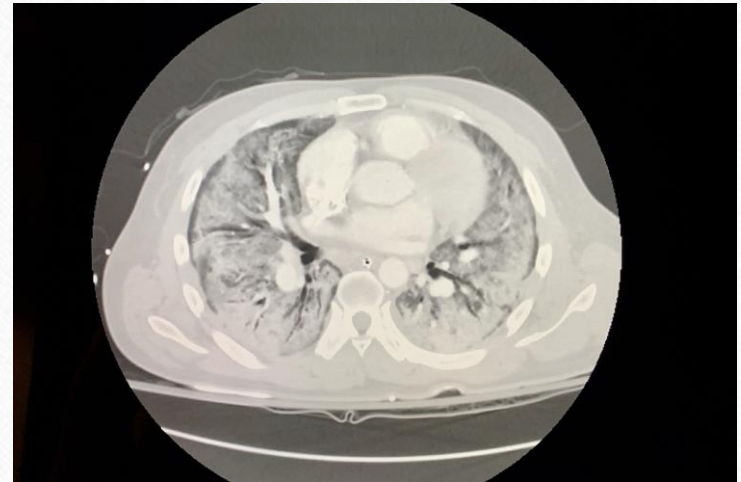


# Post-Acute Sequelae of SARS CoV-2 Infection (PASC)

Shyam Kapadia, MD

Pulmonary and Critical Care Medicine

# COVID-19 – what did we learn?



# COVID-19 – what did we learn?

Last Refresh: 7/24/2020 21:21 Time Mark Back Forward View Hide Tree Ref Range Load All Flowsheet

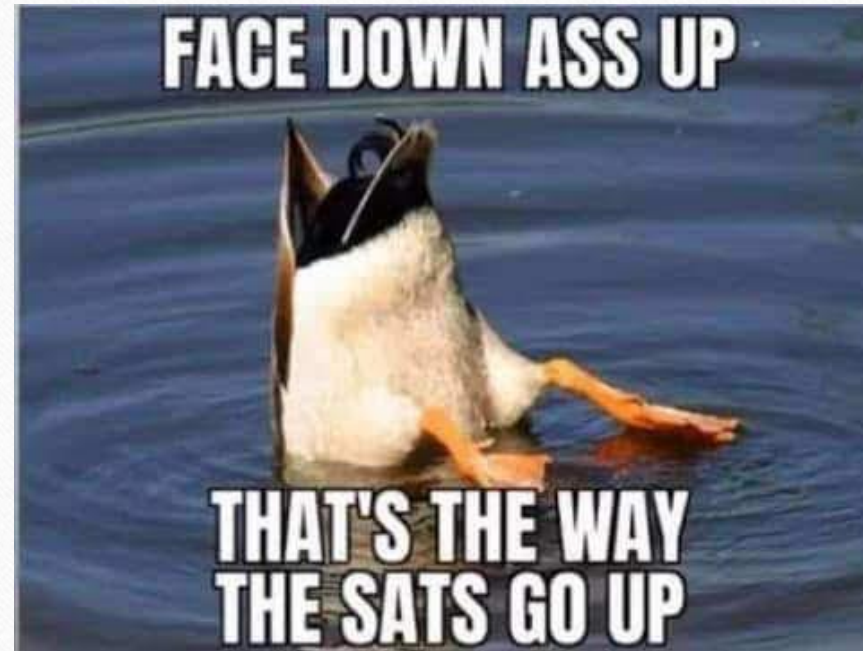
New results (No timemark set) Newest First Oldest First

	1 7/24/2020 1540	2 7/24/2020 0530	3 7/23/2020 1629	4 7/23/2020 1408	5 ... 7/23/2020 1238
<b>ARTERIAL ABG/CO-OX...</b>					
Arterial pH	7.538 ▲	7.265 ▼	7.030 ▼	6.952 ▼	6.798 ▼
Arterial PCO2	32.4 ▼	69.3 ▲	89.3 ▲	105.9 ▲	169.5 ▲
Arterial PO2	149.6 ▲	106.5 ▲	89.5	91.1	95.1
Arterial HCO3	27.0	30.8 ▲	23.1	22.9	25.7
Arterial BE	4.6 ▲	1.8	-9.8 ▼	-11.8 ▼	-13.4 ▼
Arterial SO2	99.0	97.6	95.0	93.5 ▼	91.2 ▼
Arterial THB	12.0 ▼	13.8	14.5	14.8	15.5
Arterial O2HB	98.3 ▲	97.0	94.4	92.8	90.5
Arterial COHB	0.3 *	0.3 *	0.2 *	0.1 *	0.2 *
Arterial METHB	0.4	0.3	0.4	0.7	0.6
Arterial CTD2	16.9	18.9	19.3	19.4	19.8
<b>CO-OX PANEL</b>					
Arterial Site	AL	Left Brachial	Right Radial	Right Radial	Right Radial
Arterial FID2	50.0	100.0	100.0	100.0	100.0
Arterial Mode	Ventilator	Ventilator	Ventilator	Ventilator	Ventilator



# COVID-19 – what did we learn?

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# Objectives

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- What is Post-Acute Sequelae of SARS CoV-2 Infection?
- What are the risk factors for PASC?
- What are the symptoms for PASC?
- What are the treatments for PASC?



# The Patient

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- 46 year old female with a PMH of depression who presents to the office with a chief complaint of persistent cough, exertional shortness of breath, fatigue, and a mild loss of smell.
- She was first diagnosed with COVID 19 8 weeks ago. She did not require hospitalization at that time, though had symptoms for several days.
- She was not vaccinated to COVID 19 prior to her infection





# CDC Definition

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- Post-COVID conditions are an umbrella term for the wide range of health consequences that are present **FOUR OR MORE WEEKS** after initial infection with SARS-CoV-2



# Lets Ask Google...

- 
- [https://www.google.com/search?q=post%20covid%20syndrome%20patient&tbm=isch&tbs=rimg:CbiY0-jOfNXOYWWM\\_1BL8lbYmM8AEAsgIMCgIIABABOgQIABAA&rlz=1C1GCEB\\_enUS1006US1007&hl=en-US&sa=X&ved=0CBsQuIIBahcKEwjIqfixx5f6AhUAAAAAHQAAAAAQCA&biw=1903&bih=937](https://www.google.com/search?q=post%20covid%20syndrome%20patient&tbm=isch&tbs=rimg:CbiY0-jOfNXOYWWM_1BL8lbYmM8AEAsgIMCgIIABABOgQIABAA&rlz=1C1GCEB_enUS1006US1007&hl=en-US&sa=X&ved=0CBsQuIIBahcKEwjIqfixx5f6AhUAAAAAHQAAAAAQCA&biw=1903&bih=937)

# Risk Factors for PASC

- Female Sex
- Belonging to an ethnic minority
- Socioeconomic deprivation
- Smoking
- Obesity
- Comorbidities: depression, anxiety, asthma, eczema, hay fever


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### **Symptoms and risk factors for long COVID in non-hospitalized adults**

[Anuradhaa Subramanian](#), [Krishnarajah Nirantharakumar](#) , [Sarah Hughes](#), [Puja Myles](#), [Tim Williams](#), [Krishna M. Gokhale](#), [Tom Taverner](#), [Joht Singh Chandan](#), [Kirsty Brown](#), [Nikita Simms-Williams](#), [Anoop D. Shah](#), [Megha Singh](#), [Farah Kidy](#), [Kelvin Okoth](#), [Richard Hotham](#), [Nasir Bashir](#), [Neil Cockburn](#), [Siang Ing Lee](#), [Grace M. Turner](#), [Georgios V. Gkoutos](#), [Olalekan Lee Aiyegbusi](#), [Christel McMullan](#), [Alastair K. Denniston](#), [Elizabeth Sapey](#), ... [Shamil Haroon](#) [+ Show authors](#)

# COVID Numbers... today

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- Last updated: September 15, 2022, 18:45 GMT
  - Coronavirus Cases:
    - 615,722,849
    - Deaths:
      - 6,523,927
    - Recovered:
      - 594,881,518



# Symptoms of PASC

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- Tiredness/Fatigue
- Brain fogginess
- Autonomic dysfunction/Palpitations/Dizziness
- Headache
- Cough/Dyspnea (persistent)
- Persistent loss of smell or taste
- Muscle pain/Joint pains
- Depression
- Difficulty sleeping



### Neurologic

- Olfactory deficits
- Gustatory deficits
- Headache
- Cognitive impairment
- Hearing loss/earache/tinnitus
- Retinopathy (possible)

### Psychiatric/mental health

- Insomnia
- Post traumatic stress disorder
- Depression
- Anxiety
- Obsessive compulsive syndromes
- Secondary emotional stresses (financial, social isolation, etc.)



### Cardiac/cardiovascular

- Dyspnea
- Tachycardia/palpitations
- Myocarditis
- Cerebrovascular disease
- Postural tachycardia syndrome (POTS)

### Pulmonary

- Dyspnea
- Cough
- Pulmonary fibrosis
- Impaired pulmonary function
- Pulmonary hypertension

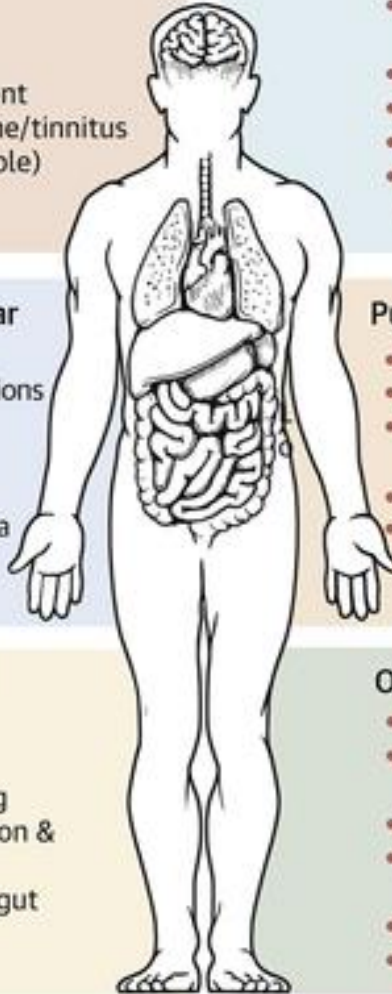


### Gastrointestinal

- Loss of appetite
- Acid reflux
- Diarrhea & vomiting
- Abdominal distension & pain
- Possible change in gut microbiome

### Other complications

- Chronic fatigue
- Kidney injury/chronic kidney disease
- Hyperglycemia/diabetes
- Pediatric inflammatory multisystemic syndrome
- Skin rash
- Hair loss



# RECOVER

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- In December 2020, Congress directed the NIH to devote \$1.15B to studying the long-term effects of COVID
- The RECOVER initiative was established in Feb 2021
- RECOVER awarded more than 30 groups with funding (including researchers from hospitals, health centers, other places)
  - \$448.3m was given to the RECOVER Clinical Science Core at NYU Langone Health
  - \$49.3m was given to the RECOVER DATA Resource Core at Massachusetts General
- Different studies are enrolling different groups of people (adults, children, their caregivers, pregnant individuals, newborns)

# What is the goal of RECOVER?

- The goal is to learn how to prevent, test, and treat PASC in the future. It will attempt to answer:
  - Why do some people get Long COVID and others do not?
  - What symptoms do people feel when they get Long COVID and how long do they last?

**Find RECOVER Study Sites Across the Country**

Use one or more of the filters below to find a study site. Sites will enroll people of certain ages and different COVID experiences, and may finish enrolling some people before others. For sites that are currently enrolling, ask to join today!

I Want a Study Site Enrolling  COVID Status  City, State, or Zip

**How to find a study site**

1. Use one or more of the filters to find a study site by study group, COVID status, or location
2. Click "Find study site"
3. To clear any of the filters, click the small grey "X" within the box



The map displays the United States with numerous orange and blue location pins scattered across the country, indicating the presence of RECOVER study sites. Labels for Canada, Mexico, Cuba, and Puerto Rico are visible on the map.

# Respiratory Symptoms

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- Respiratory symptoms are among the most common symptoms reported by patients
- These include: Shortness of breath, impaired exercise tolerance, cough and chest pain
- American Academy of PM&R Consensus

**Multi-disciplinary collaborative consensus guidance statement on the assessment and treatment of breathing discomfort and respiratory sequelae in patients with post-acute sequelae of SARS-CoV-2 infection (PASC)**

Jason H. Maley MD, George A. Alba MD, John T. Barry PT, DPT, Matthew N. Bartels MD, MPH, Talya K. Fleming MD, Christina V. Oleson MD, Leslie Rydberg MD ... [See all authors](#) ▾

First published: 13 December 2021 | <https://doi.org/10.1002/pmrj.12744> | Citations: 1

 SECTIONS

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# Assessment Recommendations

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- Clinicians should conduct a full patient history (meds received, oxygen saturation during illness, need for ICU, O2 after discharge, any new diagnoses)
  - Systematically characterize breathing discomfort
  - Trajectory of breathing discomfort (better, worse, unchanged)
- Obtain pre-COVID history (review old imaging, PFT, 6MWT)
- Obtain full set of vitals
- Consider PFT, 6MWT – in patient with breathing discomfort not improving at least 8 weeks after acute COVID-19
- Obtain chest imaging in the setting of desaturation, abnormal exam, impaired PFTs
- Consider pulmonary consultation
- Consider ENT consultation for abnormal upper airway sounds, voice changes, stridor, hoarseness, episodic breathing discomfort (especially in those that were intubated)

# Treatment Recommendations

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- Consider evaluation by a pulmonologist for any of the following:
  - Abnormal PFTs and/or chest imaging
  - Persistent productive cough and/or difficulty clearing secretions
  - Desaturations with activity
- Patients requiring home oxygen should be provided a portable oxygen device whenever possible to maximize mobility
- Refer patients with persistent breathing discomfort resulting in activity limitation for individualized rehabilitation therapy
  - If patients are awaiting PFTs, they can undergo general rehabilitation
  - Patients with PFT abnormalities meeting criteria for pulmonary rehabilitation should be referred whenever possible
- Provide breathing exercises through self-directed educational resources, in-person rehabilitation, or online programs (tele)
- For patient with chronic productive cough, difficulty clearing secretions, or with existing or new evidence of bronchiectasis, consider airway clearance techniques and consider prescribing an airway clearance device
- Pharmacologic therapies (steroids, inhaled BDs, inhaled steroids) NOT routinely recommended in the absence of impaired pulmonary function

# The End

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- Any Questions?

