Washington State Department of HEALTH

POWER OF PROVIDERS

Peer to Peer Learning Webinar

Continuing Medical Education

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the Federation of State Medical Boards, Washington Medical Commission and the Washington State Department of Health. The Federation of State Medical Boards is accredited by the ACCME to provide continuing medical education for physicians.

The Federation of State Medical Boards designates this live activity for a maximum of 1.0 *AMA PRA Category 1 Credit*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Continuing Education

- This nursing continuing professional development activity was approved by Montana Nurses Association, an accredited approver with distinction by the American Nurses Credentialing Center's Commission on Accreditation. Upon successful completion of this activity, 1.0 contact hours will be awarded.

- This program has been granted prior approval by the American Association of Medical Assistants (AAMA) for 1.0 administrative continuing education unit.

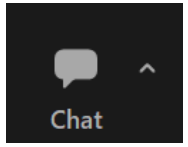
Disclosures

There are no relevant financial relationships with ineligible companies for those involved with the ability to control the content of this activity.

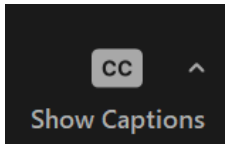
Obtaining Continuing Education

- Continuing education is available for physicians (MD, DO, ND), physician assistants, nurses (RN, ARNP, LPN), and medical assistants.
- Successful completion of this continuing education activity includes the following:
  - Attending the entire live webinar or watching the webinar recording.
  - Completing the evaluation after viewing the live webinar or webinar recording.
  - **In the evaluation survey, please check *Yes* if you're interested in continuing education credit and specify which type you wish to obtain.**
- **Please note:** CE certificates are NOT generated after evaluation completion—CE certificates will be sent by DOH within a few weeks after evaluation survey completion.
- The **expiration date** for credit for this webinar is 5/16/2024.

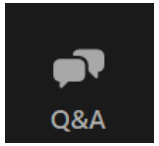
Zoom Housekeeping



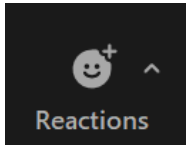
- Team shares information here
- Use for audience participation



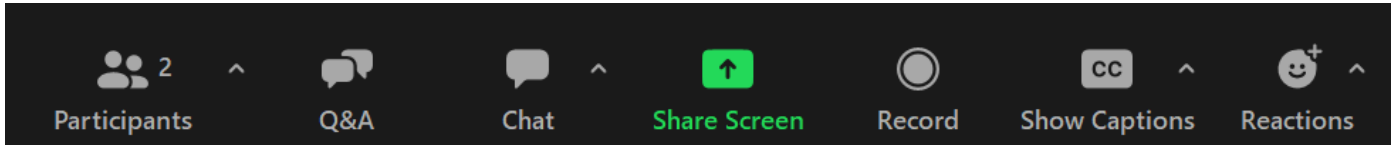
- Click to enable automatic closed captions



- Submit questions to presenter and team



- Click top-right arrow to hide participant reactions



About the Power of Providers (POP) Initiative

- Support and equip health care providers to serve as trusted sources of COVID-19 vaccine information for their patients and their communities
- Respond to member requests for resources
- Work together to increase vaccine rates across the state

Provider Commitment: SAVE

SEEK: Seek your patients' COVID-19 vaccine status

ASK/EDUCATE: If your patient isn't vaccinated, ask them about the vaccine and offer education if they are unsure

VACCINATE: Provide patient with a COVID-19 vaccine or a referral to a location that provides them

EMPOWER: Empower patients to share their vaccine status with their community

Who can join POP?

Current Membership:

- 4,500+ individuals
- 400 health care organizations
- 90 different health care roles
- Over 20 partnering health care associations

Any health care provider who engages with the people they serve about COVID-19 vaccinations is eligible—the ability to educate and refer is as important as administering the vaccine!

Visit our website to learn more at doh.wa.gov/joinpop. Fill out the member signup form to join.

Current Resources

POP Shop

Webpage to order free patient handouts, posters, discussion guides, other materials

doh.wa.gov/form/pop-shop

E-Newsletter

New resources, timely and relevant updates for members

POP en Español

Updates, links, fact sheets, other resources for providers serving Spanish-speaking populations

doh.wa.gov/popesp

Current Opportunities

Provider Advisory Group

Multi-disciplinary group of POP members who inform and help guide our work.

Peer-to-Peer Webinars

- Learn about topics related to COVID from health care experts.
- To learn about upcoming topics, register, and view recordings, visit doh.wa.gov/POPwebinars

Member Engagement

POP staff are available and engaged in conversations with providers across the state to learn about your experiences, challenges, and feedback for DOH.

Peer-to-Peer Webinars

- Health care providers share expertise and knowledge with one another
- DOH provides meeting space only, not content

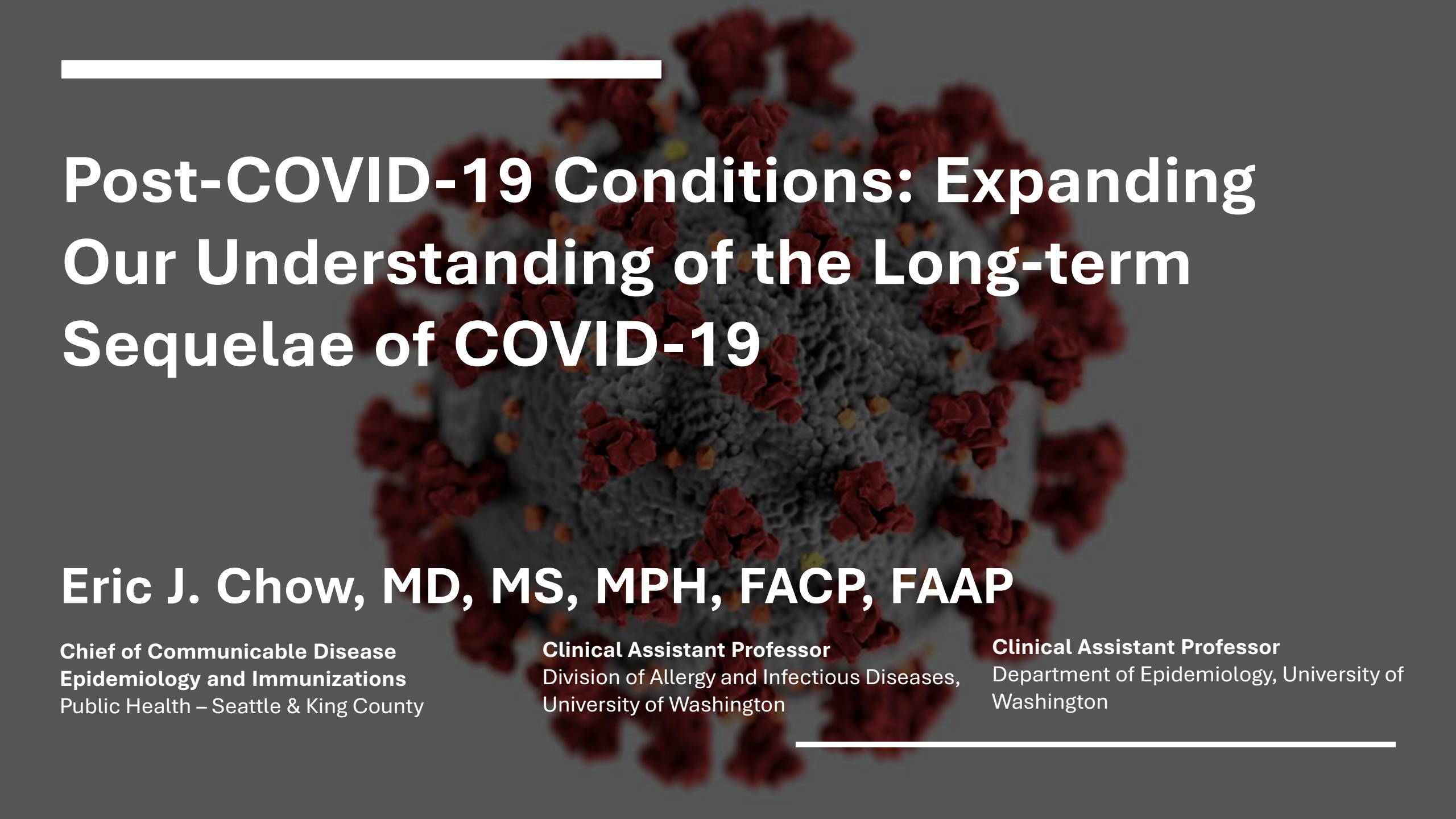
Long COVID series:

- **March 29:** Unmasking Long COVID: Insights and Updates from University of Washington Clinical Research – Dr. Helen Chu

Today's Presenter

Dr Eric J. Chow, MD, MS, MPH

- Chief of Communicable Disease Epidemiology and Immunization for Public Health – Seattle & King County.
- Clinical Assistant Professor in the Division of Allergy and Infectious Diseases and in the Department of Epidemiology. At University of Washington.
- Helped characterize the initial cases of multi-system inflammatory syndrome in children in the United States.
- His peer reviewed publications and research interests focus on community respiratory virus epidemiology, extra-pulmonary manifestations of respiratory viruses and emerging infectious diseases.



Post-COVID-19 Conditions: Expanding Our Understanding of the Long-term Sequelae of COVID-19

Eric J. Chow, MD, MS, MPH, FACP, FAAP

Chief of Communicable Disease Epidemiology and Immunizations
Public Health – Seattle & King County

Clinical Assistant Professor
Division of Allergy and Infectious Diseases, University of Washington

Clinical Assistant Professor
Department of Epidemiology, University of Washington

I have no disclosures to report.

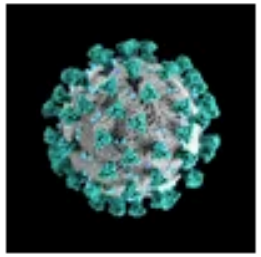
Objectives

1. Summarize the terms and case definitions associated with post-COVID-19 conditions.

2. Recognize the clinical features commonly associated with certain phenotypes of post-COVID-19 conditions.

3. Review the known epidemiology and factors associated with the development of post-COVID-19 conditions.

4. Describe the possible etiologies and underlying pathophysiologic explanations for post-COVID-19 conditions.



Coronavirus Updates

THE CORONAVIRUS CRISIS

Fauci Estimates That 100,000 To 200,000 Americans Could Die From The Coronavirus

MARCH 29, 2020 · 2:17 PM ET

Bobby Allyn

https://www.npr.org/sections/coronavirus-live-updates/2020/03/29/823517467/fauci-estimates-that-100-000-to-200-000-americans-could-die-from-the-coronavirus

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Hospitalizations

Deaths

https://covid.cdc.gov/covid-data-tracker/#datatracker-home

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

6,693,491

Hospitalizations

(as of January 2024)

Deaths

https://covid.cdc.gov/covid-data-tracker/#datatracker-home

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

6,693,491

Hospitalizations

(as of January 2024)

1,167,210

Deaths

(as of January 2024)

https://covid.cdc.gov/covid-data-tracker/#datatracker-home

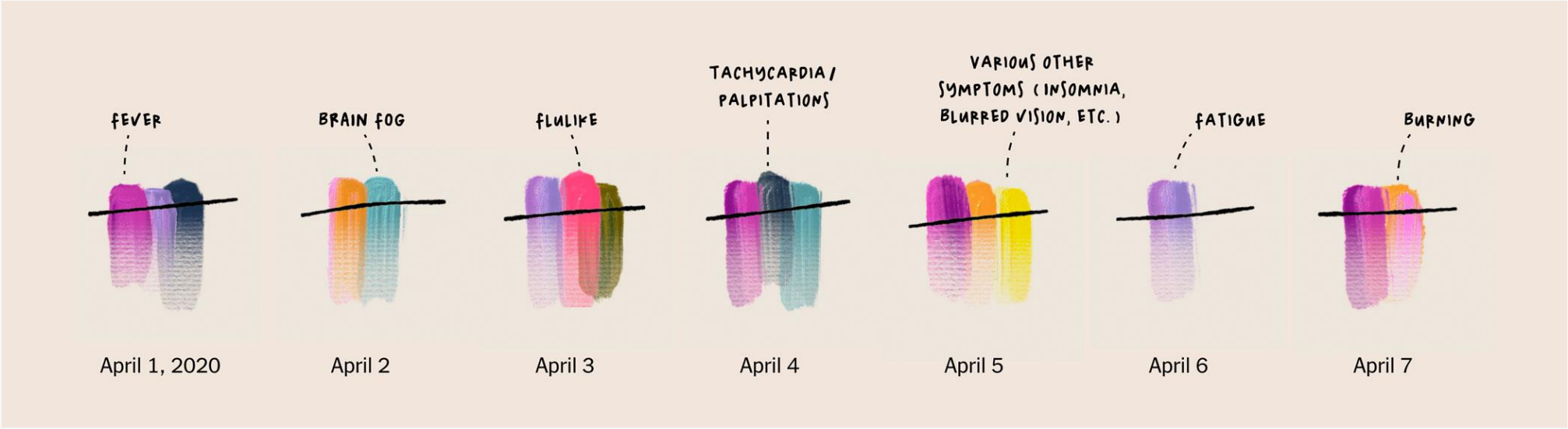
“I am one of the lucky ones. I never needed a ventilator…But 27 days later, I still have lingering pneumonia. I use two inhalers, twice a day. I can’t walk more than few blocks without stopping”

~ Mara Gay, New York Times Editorial Board Member

https://www.nytimes.com/2020/05/14/opinion/coronavirus-young-people.html

“I’ve come to realize that “long Covid” is a deceptive term for a condition that can trigger a diverse swarm of debilitating symptoms with no end in sight. What I’ve experienced is in no way just a lingering cough or a few weeks of fatigue after an acute COVID infection.”

~ Georgia Lupi



https://www.nytimes.com/interactive/2023/12/14/opinion/my-life-with-long-covid.html

“I was also reading disheartening stories of perplexed and at times dismissive healthcare providers who reduced long-haul symptoms to ‘anxiety attacks’ or ‘COVID-19-related hysteria.’ This was a ‘club’ that none of us ‘wanted’ to join.”

-Robin Macnofsky

https://academic.oup.com/ofid/article/8/6/ofab146/6188371

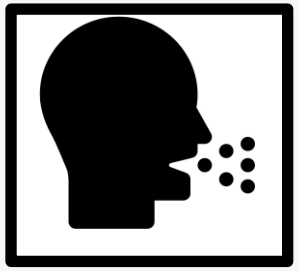
Characterized by over 200 symptoms have been reported.

Fatigue

Shortness of breath

Chest pain or palpitations

Anosmia



Cough

Dizziness or balance issues

Headache

Insomnia or sleep disturbances

Depression or anxiety

Also includes: fever, joint pain, change in libido, cognitive difficulties, GI issues, menstrual cycle irregularities

”...Under reasonable assumptions given the data available, long Covid could account for 15% of the nations... unfilled jobs.”

Bach K. Is 'long Covid' worsening the labor shortage? Accessed July 18, 2023. https://www.brookings.edu/articles/is-long-covid-worsening-the-labor-shortage/

“Approximately 18% of workers with Long COVID… could not return to work for more than 1 year”

– New York State Insurance Fund

https://ww3.nysif.com/en/footerpages/column1/aboutnysif/nysif_news/2023/20230124longcovid

- **44% of people with post-COVID-19 conditions cannot work and those that do work 51% fewer hours.**
- **Up to $9000 healthcare costs per person annually if extrapolating from chronic fatigue syndrome.**
- **As of January 2022, cost of post-COVID-19 conditions including lost wages and medical expenses is estimated to be >$386 billion.**

https://www.longhauler-advocacy.org/calculations-formulas
https://www.tandfonline.com/doi/full/10.1080/21641846.2021.1878716
https://solvecfs.org/wp-content/uploads/2022/04/Long_Covid_Impact_Paper.pdf

>773,000,000

Reported COVID-19 cases to WHO
(as of December 31 2023)

Assume

~10%

Experience post-COVID-19 conditions

~77,300,000

have had or is currently experiencing a post-COVID-19 condition

https://data.who.int/dashboards/covid19/cases?n=c

Terms and Case Definitions

A Diagnosis by Many Names and Definitions

Long COVID	Post-COVID-19 Condition	Post-COVID-Conditions	Post-acute sequelae of SARS-CoV-2 Infection (PASC)
Persistent Symptoms or COVID-19 Consequences	Ongoing symptomatic COVID-19	Post-COVID-19 syndrome	U09.9 Post-COVID-Condition, unspecified

https://www.covid.gov/assets/files/National-Research-Action-Plan-on-Long-COVID-08012022.pdf

Long COVID

Post-COVID-19 Conditions (PCC)

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

U09.9 Post-COVID Condition, unspecified

Post-COVID-19 Syndrome

Long COVID

Post-COVID-19 Conditions (PCC)

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

U09.9 Post-COVID Condition, unspecified

Post-COVID-19 Syndrome

- Patient driven by lived experience
- More commonly used in lay language
- Includes signs, symptoms, sequelae that persist or occur after acute COVID-19 experienced by individuals
- Progressive or relapse-remitting

https://www.sciencedirect.com/science/article/pii/S0277953620306456?via%3Dihub

Long COVID

Post-COVID-19 Conditions (PCC)

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

U09.9 Post-COVID Condition, unspecified

Post-COVID-19 Syndrome

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

World Health Organization

IDSA
Infectious Diseases Society of America

- Used by the medical, scientific, and public health communities
- Equivalent to “Long COVID” including direct and indirect effects of the virus
- Physical and mental health consequences present 4+ weeks after acute infection

Long COVID

Post-COVID-19 Conditions (PCC)

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

U09.9 Post-COVID Condition, unspecified

Post-COVID-19 Syndrome

National Institutes of Health

- Term used in NIH funded research studies such as RECOVER Study
- Focusing on the direct effects of the virus
- Persistent, relapsing or new symptoms or health effects after acute SARS-CoV-2 infection (present 4+ weeks after infection); definition evolving over time

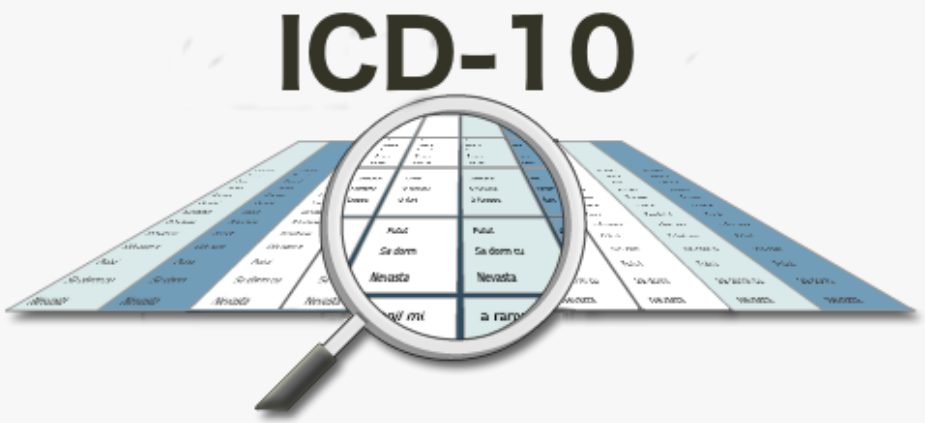
Long COVID

Post-COVID-19 Conditions (PCC)

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

U09.9 Post-COVID Condition, unspecified

Post-COVID-19 Syndrome



- International Classification of Diseases (ICD)-10 code
- No definition but establishes a link with COVID-19
- Not for acute COVID-19 unless in a setting of reinfection AND condition related to prior infection

Long COVID

Post-COVID-19 Conditions (PCC)

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

U09.9 Post-COVID Condition, unspecified

Post-COVID-19 Syndrome

NICE
National Institute for Health and Care Excellence

- UK based organization
- Long-term effects of COVID-19 divided into time periods: 4, 4-12, and >12
- Distinguishes between symptoms that are persistent after acute COVID-19 and symptoms/conditions that are new >12 weeks after infection

NATIONAL ACADEMIES

Sciences
Engineering
Medicine

What We Heard:
Engagement Report on the Working Definition for Long COVID

Presented to the Committee on Examining the Working Definition for Long COVID, at the National Academies of Sciences, Engineering, and Medicine

JUNE 2023

Prepared by EnSpark Consulting

https://www.nationalacademies.org/documents/embed/link/LF2255DA3DD1C41C0A42D3BEF0989ACAECE3053A6A9B/file/DD8E87E8161DD0ED2EA0625D300E9C2F72CC0AAE9038?noSaveAs=1

EnSpark Consulting

“Long COVID is broadly defined as signs, symptoms and conditions that continue or develop after initial COVID-19 or SARS-CoV-2 infection.

The signs, symptoms and conditions are present four weeks or more after the initial phase of infection; may be multisystemic; and may present with a relapsing-remitting pattern and progression or worsening over time with the possibility of severe and life-threatening events even months or years after infection.

Long COVID is not one condition. It represents many potentially overlapping entities, likely with different biological causes and different sets of risk factors and outcomes.”

~ U.S. Department of Health and Human Services 2022

Upcoming Events

JAN
18

12:00PM - 3:00PM (ET)
MEETING

JANUARY 18, 2024

Examining the Working Definition for Long COVID - Committee Meeting 7

FEB
5

12:00PM - 3:00PM (ET)
MEETING

FEBRUARY 5, 2024

Examining the Working Definition for Long COVID - Committee Meeting 8

Health consequences (physical and mental) that can be present 4 or more weeks after infection with SARS-CoV-2

OR

Instances in which there is a lack of return to a usual state of health following acute COVID-19

https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-conditions.html

Clinical Presentations of Post COVID-19 Conditions

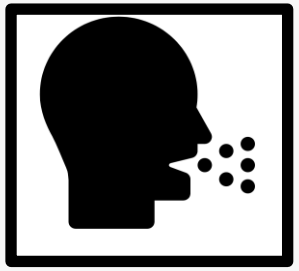
Characterized by over 200 symptoms have been reported.

Fatigue

Shortness of breath

Chest pain or palpitations

Anosmia



Cough

Dizziness or balance issues

Headache

Insomnia or sleep disturbances

Depression or anxiety

Also includes: fever, joint pain, change in libido, cognitive difficulties, GI issues, menstrual cycle irregularities

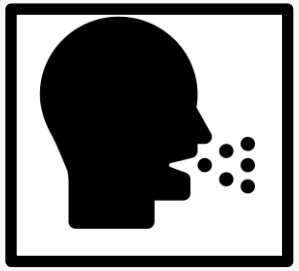
Persistent or New Symptoms and Conditions

Fatigue

Shortness of breath

Chest pain or palpitations

Anosmia



Cough

Dizziness or balance issues

Headache

Insomnia or sleep disturbances

Depression or anxiety

Also includes: fever, joint pain, change in libido, cognitive difficulties, GI issues, menstrual cycle irregularities

Increased Risk for New Health Conditions

Morbidity and Mortality Weekly Report

Post-COVID Conditions Among Adult COVID-19 Survivors Aged 18–64 and ≥65 Years — United States, March 2020–November 2021

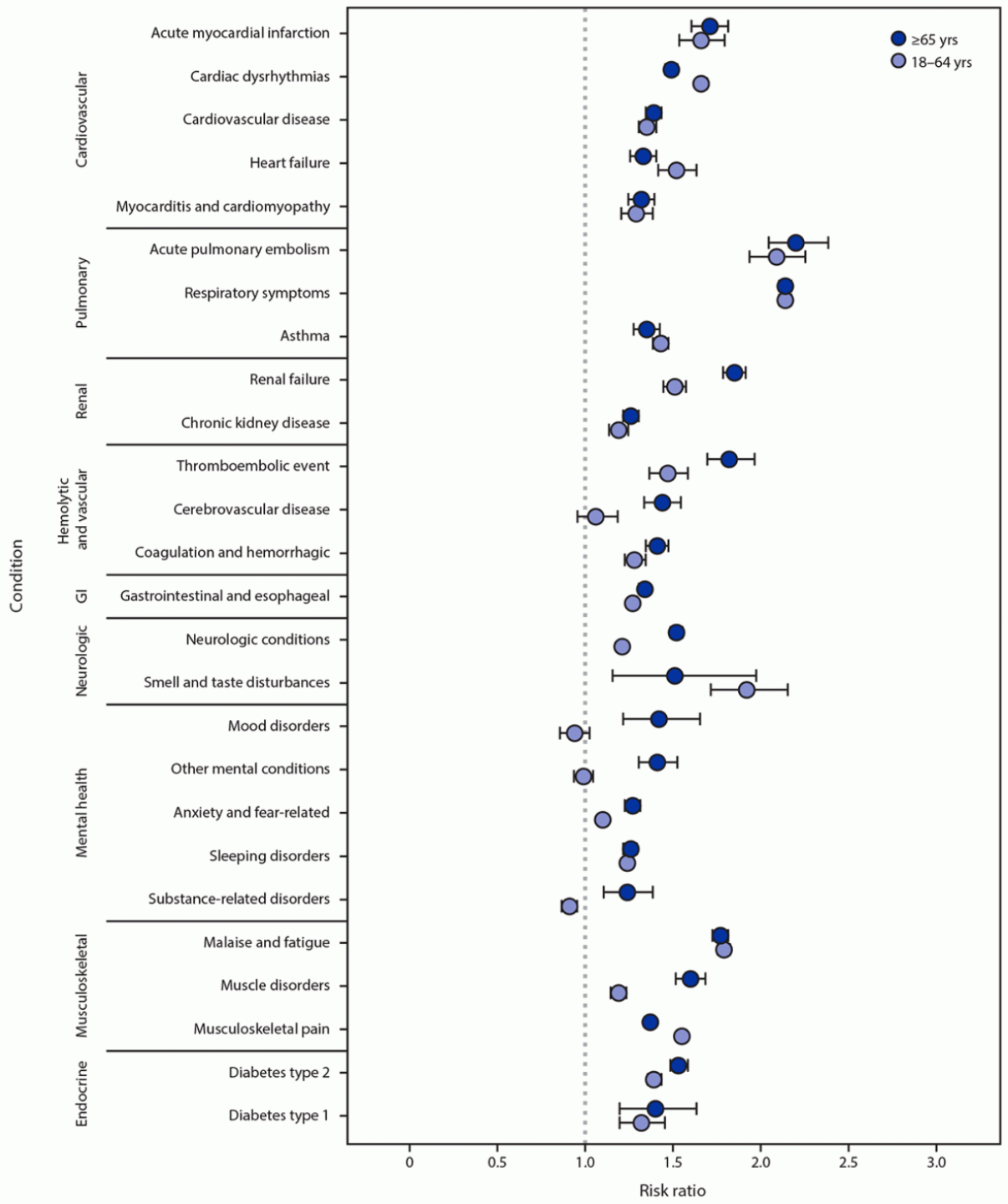
Lara Bull-Otterson, PhD[1]; Sarah Baca[1,2]; Sharon Saydah, PhD[1]; Tegan K. Boehmer, PhD[1]; Stacey Adjei, MPH[1]; Simone Gray, PhD[1]; Aaron M. Harris, MD[1]

Morbidity and Mortality Weekly Report

Post–COVID-19 Symptoms and Conditions Among Children and Adolescents — United States, March 1, 2020–January 31, 2022

Lyudmyla Kompaniyets, PhD[1]; Lara Bull-Otterson, PhD[1]; Tegan K. Boehmer, PhD[1]; Sarah Baca[1,2]; Pablo Alvarez, MPH[1,2]; Kai Hong, PhD[1]; Joy Hsu, MD[1]; Aaron M. Harris, MD[1]; Adi V. Gundlapalli, MD, PhD[1]; Sharon Saydah, PhD[1]

Health Conditions in Adults

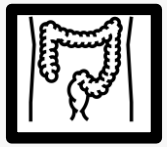


Acute Cardiovascular Events

Acute Pulmonary Events

Kidney Disease

Hematologic Diseases



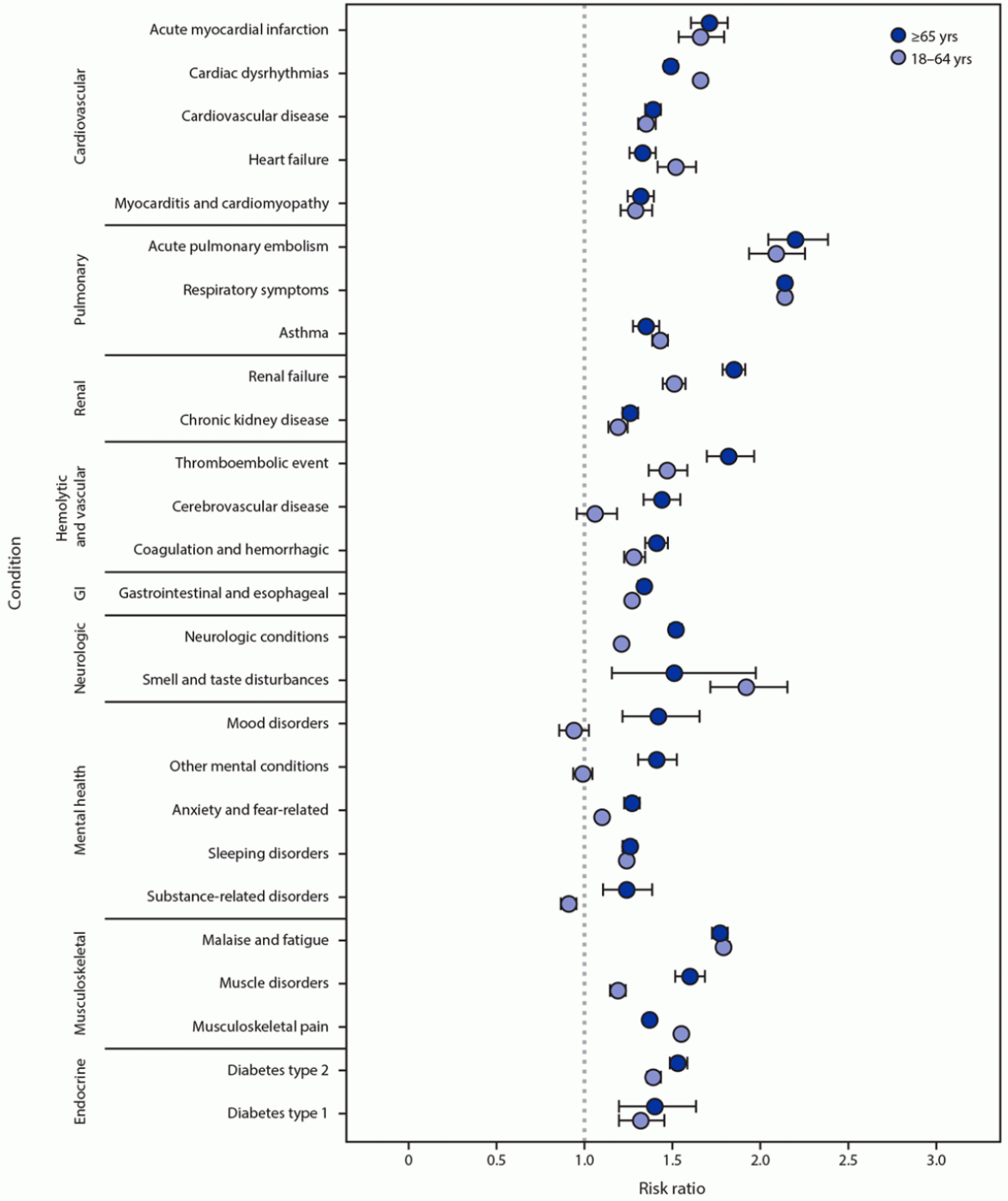
Gastrointestinal Disorders

Neurologic Disorders

Mental Health Disorders

Musculoskeletal/Rheumatic Disorders

Endocrine Disorders



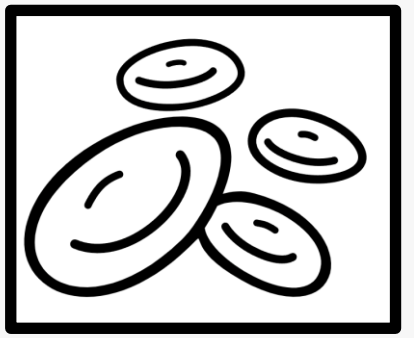
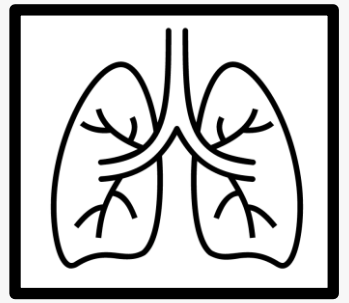
Health Conditions in Children

TABLE 3. Adjusted hazard ratios of selected potential post–COVID-19 symptoms and conditions among children and adolescents aged 2–17 years with and without COVID-19, by age group — HealthVerity medical claims database, United States, March 1, 2020–January 31, 2022

Outcome	Adjusted hazard ratio (95% CI)*		
	Aged 2–4 yrs	Aged 5–11 yrs	Aged 12–17 yrs
Symptom			
Smell and taste disturbances	1.22 (0.70–2.15)	0.94 (0.83–1.07)	1.23 (1.16–1.31)†
Circulatory signs and symptoms	1.17 (1.12–1.23)†	1.11 (1.08–1.13)†	1.04 (1.02–1.06)†
Malaise and fatigue	1.13 (1.05–1.22)†	1.08 (1.05–1.12)†	1.03 (1.01–1.04)†
Musculoskeletal pain	1.16 (1.10–1.21)†	1.06 (1.04–1.07)†	1.00 (0.99–1.01)
Dizziness and syncope	1.08 (0.90–1.29)	1.03 (0.99–1.08)	1.00 (0.98–1.02)
Gastrointestinal and esophageal disorders	1.15 (1.10–1.20)†	1.02 (1.00–1.04)†	0.97 (0.95–0.99)†
Sleeping disorders	0.99 (0.93–1.06)	0.89 (0.86–0.92)†	0.91 (0.89–0.94)†
Respiratory signs and symptoms	1.07 (1.04–1.10)†	0.93 (0.92–0.94)†	0.88 (0.87–0.89)†
Symptoms of mental conditions	1.03 (0.97–1.10)	0.92 (0.90–0.95)†	0.89 (0.86–0.91)†
Condition			
Acute pulmonary embolism	—§	—§	2.03 (1.61–2.56)†
Myocarditis and cardiomyopathy	2.39 (1.57–3.65)†	2.84 (2.39–3.37)†	1.66 (1.48–1.88)†
Venous thromboembolic event	—§	2.69 (1.73–4.19)†	1.52 (1.22–1.91)†
Acute and unspecified renal failure	1.52 (1.07–2.14)†	1.38 (1.16–1.63)†	1.27 (1.15–1.40)†
Type 1 diabetes	1.01 (0.57–1.78)	1.31 (1.13–1.53)†	1.20 (1.09–1.33)†
Coagulation and hemorrhagic disorders	1.47 (1.20–1.80)†	1.28 (1.15–1.43)†	1.10 (1.03–1.19)†
Type 2 diabetes	1.24 (0.85–1.81)	1.14 (1.02–1.28)†	1.18 (1.11–1.24)†
Cardiac dysrhythmias	1.44 (1.22–1.70)†	1.23 (1.14–1.32)†	1.12 (1.08–1.17)†
Cerebrovascular disease	1.66 (0.85–3.23)	1.14 (0.79–1.64)	1.18 (0.93–1.48)
Chronic kidney disease	0.86 (0.54–1.36)	1.04 (0.83–1.31)	1.12 (0.96–1.31)
Asthma	1.12 (1.07–1.18)†	1.02 (1.00–1.05)†	0.96 (0.94–0.98)†
Muscle disorders	0.87 (0.77–0.98)†	0.86 (0.82–0.91)†	0.96 (0.93–0.99)†
Neurological conditions	0.98 (0.93–1.04)	0.96 (0.93–0.98)†	0.91 (0.89–0.93)†
Anxiety and fear-related disorders	0.91 (0.83–1.00)	0.86 (0.83–0.88)†	0.84 (0.82–0.85)†
Mood disorders	0.82 (0.62–1.08)	0.73 (0.69–0.77)†	0.80 (0.77–0.83)†






[redacted]

RECOVER
Researching COVID to Enhance Recovery

En Español

HOME | WHAT IS LONG COVID? | RESEARCH | NEWS & EVENTS | ABOUT THE INITIATIVE

RECOVER: Researching COVID to Enhance Recovery

The National Institutes of Health (NIH) created the RECOVER Initiative to learn about the long-term effects of COVID.

The goal of RECOVER is to rapidly improve our understanding of and ability to predict, treat, and prevent PASC (post-acute sequelae of SARS-CoV-2), including Long COVID.

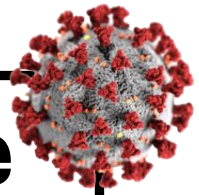
LEARN MORE ABOUT LONG COVID

Research

JAMA | Original Investigation

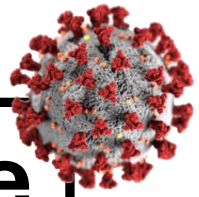
Development of a Definition of Postacute Sequelae of SARS-CoV-2 Infection

Tanayott Thaweethai, PhD; Sarah E. Jolley, MD, MS; Elizabeth W. Karlson, MD, MS; Emily B. Levitan, ScD; Bruce Levy, MD; Grace A. McComsey, MD; Lisa McCorkell, MPP; Girish N. Nadkarni, MD, MPH; Sairam Parthasarathy, MD; Upinder Singh, MD; Tiffany A. Walker, MD; Caitlin A. Selvaggi, MS; Daniel J. Shinnick, MS; Carolin C. M. Schulte, PhD; Rachel Atchley-Challenner, PhD; RECOVER Consortium Authors; Leora I. Horwitz, MD; Andrea S. Foulkes, ScD; for the RECOVER Consortium



Acute Cohort

(within 30 days after acute infection)

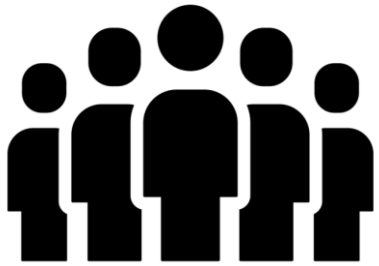


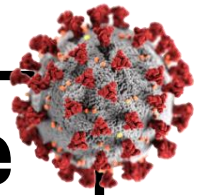
Post-acute Cohort

(30 days to 3 years after acute infection)

Uninfected Cohort

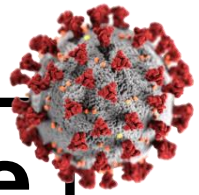
(No evidence of current or prior infection)





Acute Cohort

(within 30 days after acute infection)

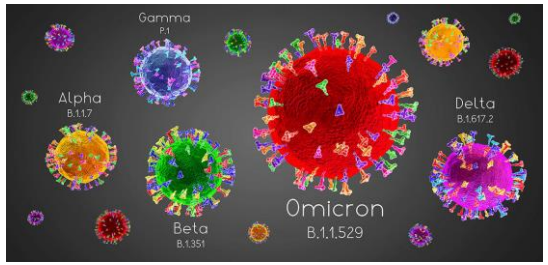


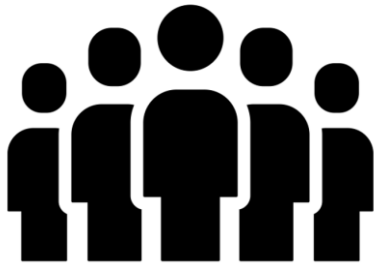
Post-acute Cohort

(30 days to 3 years after acute infection)

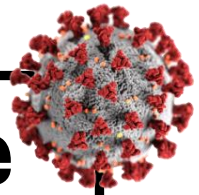
Uninfected Cohort

(No evidence of current or prior infection)



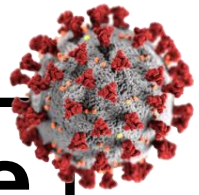


https://news.cnrs.fr/articles/choosing-a-vaccination-strategy-to-deal-with-covid-variants



Acute Cohort

(within 30 days after acute infection)

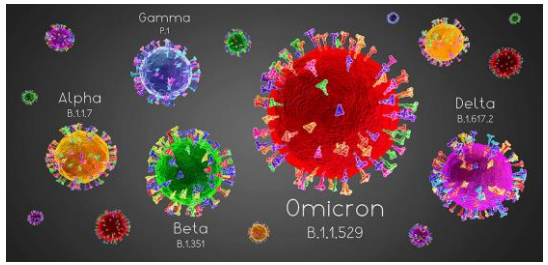


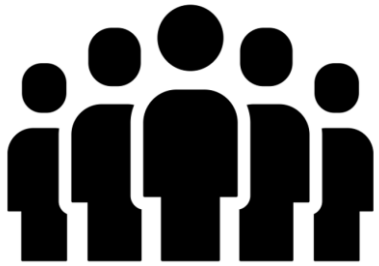
Post-acute Cohort

(30 days to 3 years after acute infection)

Uninfected Cohort

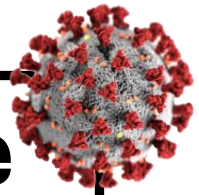
(No evidence of current or prior infection)





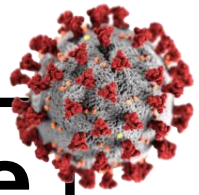
85 sites across the US

https://news.cnrs.fr/articles/choosing-a-vaccination-strategy-to-deal-with-covid-variants



Acute Cohort

(within 30 days after acute infection)

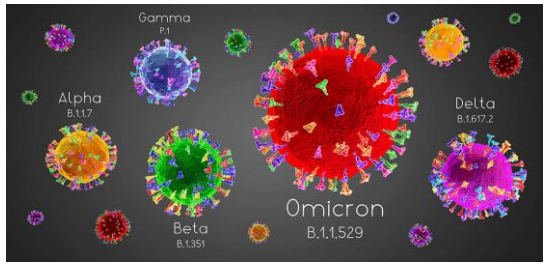


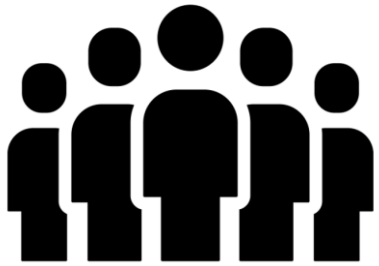
Post-acute Cohort

(30 days to 3 years after acute infection)

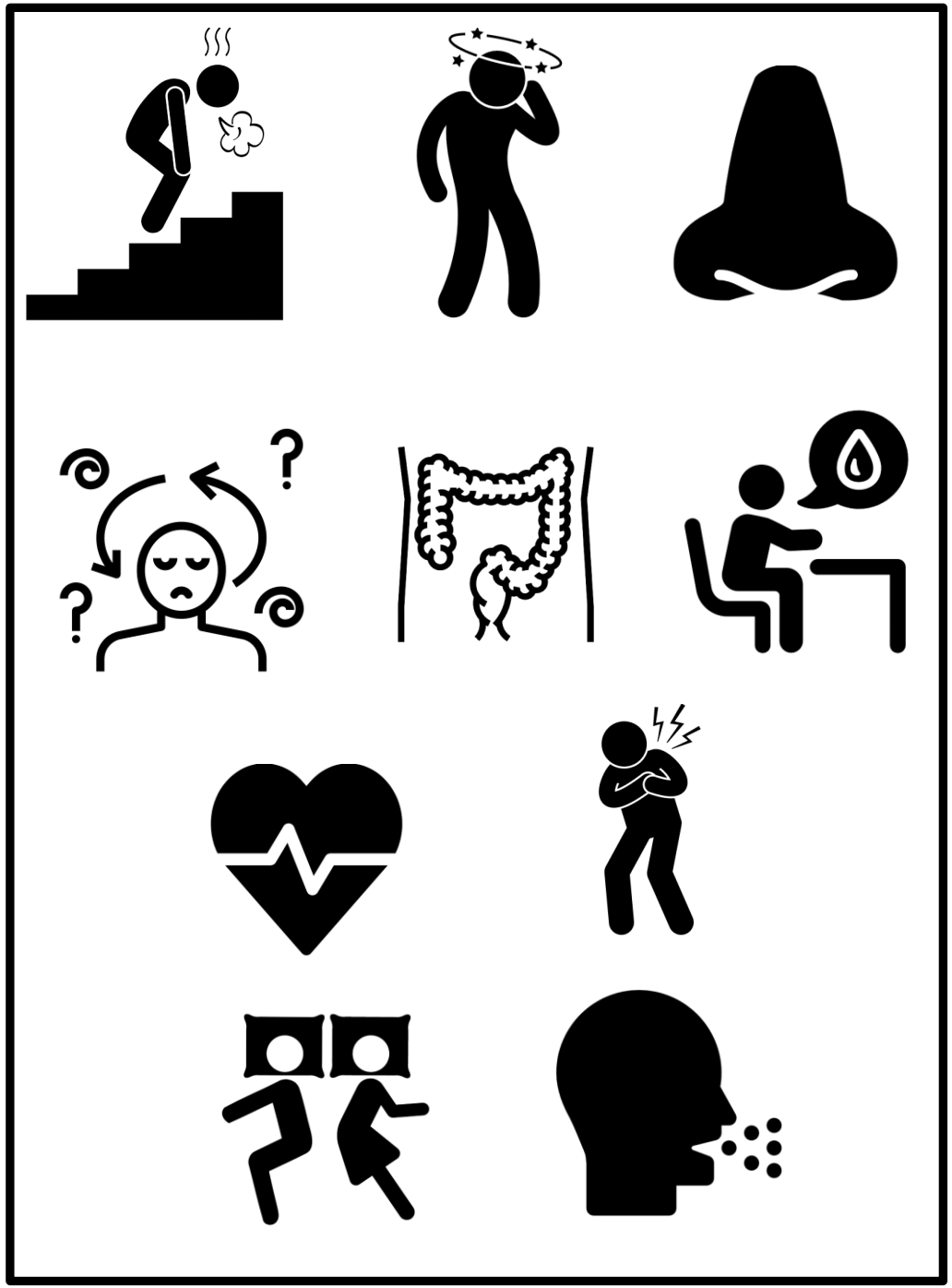
Uninfected Cohort

(No evidence of current or prior infection)

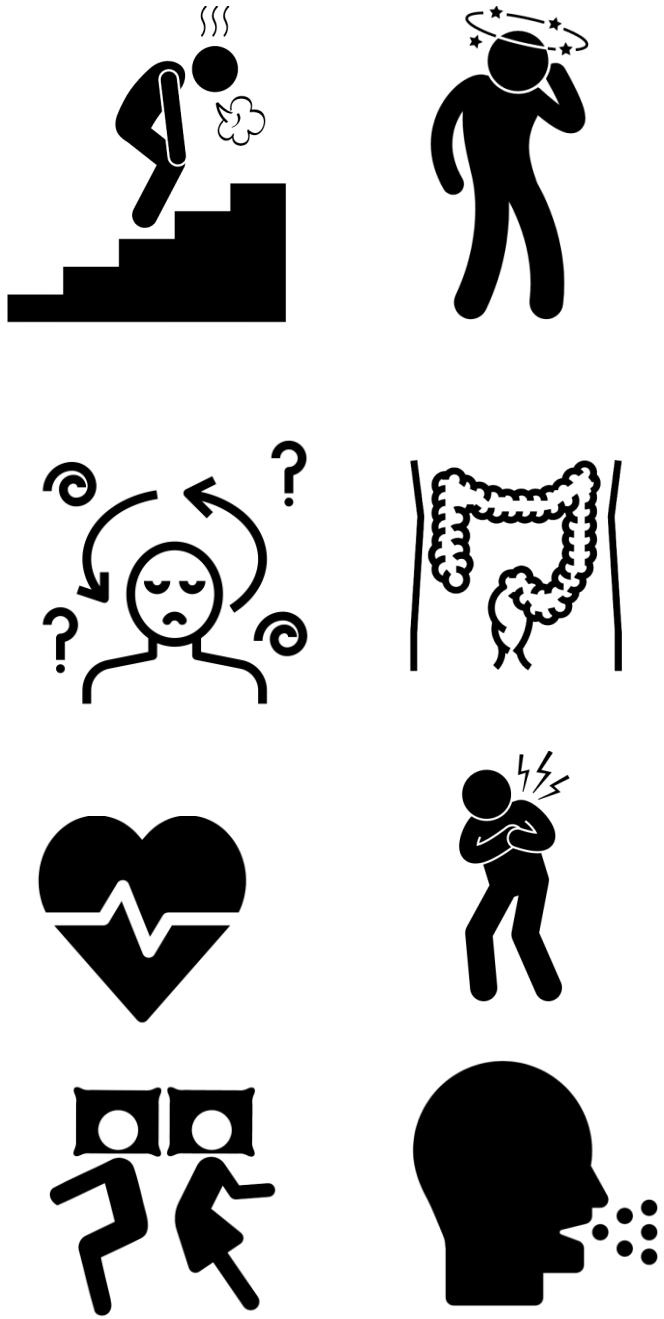




85 sites across the US

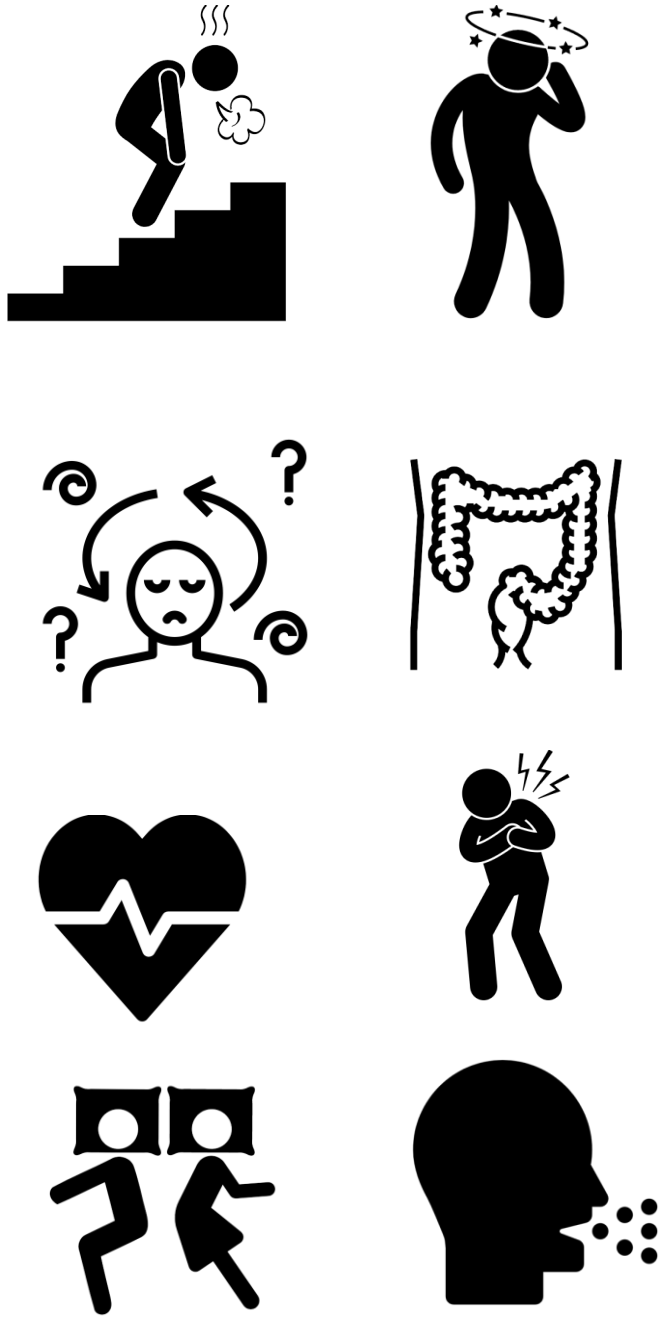


https://news.cnrs.fr/articles/choosing-a-vaccination-strategy-to-deal-with-covid-variants



Malaise and **Abnormal Movements**

1. Symptoms assigned a value
2. Score was totaled to provide the individual's PASC score
3. Using a PASC score threshold of 12 or greater to identify individuals with PASC

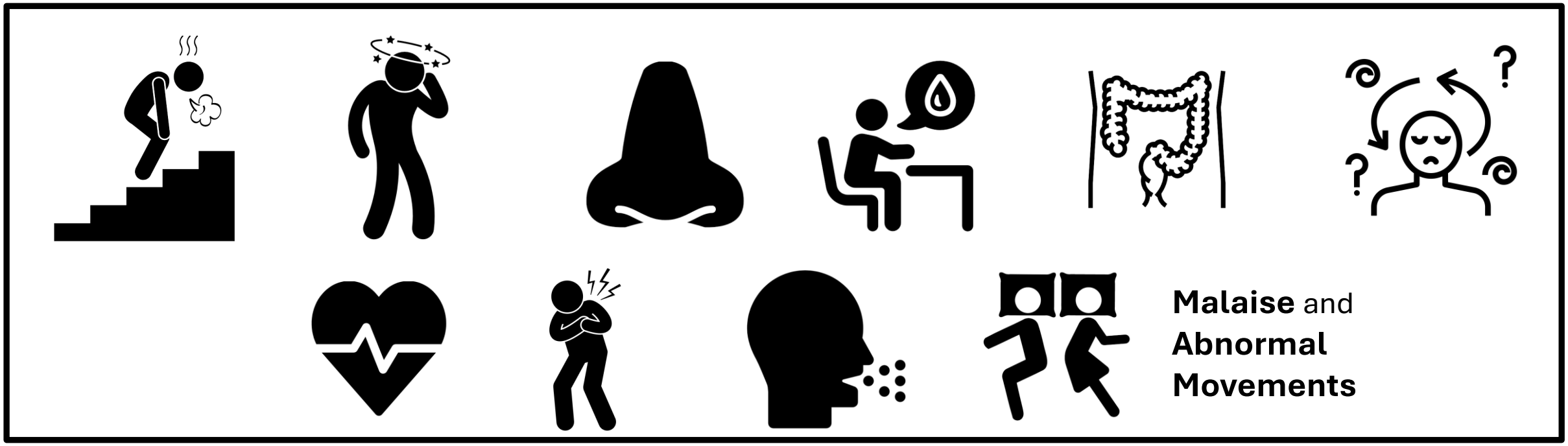


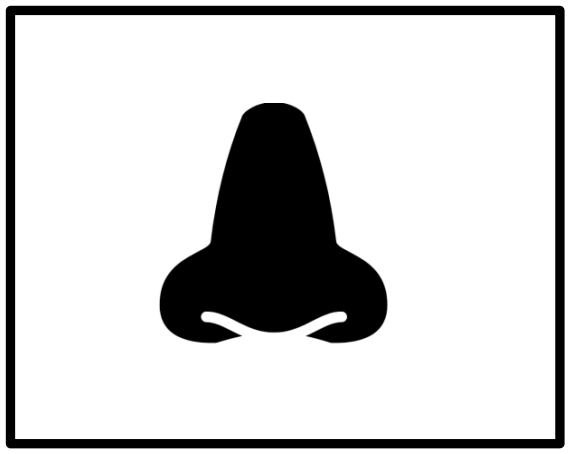
Malaise and **Abnormal Movements**

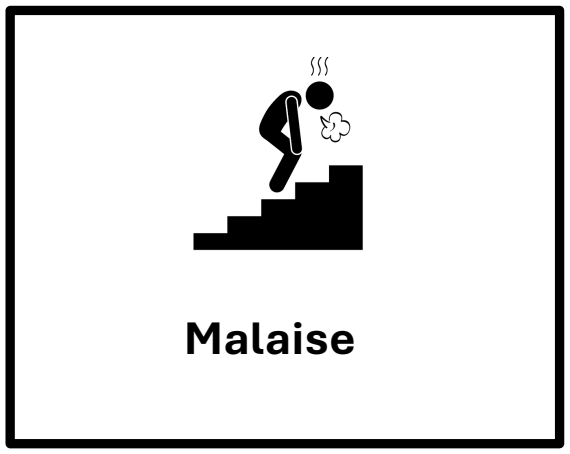
1. Among infected cohort, **23% were PASC positive**.

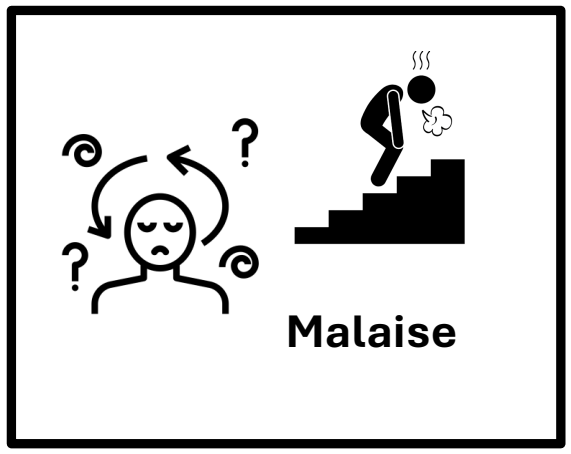
2. Among acute cohort during the Omicron period, **10% were PASC positive**.

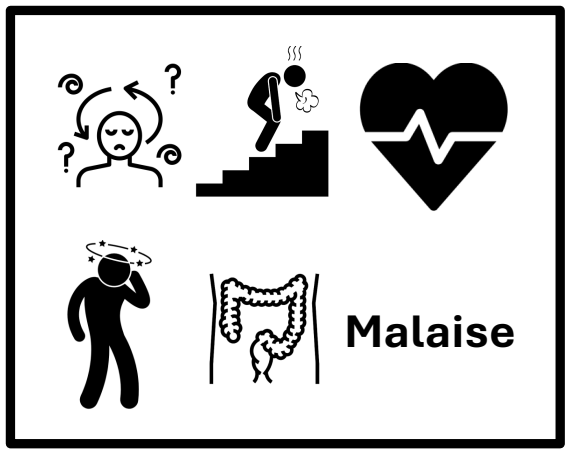
3. Should also note that **4% of people without a history of COVID-19 also met PASC score cutoff**.

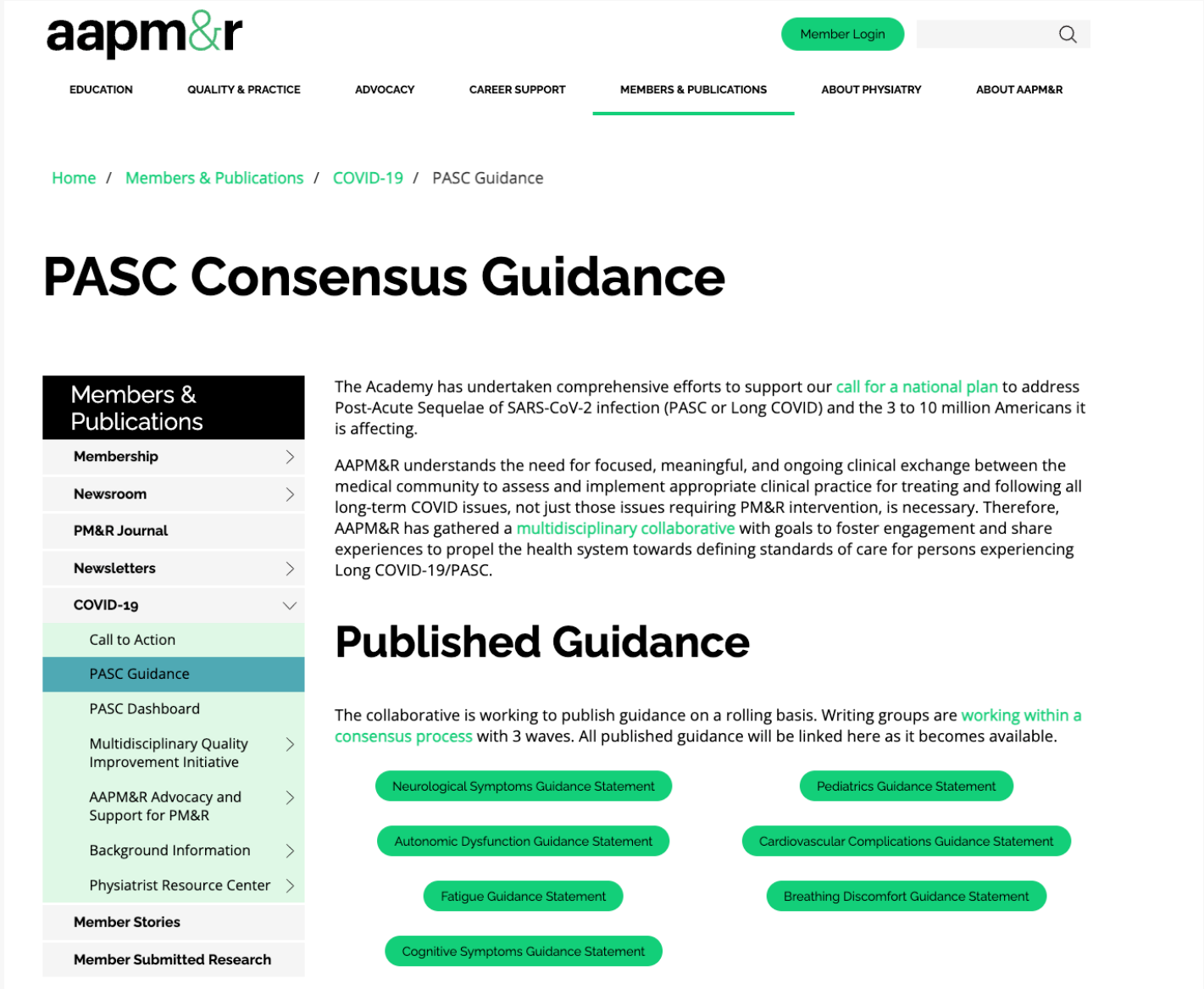

Malaise and
Abnormal
Movements




Malaise


Malaise

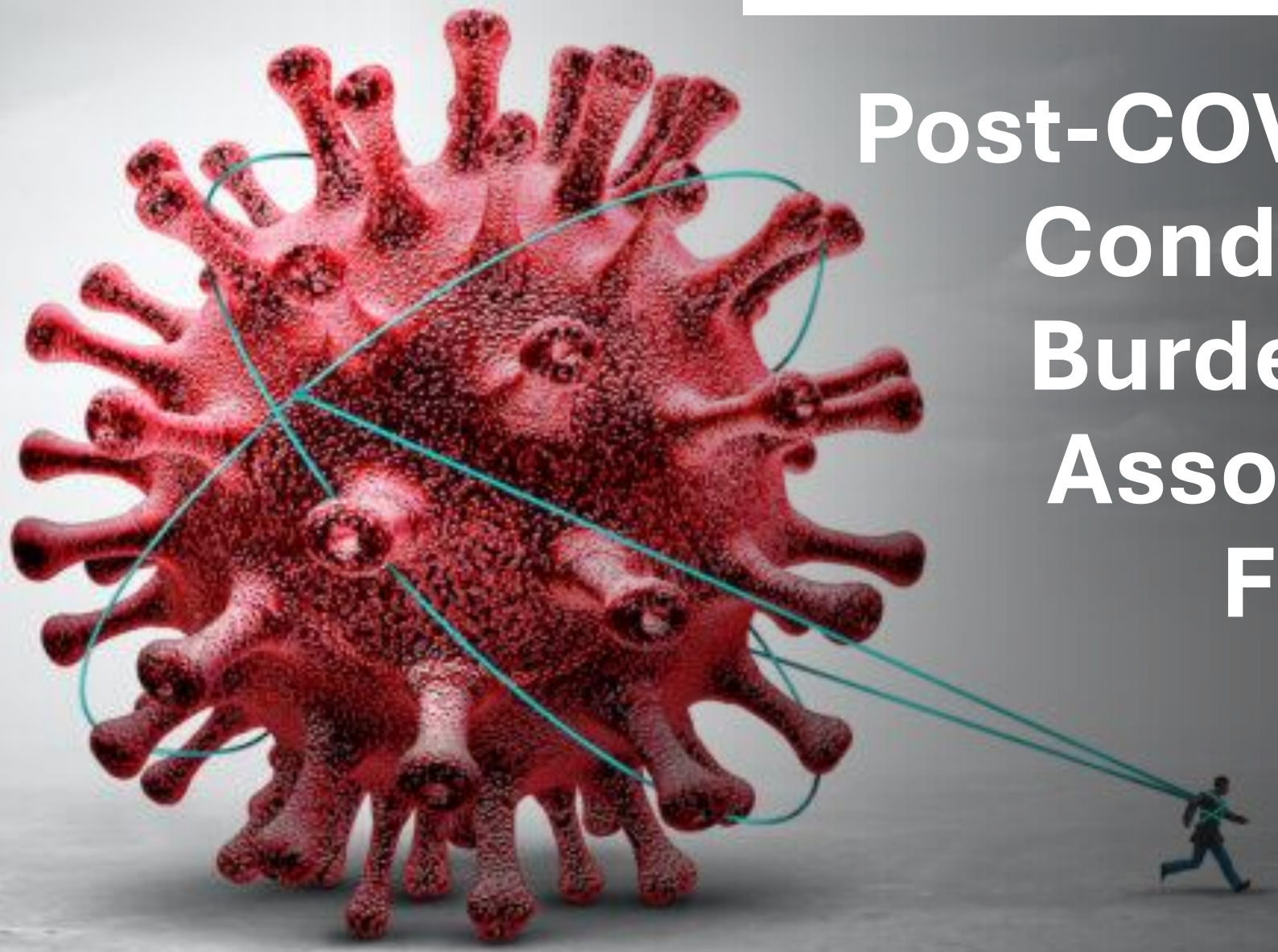

Malaise



- Neurological Symptoms
- Automatic Dysfunction
- Fatigue
- Cognitive Symptoms
- Cardiovascular Complications
- Breathing Discomfort
- Pediatrics

- **Low and slow**
- **Gradual increases**
- **Titrated work hours**

Post-COVID-19 Conditions: Burden and Associated Factors



https://medicine.wustl.edu/news/long-covid-still-worrisome-2-years-after-infection/

>773,000,000

Reported COVID-19 cases to WHO
(as of December 31 2023)

Assume

~10%

Experience post-COVID-19 conditions

~77,300,000

have had or is currently experiencing a post-COVID-19 condition

https://data.who.int/dashboards/covid19/cases?n=c

Persistence of somatic symptoms after COVID-19 in the Netherlands: an observational cohort study

Aranka V Ballering, Sander K R van Zon, Tim C olde Hartman, Judith G M Rosmalen, for the Lifelines Corona Research Initiative*

→ Post-COVID-19 condition occurs in **1 in 8 adults** with COVID-19 in the general population.

Morbidity and Mortality Weekly Report

Post-COVID Conditions Among Adult COVID-19 Survivors Aged 18–64 and ≥65 Years — United States, March 2020–November 2021

Lara Bull-Otterson, PhD[1]; Sarah Baca[1,2]; Sharon Saydah, PhD[1]; Tegan K. Boehmer, PhD[1]; Stacey Adjei, MPH[1]; Simone Gray, PhD[1]; Aaron M. Harris, MD[1]

→ Approximately **1 in 5 adults (18-64 years)** and **1 in 4 older adults (≥65 years)** had a health condition that may be related to previous SARS-CoV-2 infection.

Prevalence and risk factors of post-COVID-19 condition in adults and children at 6 and 12 months after hospital discharge: a prospective, cohort study in Moscow (StopCOVID)

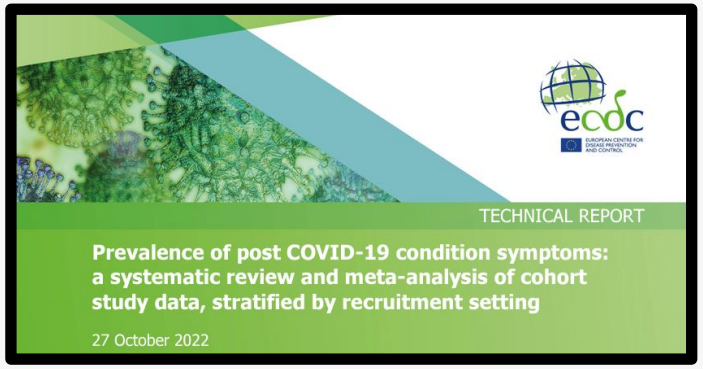
Ekaterina Pazukhina[1,21], Margarita Andreeva[31], Ekaterina Spiridonova[31], Polina Bobkova[31], Anastasia Shikhaleva[31], Yasmin El-Taravi[31], Mikhail Rumyantsev[31], Aysylu Gamirova[31], Anastasiia Bairashevskaia[3], Polina Petrova[3], Dina Baimukhambetova[3], Maria Pikuza[3], Elina Abdeeva[3], Yulia Filippova[3], Salima Deunezhewa[3], Nikita Nekliudov[3], Polina Bugaeva[3], Nikolay Bulanov[4], Sergey Avdeev[5], Valentina Kapustina[6], Alla Guekht[7,8], Audrey DunnGalvin[3,9], Pasquale Comberiati[10], Diego G. Peroni[10], Christian Apfelbacher[11], Jon Genuneit[12], Luis Felipe Reyes[13,14], Caroline L. H. Brackel[15,16], Victor Fomin[17], Andrey A. Svistunov[17], Peter Timashev[18], Lyudmila Mazankova[19], Alexandra Miroshina[20], Elmira Samitova[19,20], Svetlana Borzakova[8,21], Elena Bondarenko[3], Anatoliy A. Korsunskiy[3], Gail Carson[22], Louise Sigfrid[22], Janet T. Scott[23], Matthew Greenhawt[24], Danilo Buonsenso[25,26,27], Malcolm G. Semple[28,29], John O. Warner[30], Piero Olliaro[22], Dale M. Needham[31,32,33], Petr Glybochko[17], Denis Butnaru[17], Ismail M. Osmanov[8,20†], Daniel Munblit[3,7,30*†] and Sechenov StopCOVID Research Team

→ Prevalence of post-COVID-19 conditions estimated to be **1 in 3 adults** and **1 in 10 children** who were hospitalized with COVID-19.

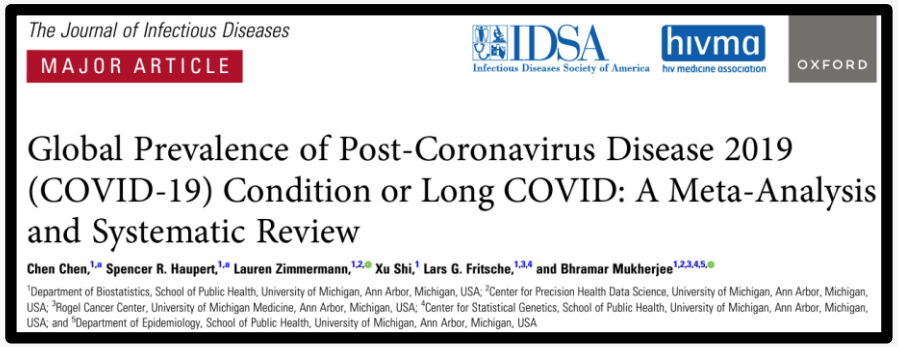
Physical and mental health 3 months after SARS-CoV-2 infection (long COVID) among adolescents in England (CLoCk): a national matched cohort study

Terence Stephenson, Snehal M Pinto Pereira, Roz Shafran, Bianca L de Stavola, Natalia Rojas, Kelsey McOwat, Ruth Simmons, Maria Zavala, Lauren O'Mahoney, Trudie Chalder, Esther Crawley, Tamsin J Ford, Anthony Harnden, Isobel Heyman, Olivia Swann, Elizabeth Whittaker, CLoCk Consortium, Shamez N Ladhani

→ Among non-hospitalized adolescents aged 11-17 years, there were **13.2% more individuals** reporting symptoms and **14% more reporting ≥3 symptoms** at 3 months among those with COVID-19 compared to those without.



Prevalence of any post COVID-19 condition symptom was estimated to be **51% among community setting cohorts**.



Estimated global prevalence of post-COVID-19 conditions estimated to be **43%** among those with prior SARS-CoV-2 infection.

15% of US adults reported ever having long COVID; **28% of adults with previous COVID-19** reported ever having long COVID

Among adult study participants first infected on or after December 1, 2021 and enrolled within 30 days of infection, **10% were PASC positive at 6 months**.

10-30% of non-hospitalized cases

50-70% of hospitalized cases

10-12% of vaccinated cases

Age

Age

- People of all ages are at risk for post-COVID-19 conditions

Age

- People of all ages are at risk for post-COVID-19 conditions
- Highest percentages of diagnoses between ages 36 and 50 years

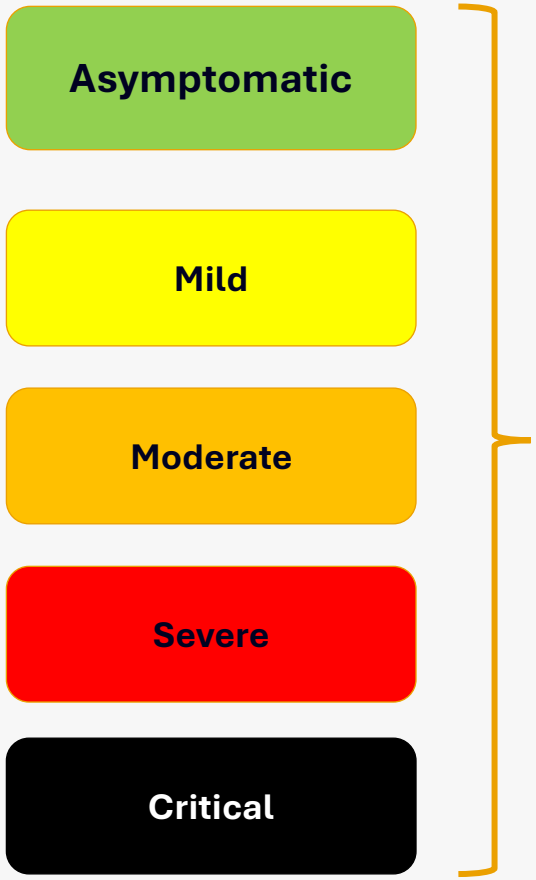
Age

- People of all ages are at risk for post-COVID-19 conditions
- Highest percentages of diagnoses between ages 36 and 50 years
- Risk appears higher in older age groups with similar acute disease severity

Acute COVID-19

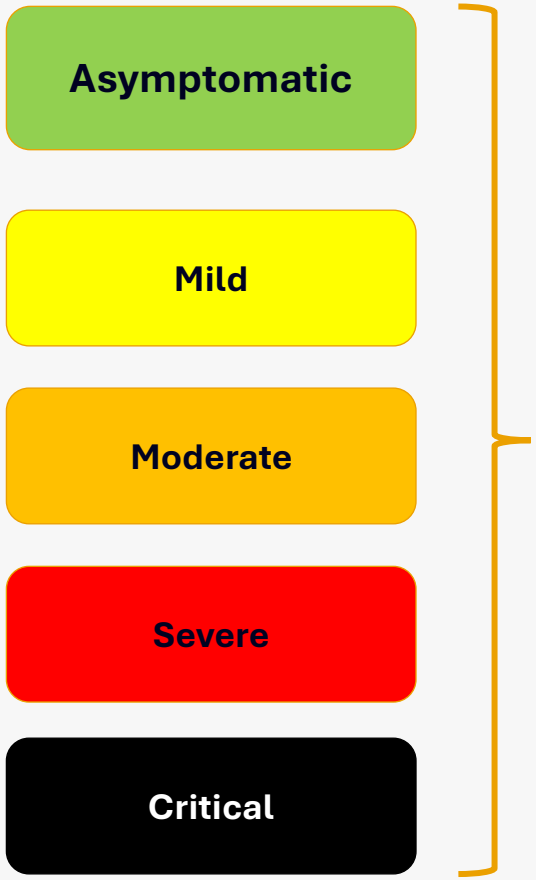
- Asymptomatic
- Mild
- Moderate
- Severe
- Critical

Acute COVID-19



- People with all acute disease severities are at risk for post-COVID-19 conditions including those who had asymptomatic or mild infection.

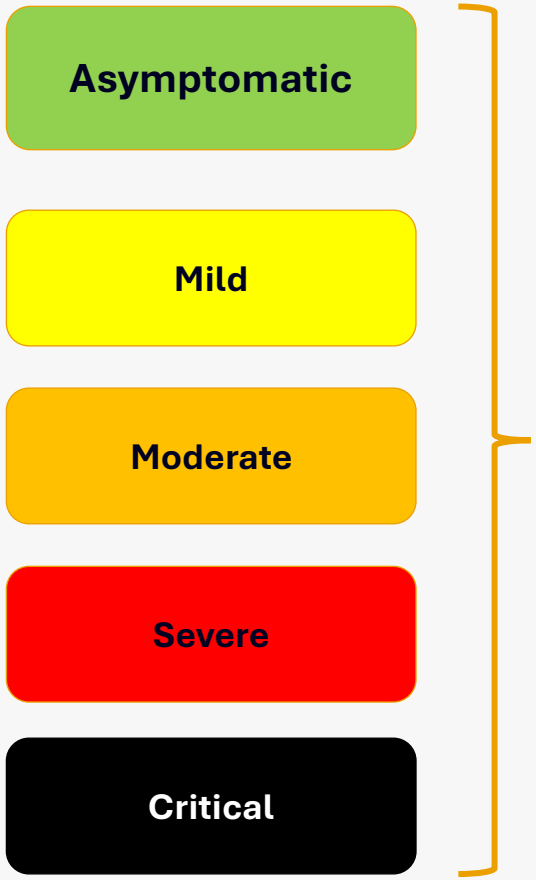
Acute COVID-19



- People with all acute disease severities are at risk for post-COVID-19 conditions including those who had asymptomatic or mild infection.

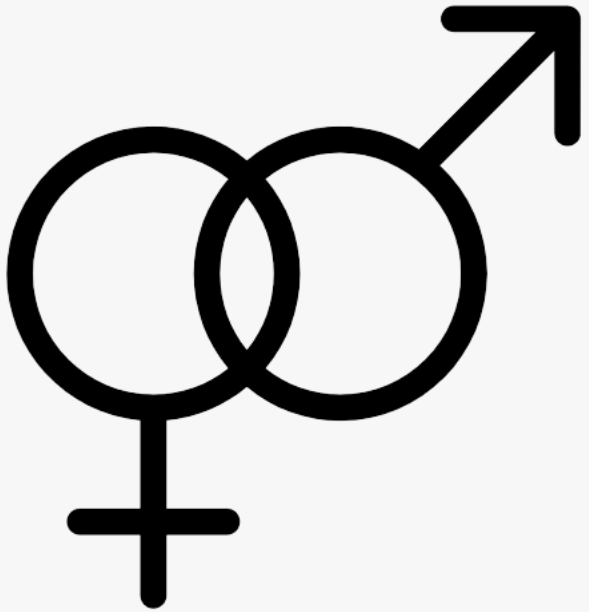
- Most cases are in individuals with mild infection given the proportion of people with non-severe acute infection.

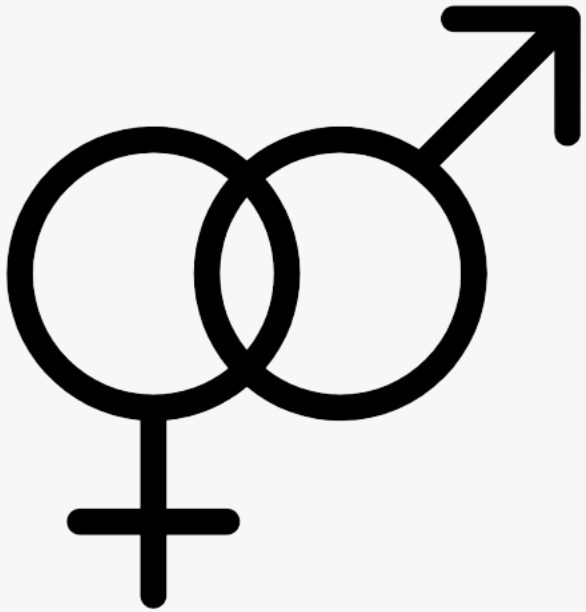
Acute COVID-19



- People with all acute disease severities are at risk for post-COVID-19 conditions including those who had asymptomatic or mild infection.
- Most cases are in individuals with mild infection given the proportion of people with non-severe acute infection.
- However, people with more severe acute COVID-19 are more at risk for post-COVID-19 conditions.


Alpha
September 2020
Delta
October 2020
Gamma
November 2020
Beta
May 2020
Omicron
November 2021





Prevalence of described cases appears to be higher in women

There are likely racial and ethnic disparities.

Morbidity and Mortality Weekly Report

Trends in Racial and Ethnic Disparities in COVID-19 Hospitalizations, by Region — United States, March–December 2020

Sebastian D. Romano, MPH[1]; Anna J. Blackstock, PhD[1]; Ethel V. Taylor, DVM[1]; Suad El Burai Felix, MPH[1]; Stacey Adjei, MPH[1]; Christa-Marie Singleton, MD[1]; Jennifer Fuld, PhD[1]; Beau B. Bruce, MD, PhD[1]; Tegan K. Boehmer, PhD[1]

Annals of Internal Medicine

REVIEW

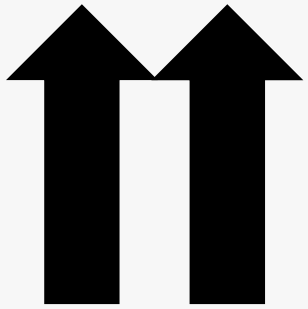
Racial and Ethnic Disparities in COVID-19–Related Infections, Hospitalizations, and Deaths

A Systematic Review

Katherine Mackey, MD, MPP; Chelsea K. Ayers, MPH; Karli K. Kondo, PhD; Somnath Saha, MD, MPH; Shailesh M. Advani, MD, MPH; Sarah Young, MPH; Hunter Spencer, DO; Max Rusek, MD; Johanna Anderson, MPH; Stephanie Veazie, MPH; Mia Smith, MPH; and Devan Kansagara, MD, MCR

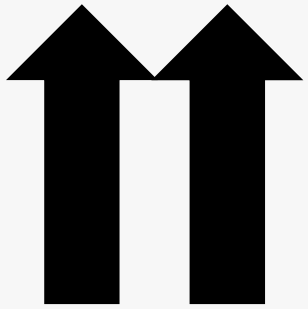
When compared to White populations, Black and Hispanic populations have:

When compared to White populations, Black and Hispanic populations have:

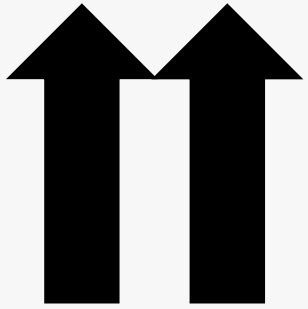


Rates of SARS-CoV-2 infections

When compared to White populations, Black and Hispanic populations have:



Rates of SARS-CoV-2 infections



Risk of hospitalization due to COVID-19

Racial/Ethnic Disparities in Post-acute Sequelae of SARS-CoV-2 Infection in New York: an EHR-Based Cohort Study from the RECOVER Program

Dhruv Khullar, MD, MPP[1,2], Yongkang Zhang, PhD[1], Chengxi Zang, PhD[1], Zhenxing Xu, PhD[1], Fei Wang, PhD[1], Mark G. Weiner, MD[1], Thomas W. Carton, PhD[3], Russell L. Rothman, MD, MPP[4], Jason P. Block, MD, MPH[5], and Rainu Kaushal, MD, MPH[1]

[1]Department of Population Health Sciences, Weill Cornell Medicine, New York, NY, USA; [2]Department of Medicine, Weill Cornell Medicine, New York, NY, USA; [3]Louisiana Public Health Institute, New Orleans, LA, USA; [4]Institute for Medicine and Public Health, Vanderbilt University Medical Center, Nashville, TN, USA; [5]Department of Population Medicine, Harvard Pilgrim Health Care Institute, Harvard Medical School, Boston, MA, USA.

Racial/Ethnic Disparities in Post-acute Sequelae of SARS-CoV-2 Infection in New York: an EHR-Based Cohort Study from the RECOVER Program

Dhruv Khullar, MD, MPP[1,2], Yongkang Zhang, PhD[1], Chengxi Zang, PhD[1], Zhenxing Xu, PhD[1], Fei Wang, PhD[1], Mark G. Weiner, MD[1], Thomas W. Carton, PhD[3], Russell L. Rothman, MD, MPP[4], Jason P. Block, MD, MPH[5], and Rainu Kaushal, MD, MPH[1]

[1]Department of Population Health Sciences, Weill Cornell Medicine, New York, NY, USA; [2]Department of Medicine, Weill Cornell Medicine, New York, NY, USA; [3]Louisiana Public Health Institute, New Orleans, LA, USA; [4]Institute for Medicine and Public Health, Vanderbilt University Medical Center, Nashville, TN, USA; [5]Department of Population Medicine, Harvard Pilgrim Health Care Institute, Harvard Medical School, Boston, MA, USA.

Black and Hispanic populations had different odds of developing specific post-COVID-19 symptoms compared to white individuals.

ORIGINAL ARTICLE—CME

PM&R

Race, ethnicity, and utilization of outpatient rehabilitation for treatment of post COVID-19 condition

Claudia B. Hentschel MD[1] | Benjamin A. Abramoff MD[2] | Timothy R. Dillingham MD[2] | Liliana E. Pezzin PhD JD[3]

Black population had a lower utilization of outpatient rehabilitation services despite similar incidence of post COVID-19 conditions.

Post-COVID-19 Conditions After Reinfection?

nature medicine

Article

https://doi.org/10.1038/s41591-022-02051-3

Acute and postacute sequelae associated with SARS-CoV-2 reinfection

Received: 12 June 2022

Accepted: 23 September 2022

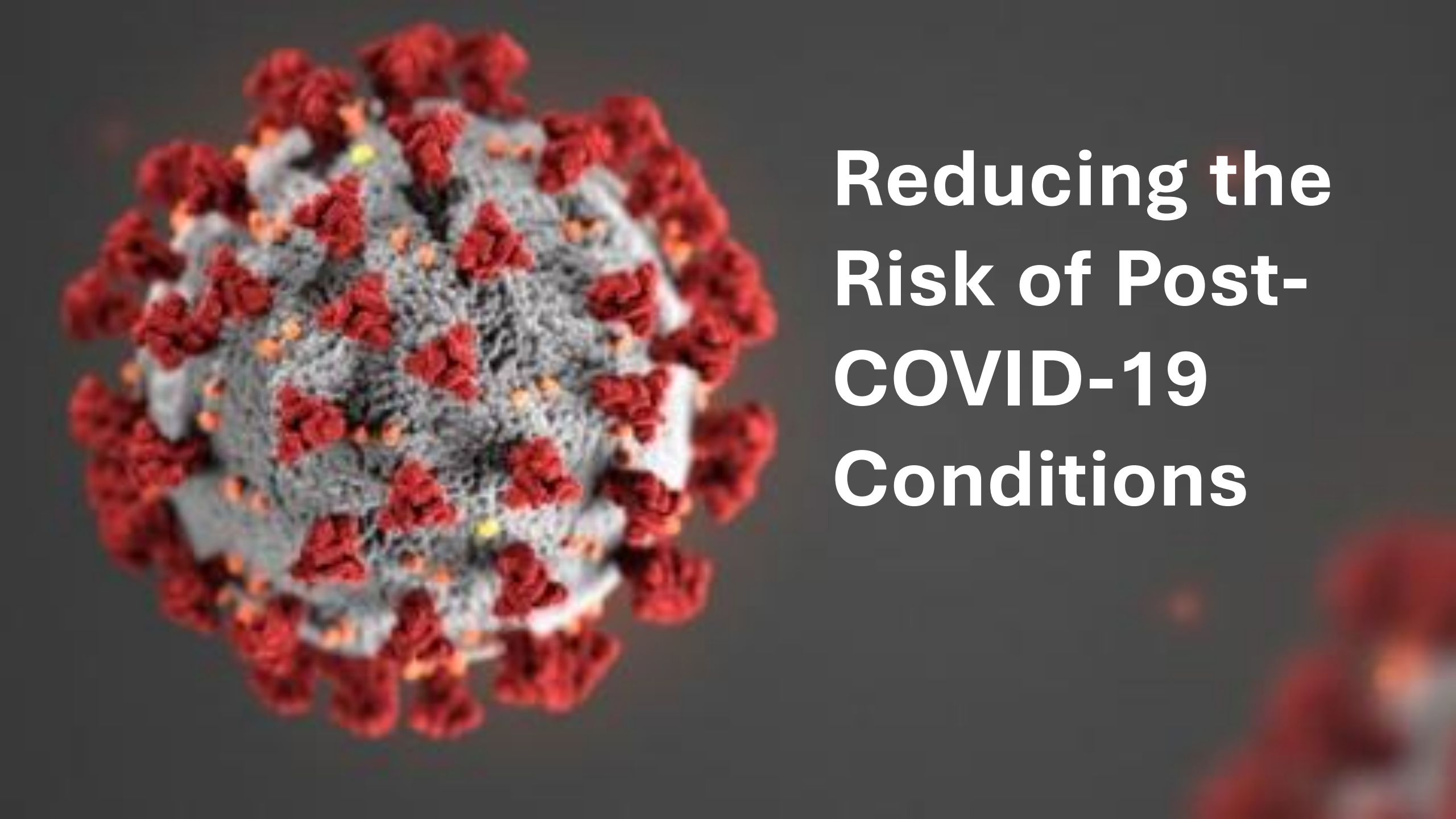
Benjamin Bowe[1,2], Yan Xie[1,2] & Ziyad Al-Aly[1,2,3,4,5]

JAMA | Original Investigation

Development of a Definition of Postacute Sequelae of SARS-CoV-2 Infection

Tanayott Thaweethai, PhD; Sarah E. Jolley, MD, MS; Elizabeth W. Karlson, MD, MS; Emily B. Levitan, ScD; Bruce Levy, MD; Grace A. McComsey, MD; Lisa McCorkell, MPP; Girish N. Nadkarni, MD, MPH; Sairam Parthasarathy, MD; Upinder Singh, MD; Tiffany A. Walker, MD; Caitlin A. Selvaggi, MS; Daniel J. Shinnick, MS; Carolin C. M. Schulte, PhD; Rachel Atchley-Challenner, PhD; RECOVER Consortium Authors; Leora I. Horwitz, MD; Andrea S. Foulkes, ScD; for the RECOVER Consortium

- **SARS-CoV-2 reinfection associated with higher risk of sequelae**
- **Cumulative risk of post-COVID-19 conditions increases with the total number of infections**



Reducing the Risk of Post-COVID-19 Conditions

[redacted]

Risk factors and disease profile of post-vaccination SARS-CoV-2 infection in UK users of the COVID Symptom Study app: a prospective, community-based, nested, case-control study

Michela Antonelli, Rose S Penfold, Jordi Merino, Carole H Sudre, Erika Molteni, Sarah Berry, Liane S Canas, Mark S Graham, Kerstin Klaser, Marc Modat, Benjamin Murray, Eric Kerfoot, Liyuan Chen, Jie Deng, Marc F Österdahl, Nathan J Cheetham, David A Drew, Long H Nguyen, Joan Capdevila Pujol, Christina Hu, Somesh Selvachandran, Lorenzo Polidori, Anna May, Jonathan Wolf, Andrew T Chan, Alexander Hammers, Emma L Duncan, Tim D Spector, Sebastien Ourselin*, Claire J Steves*

Clinical Infectious Diseases

MAJOR ARTICLE

Prevalence of Post-Coronavirus Disease Condition 12 Weeks After Omicron Infection Compared With Negative Controls and Association With Vaccination Status

Mayssam Nehme,[1] Pauline Vetter,[2,3,4] François Chappuis,[5,6] Laurent Kaiser,[2,3,4] and Idris Guessous;[1,6] for the CoviCare Study Team[a]

[1]Division of Primary Care Medicine of the Geneva University Hospitals, Geneva, Switzerland; [2]Division of Infectious Diseases, Geneva University Hospitals, Geneva, Switzerland; [3]Geneva Center for Emerging Viral Diseases, Geneva University Hospitals, Geneva, Switzerland; [4]Division of Laboratory Medicine, Laboratory of Virology, Geneva University Hospitals, Geneva, Switzerland; [5]Division of Tropical and Humanitarian Medicine, Geneva University Hospitals, Geneva, Switzerland; and [6]Faculty of Medicine, University of Geneva, Geneva, Switzerland

nature medicine

ARTICLES

https://doi.org/10.1038/s41591-022-01840-0

Check for updates

OPEN

Long COVID after breakthrough SARS-CoV-2 infection

Ziyad Al-Aly[1,2,3,4,5] ✉, Benjamin Bowe[1,2] and Yan Xie[1,2,6]

Association Between BNT162b2 Vaccination and Long COVID After Infections Not Requiring Hospitalization in Health Care Workers

Survivors of COVID-19 may present with long-lasting symptoms.[1] Some factors have been associated with the development of post-COVID conditions (also referred to as "long COVID"),[2] including hospitalization.[3] A study of older US veterans showed 15% reduction of long COVID after vaccination; however, study limitations included the low number of women and suboptimal vaccination schedules.[4]

Supplemental content

JAMA | Original Investigation

Development of a Definition of Postacute Sequelae of SARS-CoV-2 Infection

Tanayott Thaweethai, PhD; Sarah E. Jolley, MD, MS; Elizabeth W. Karlson, MD, MS; Emily B. Levitan, ScD; Bruce Levy, MD; Grace A. McComsey, MD; Lisa McCorkell, MPP; Girish N. Nadkarni, MD, MPH; Sairam Parthasarathy, MD; Upinder Singh, MD; Tiffany A. Walker, MD; Caitlin A. Selvaggi, MS; Daniel J. Shinnick, MS; Carolin C. M. Schulte, PhD; Rachel Atchley-Challenner, PhD; RECOVER Consortium Authors; Leora I. Horwitz, MD; Andrea S. Foulkes, ScD; for the RECOVER Consortium

A Summary of the Findings:

1. COVID-19 vaccination is associated with a reduction in risk of post-COVID-19 conditions in a dose response fashion.

2. Proportion of individuals with post-COVID-19 conditions was lower among fully vaccinated than unvaccinated participants before and during Omicron circulation

3. To protect against post-COVID-19 conditions, a layered approach combining COVID-19 vaccination and non-pharmaceutical interventions to prevent SARS-CoV-2 infection in the first place is needed.


Pfizer
PAXLOVID™
(nirmatrelvir tablets; ritonavir tablets),
co-packaged for oral use
300 mg; 100 mg Dose Pack
Remdesivir
Multiple dose vial. See package insert
Store between 2° to 8° (35° to 46° F)
Do Not Freeze
10 doses
0.5 ml each
MERCK
Molnupiravir
For Covid-19 treatment
For emergency use only

Research

JAMA Internal Medicine | Original Investigation

Association of Treatment With Nirmatrelvir and the Risk of Post–COVID-19 Condition

Yan Xie, PhD; Taeyoung Choi, MPH; Ziyad Al-Aly, MD

ORIGINAL RESEARCH

Annals of Internal Medicine

Effectiveness of Nirmatrelvir–Ritonavir Against the Development of Post–COVID-19 Conditions Among U.S. Veterans

A Target Trial Emulation

George N. Ioannou, BMBCh, MS; Kristin Berry, PhD; Nallakkandi Rajeevan, PhD; Yuli Li, MS; Pradeep Mutalik, MD; Lei Yan, PhD; David Bui, PhD; Francesca Cunningham, PharmD; Denise M. Hynes, MPH, PhD, RN; Mazhgan Rowneki, MPH; Amy Bohnert, PhD, MHS; Edward J. Boyko, MD, MPH; Theodore J. Iwashyna, MD, PhD; Matthew L. Maciejewski, PhD; Thomas F. Osborne, MD; Elizabeth M. Viglianti, MD, MPH, MSc; Mihaela Aslan, PhD; Grant D. Huang, MPH, PhD; and Kristina L. Bajema, MD, MSc

www.nature.com/scientificreports

scientific reports

Check for updates

OPEN

Nirmatrelvir/ritonavir and risk of long COVID symptoms: a retrospective cohort study

Seth Congdon[1✉], Zev Narrowe[2], Nang Yone[2], Jacob Gunn[2], Yuting Deng[1], Priya Nori[1], Kelsie Cowman[1], Marjan Islam[3], Sharon Rikin[1] & Joanna Starrels[1]

RESEARCH

OPEN ACCESS

Check for updates

Molnupiravir and risk of post-acute sequelae of covid-19: cohort study

Yan Xie,[1,2] Taeyoung Choi,[1,2] Ziyad Al-Aly[1,2,3,4,5]

Research Letter

October 23, 2023

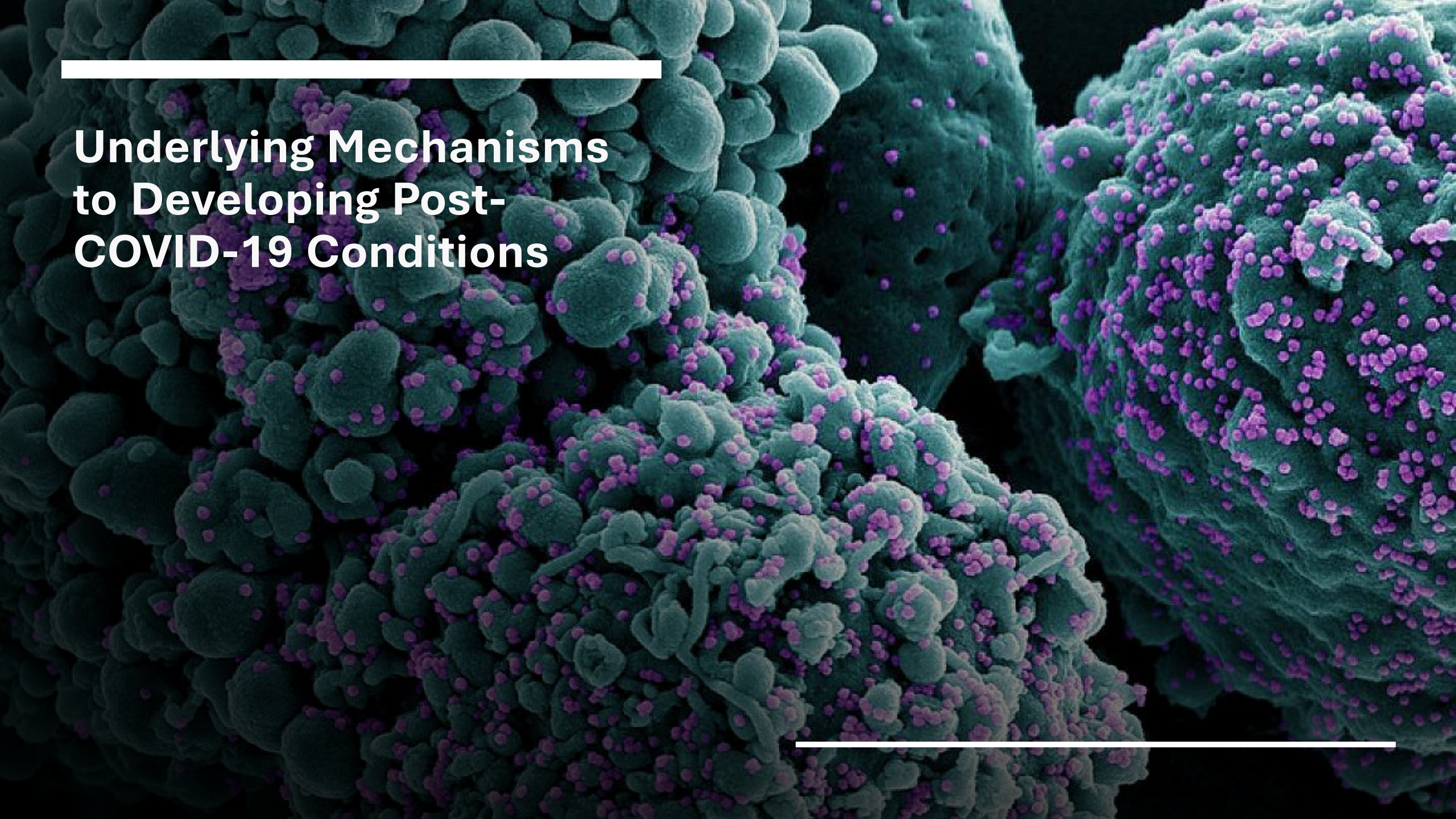
Nirmatrelvir and Molnupiravir and Post–COVID-19 Condition in Older Patients

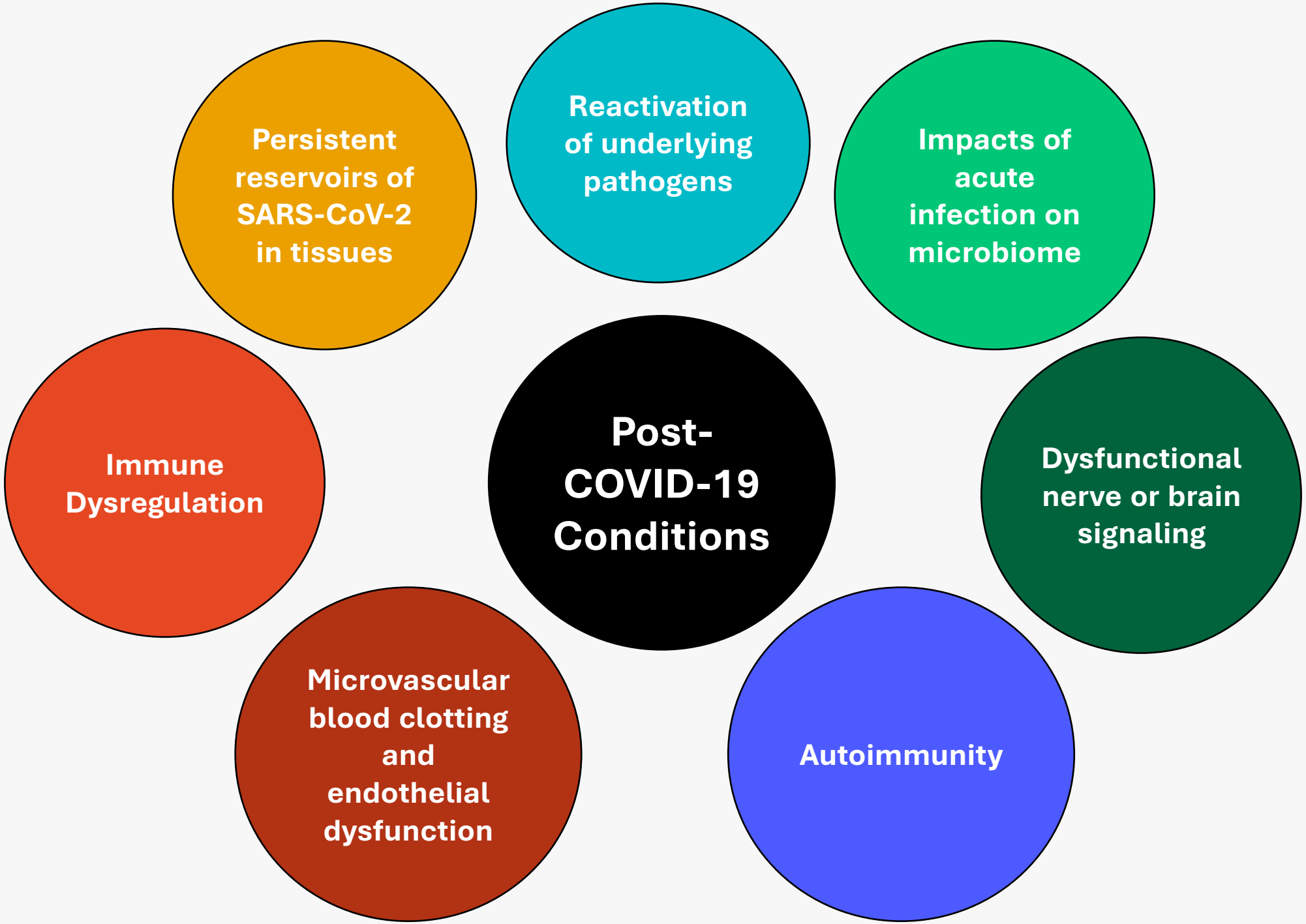
Kin Wah Fung, MD[1]; Fitsum Baye, MS[1]; Seo H. Baik, PhD[1,2]; et al

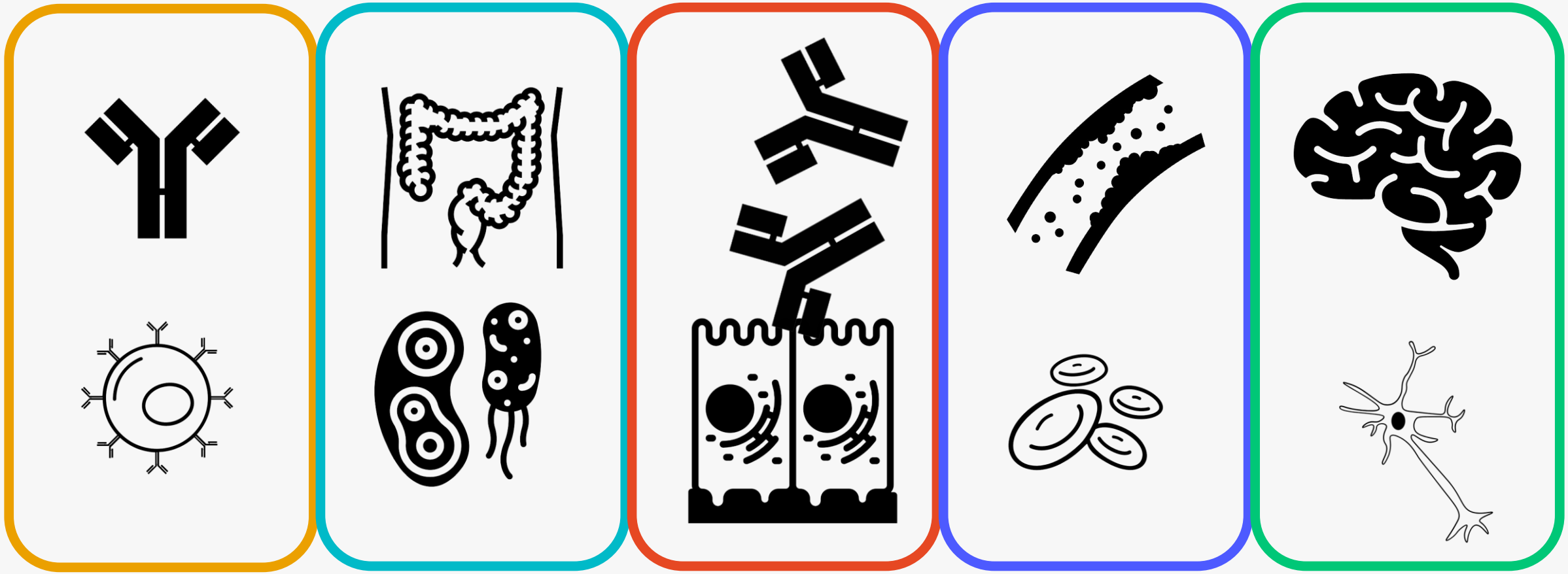
» Author Affiliations | Article Information

JAMA Intern Med. 2023;183(12):1404-1406. doi:10.1001/jamainternmed.2023.5099

Underlying Mechanisms to Developing Post-COVID-19 Conditions




Persistent reservoirs of SARS-CoV-2 in tissues
Reactivation of underlying pathogens
Impacts of acute infection on microbiome
Immune Dysregulation
Post-COVID-19 Conditions
Dysfunctional nerve or brain signaling
Microvascular blood clotting and endothelial dysfunction
Autoimmunity



Immune dysregulation

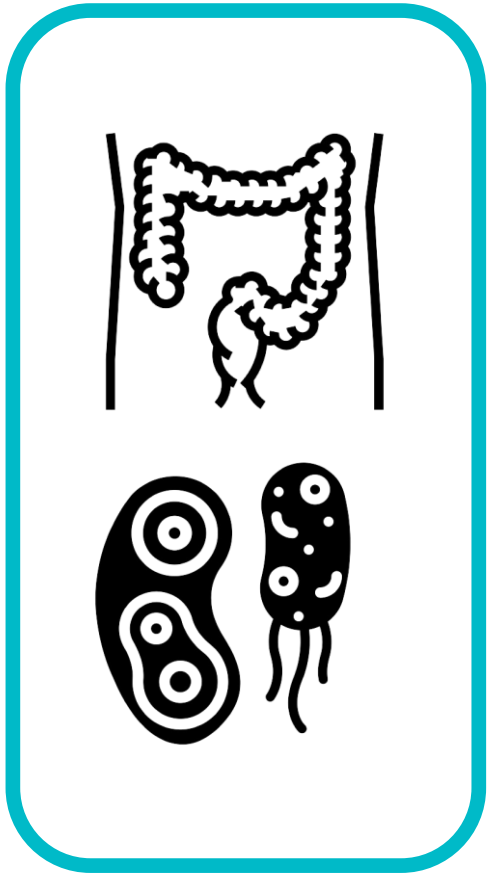
Microbial flora disruption

Autoimmunity and immune priming

Coagulation and endothelial dysfunction

Dysfunctional neurological signaling

https://www.nature.com/articles/s41579-022-00846-2/figures/3



Gut microbiota

OPEN ACCESS

Original research

Gut microbiota composition reflects disease severity and dysfunctional immune responses in patients with COVID-19

Yun Kit Yeoh [1,2] Tao Zuo [2,3,4] Grace Chung-Yan Lui,[3,5] Fen Zhang,[2,3,4] Qin Liu,[2,3,4] Amy YL Li,[3] Arthur CK Chung,[2,3,4] Chun Pan Cheung,[2,3,4] Eugene YK Tso,[6] Kitty SC Fung,[7] Veronica Chan,[6] Lowell Ling,[8] Gavin Joynt,[8] David Shu-Cheong Hui,[3,5] Kai Ming Chow [3] Susanna So Shan Ng,[3,5] Timothy Chun-Man Li,[3,5] Rita WY Ng,[1] Terry CF Yip,[3,4] Grace Lai-Hung Wong [3,4] Francis KL Chan [2,3,4] Chun Kwok Wong,[9] Paul KS Chan,[1,2,10] Siew C Ng [2,3,4]

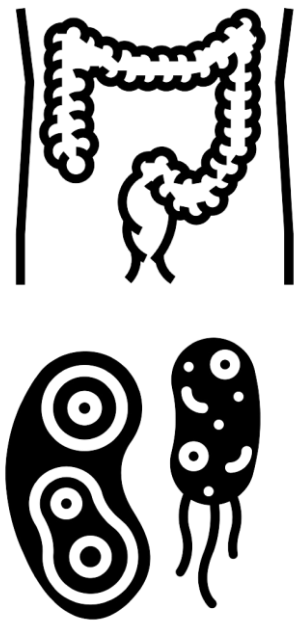
COVID-19

OPEN ACCESS

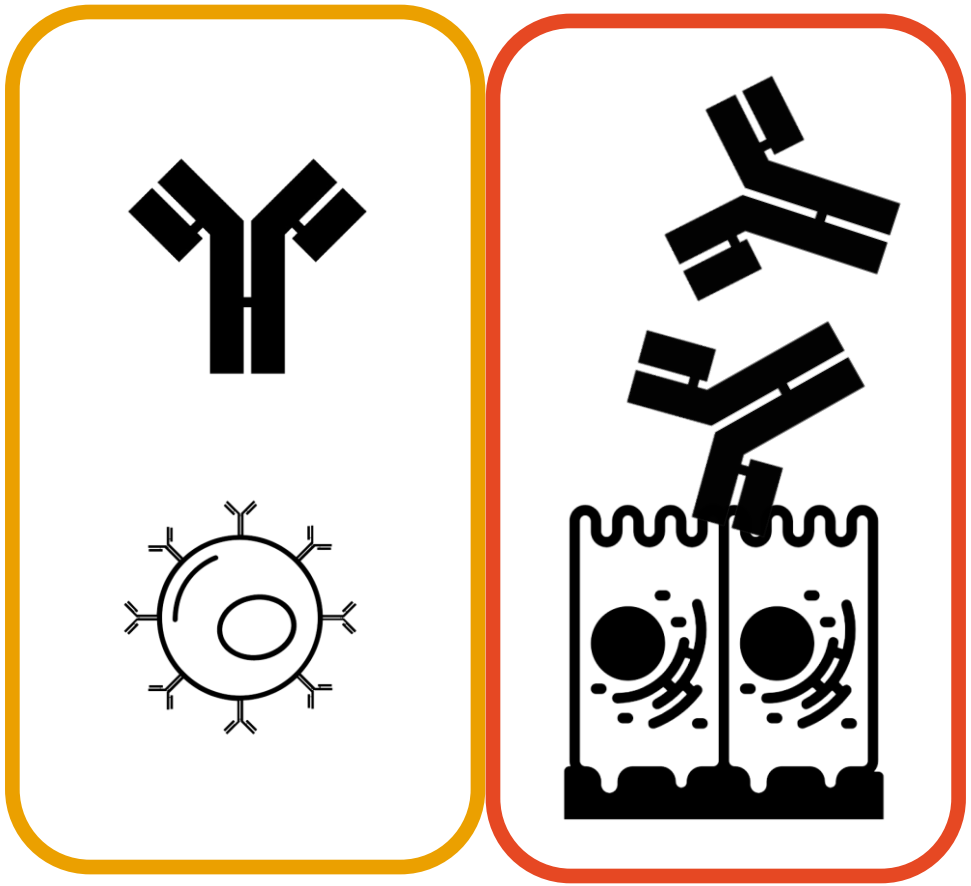
Original research

Gut microbiota dynamics in a prospective cohort of patients with post-acute COVID-19 syndrome

Qin Liu,[1,2,3,4] Joyce Wing Yan Mak [1,2,3] Qi Su,[1,2,3,4] Yun Kit Yeoh [1,4,5] Grace Chung-Yan Lui,[2,6] Susanna So Shan Ng,[2] Fen Zhang [1,2,3,4] Amy Y L Li,[1,2,3] Wenqi Lu,[1,2,3,4] David Shu-Cheong Hui,[6] Paul KS Chan,[1,5] Francis K L Chan [1,2,3,4] Siew C Ng [1,2,3,4]



- Studies show that gut microbiome composition is significantly altered comparing those with COVID-19 and those without COVID-19.
- Commensals associated with immunomodulating potential were underrepresented in those with COVID-19.
- Disruption was associated with elevated inflammatory markers.
- Continued dysbiosis after infection resolution suggest possible pathway for lingering symptoms.



Cell

CellPress
OPEN ACCESS

Article

Multiple early factors anticipate post-acute COVID-19 sequelae

Yapeng Su,[1,2,3,28,*] Dan Yuan,[1,4,28] Daniel G. Chen,[1,5,28] Rachel H. Ng,[1,4] Kai Wang,[1] Jongchan Choi,[1] Sarah Li,[1] Sunga Hong,[1] Rongyu Zhang,[1,4] Jingyi Xie,[1,6] Sergey A. Kornilov,[1] Kelsey Scherler,[1] Ana Jimena Pavlovitch-Bedzyk,[7] Shen Dong,[8] Christopher Lausted,[1] Inyoul Lee,[1] Shannon Fallen,[1] Chengzhen L. Dai,[1] Priyanka Baloni,[1] Brett Smith,[1] Venkata R. Duvvuri,[1] Kristin G. Anderson,[3,9] Jing Li,[7] Fan Yang,[10] Caroline J. Duncombe,[11] Denise J. McCulloch,[12] Clifford Rostomily,[1] Pamela Troisch,[1] Jing Zhou,[13] Sean Mackay,[13] Quinn DeGottardi,[14] Damon H. May,[14] Ruth Taniguchi,[14] Rachel M. Gittelman,[14] Mark Klinger,[14] Thomas M. Snyder,[14] Ryan Roper,[1] Gladys Wojciechowska,[1,15]

Cases

Mild

Moderate

Severe

Cases

Mild

Moderate

Severe

Healthy Controls

Acute Infection

2-3 months after symptom onset

Cases

Mild

Moderate

Severe

Healthy Controls

Acute Infection

Plasma multi-omics

SARS-CoV-2 RNAemia & other virus viremia

Single cell multi-omics

Symptom surveys & EHR

Autoantibodies & SARS-CoV-2 antibodies

2-3 months after symptom onset

Cases

Mild

Moderate

Severe

Healthy Controls

Acute Infection

Plasma multi-omics

SARS-CoV-2 RNAemia & other virus viremia

Single cell multi-omics

Symptom surveys & EHR

Autoantibodies & SARS-CoV-2 antibodies

2-3 months after symptom onset

Cases

Mild

Moderate

Severe

Several possible PASC symptoms

Healthy Controls

Acute Infection

Plasma multi-omics

SARS-CoV-2 RNAemia & other virus viremia

Single cell multi-omics

Symptom surveys & EHR

Autoantibodies & SARS-CoV-2 antibodies

2-3 months after symptom onset

Cases

Mild

Moderate

Severe

Several possible PASC symptoms

Healthy Controls

Acute Infection

Plasma multi-omics

SARS-CoV-2 RNAemia & other virus viremia

Single cell multi-omics

Symptom surveys & EHR

Autoantibodies & SARS-CoV-2 antibodies

2-3 months after symptom onset

Cases

Mild

Moderate

Severe

Several possible PASC symptoms

Healthy Controls

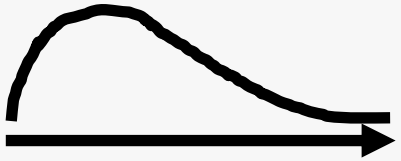
Pre-existing Type 2 Diabetes

SARS-CoV-2 RNAemia at Acute Infection

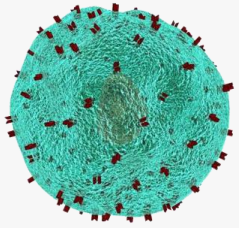
EBV Viremia at Acute Infection

Auto-antibodies During Acute Infection

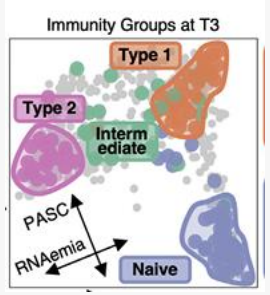
Additional Findings



- **Markers of post-COVID-19 conditions are mostly present at time of acute infection and many are no longer detectable at the time of diagnosis.**

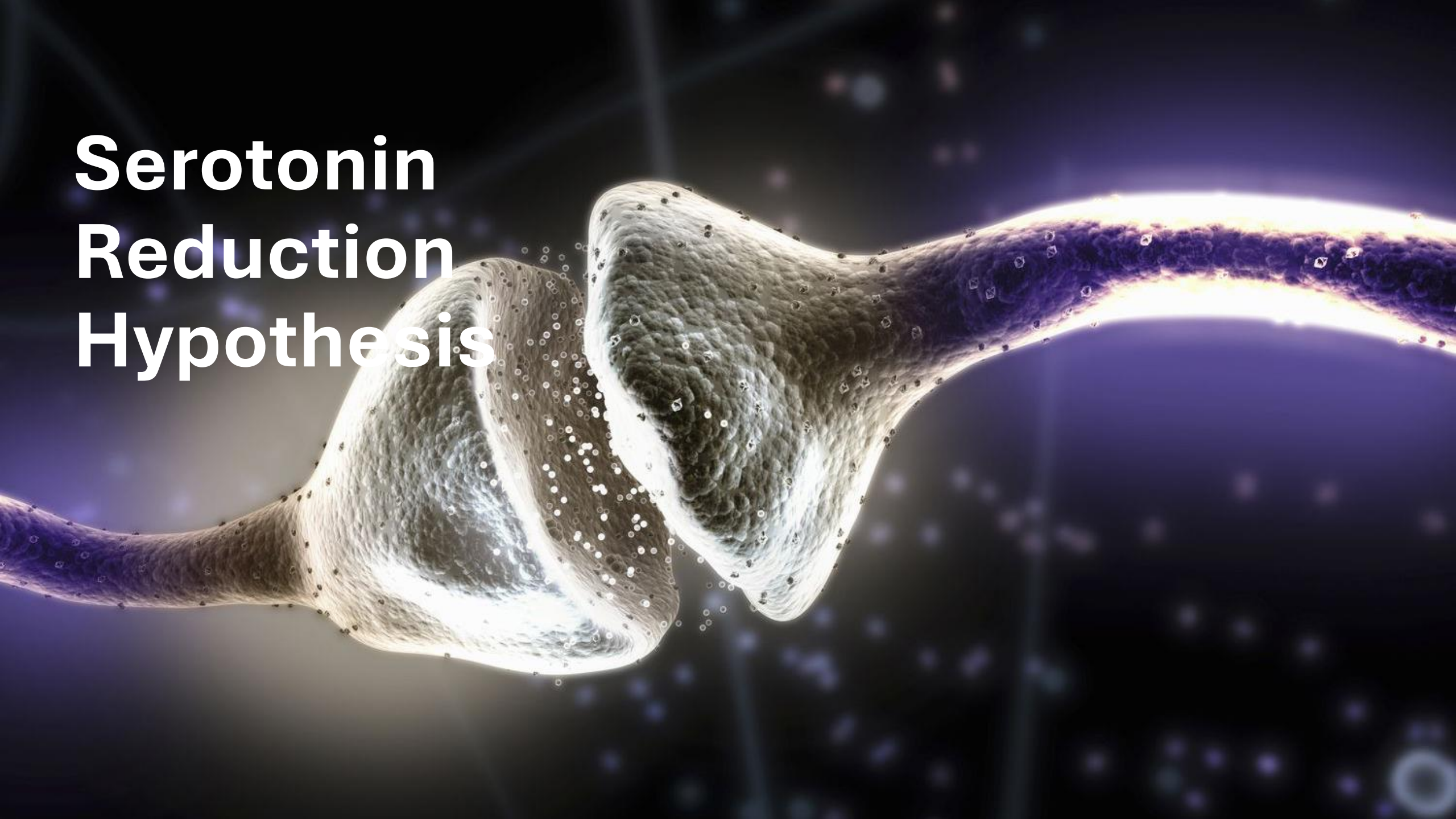


- **Specific T-cell subpopulations are associated with specific post-COVID-19 conditions (e.g. gastrointestinal symptoms).**



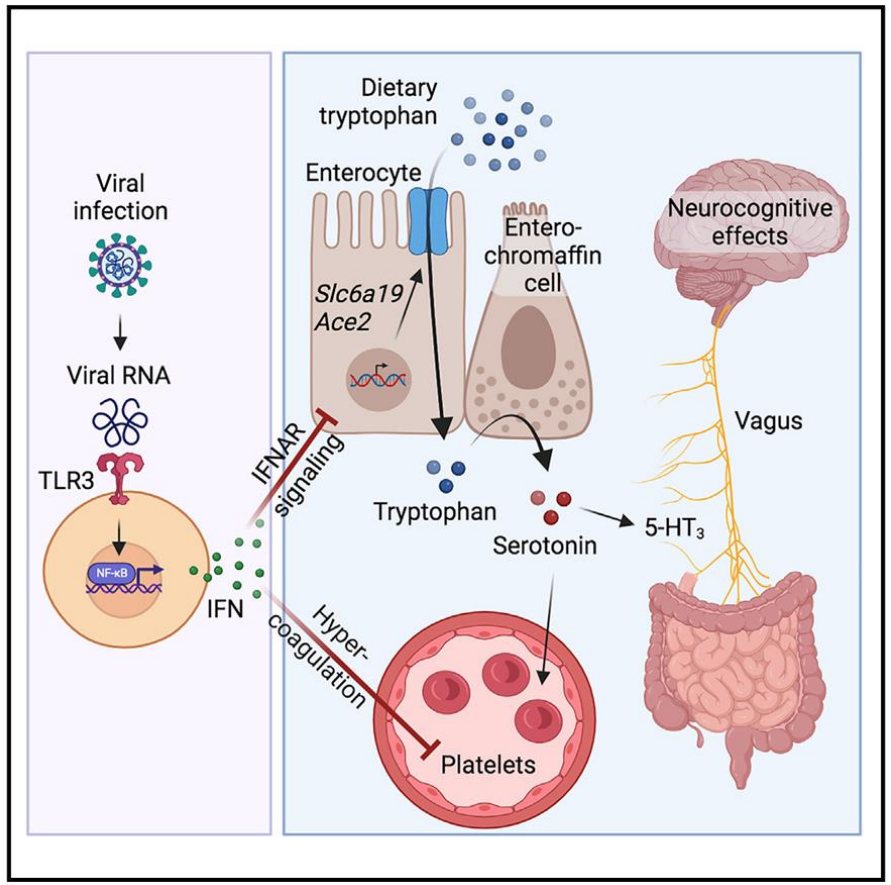
- **Distinct immune endotypes or “signatures” at the time of post-COVID-19 condition were present with various expressions of immune cell sub-types.**

Serotonin Reduction Hypothesis



Cell

Serotonin reduction in post-acute sequelae of viral infection



Authors

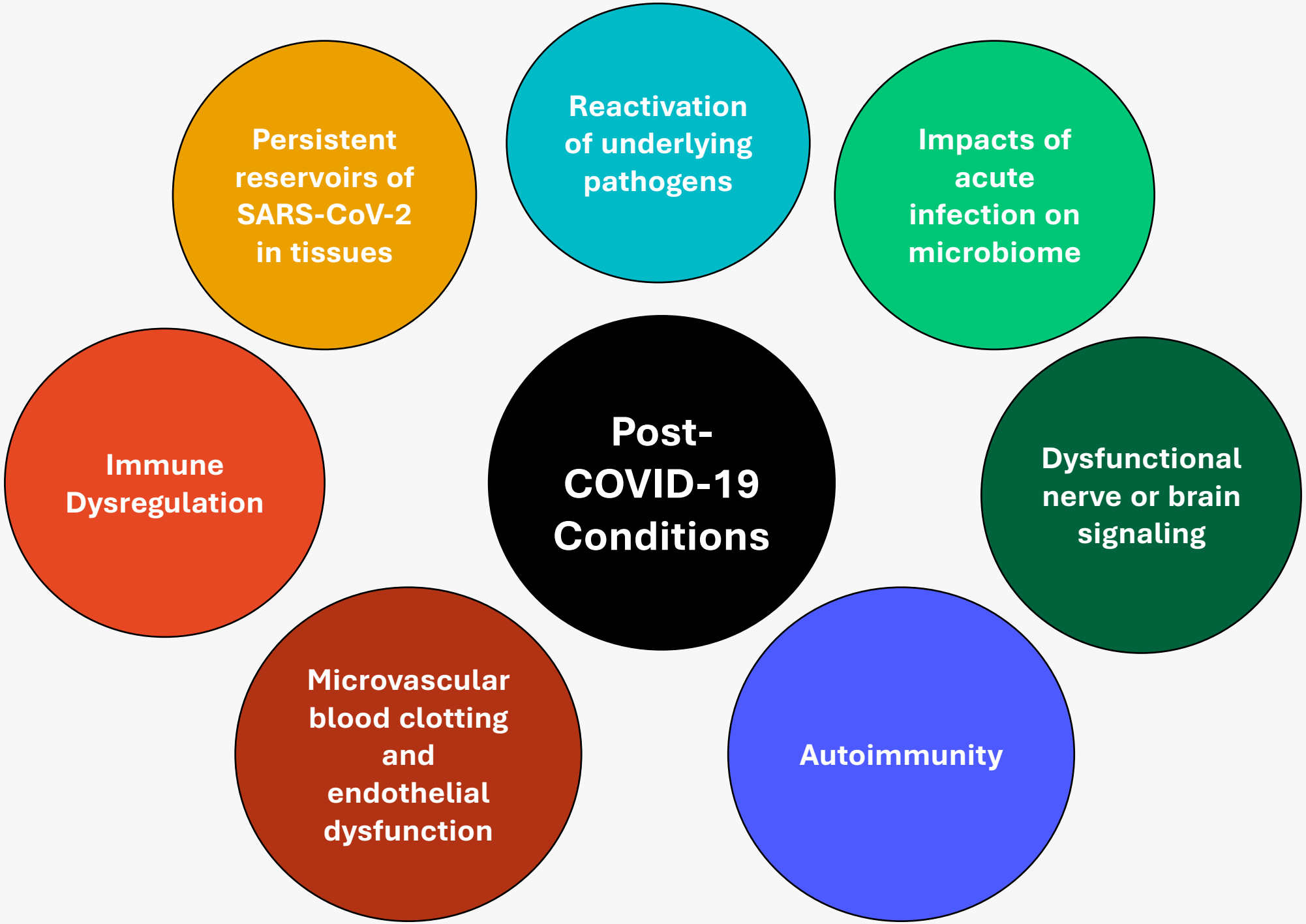
Andrea C. Wong, Ashwarya S. Devason, Iboro C. Umana, ..., Sara Cherry, Christoph A. Thaiss, Maayan Levy

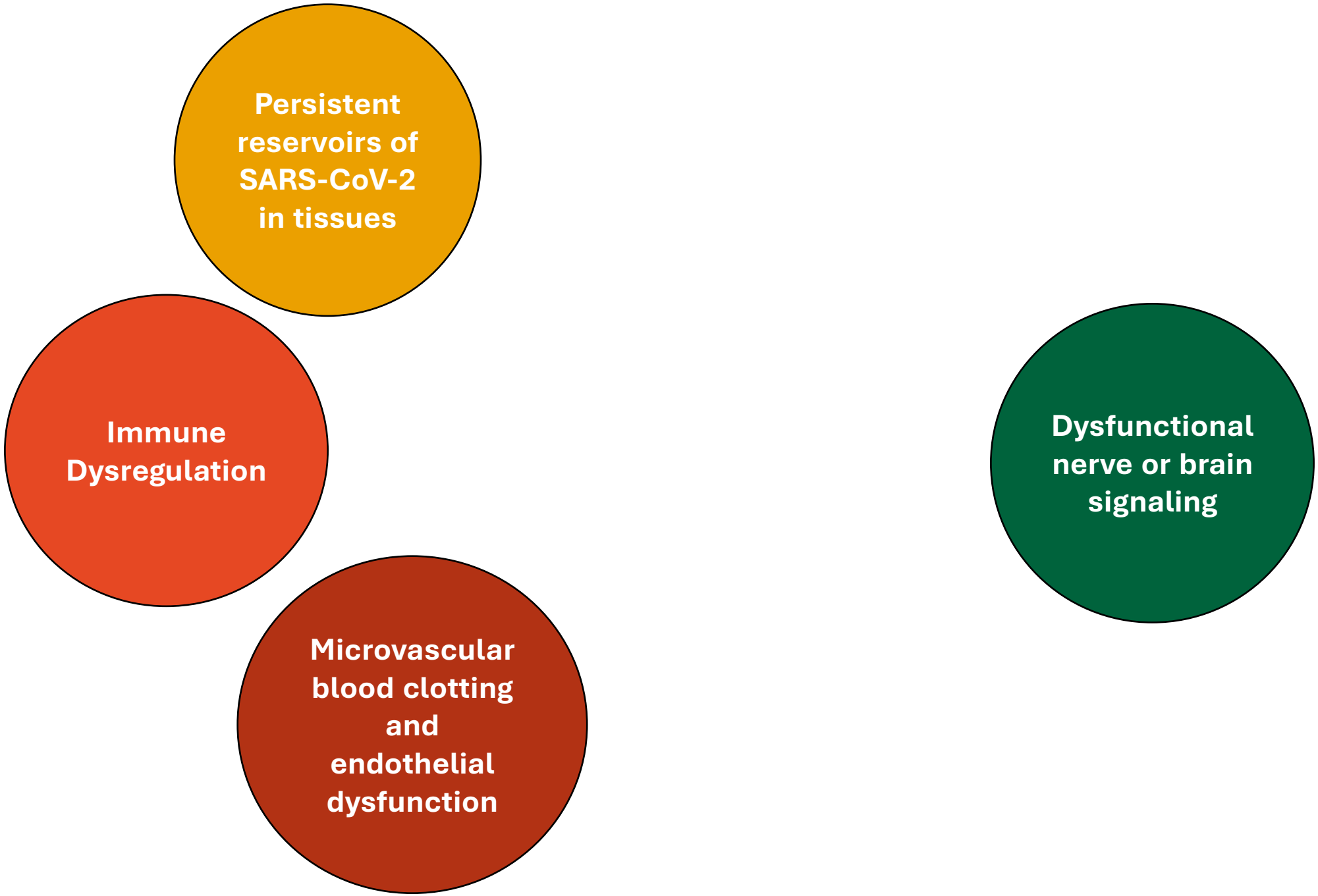
Correspondence

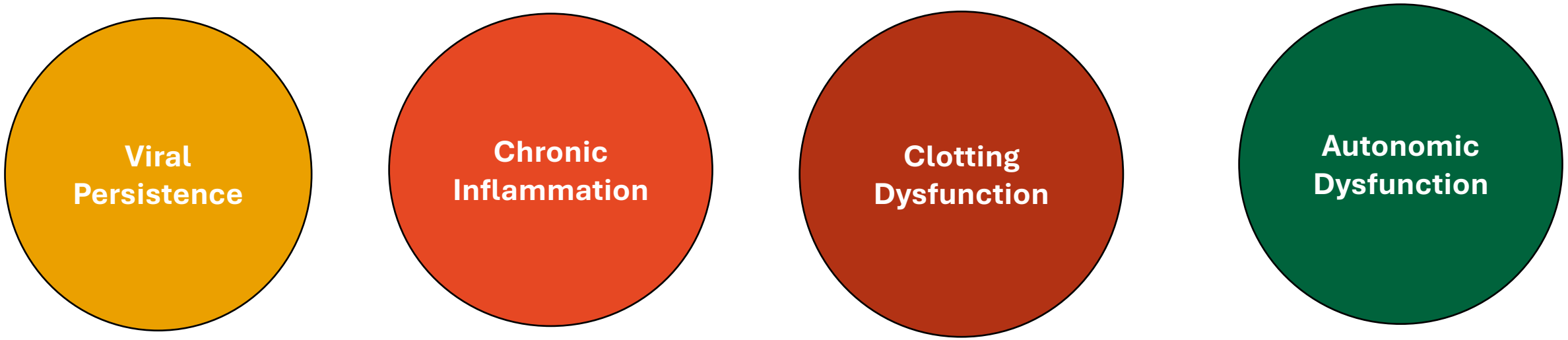
benjamin.abramoff@pennmedicine.upenn.edu (B.A.A.), cherrys@pennmedicine.upenn.edu (S.C.), thaiss@pennmedicine.upenn.edu (C.A.T.), maayanle@pennmedicine.upenn.edu (M.L.)

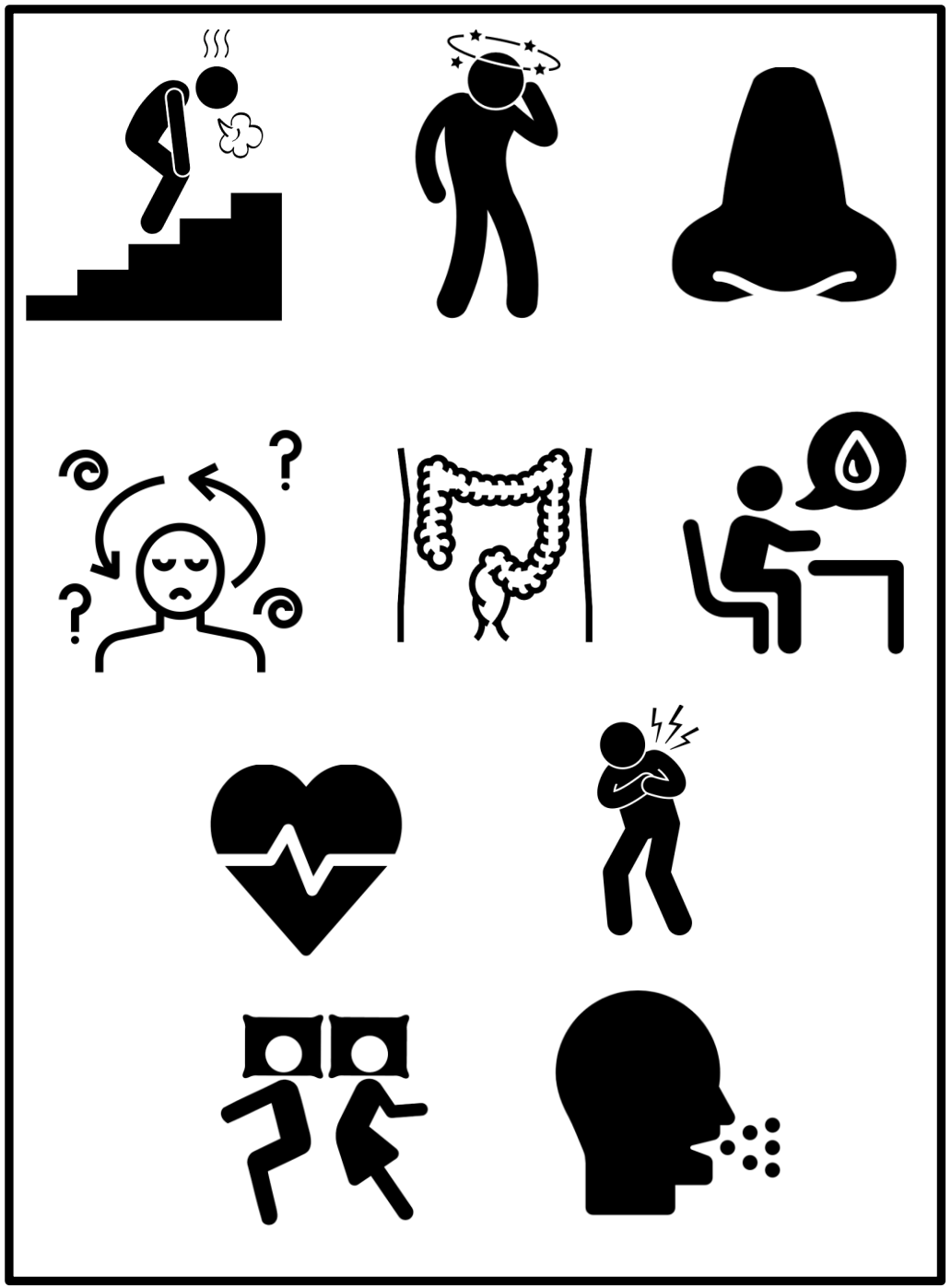
In brief

Post-viral syndromes are associated with serotonin reduction, which may contribute to the neurological and cognitive symptoms seen in individuals with Long COVID.


Persistent reservoirs of SARS-CoV-2 in tissues
Reactivation of underlying pathogens
Impacts of acute infection on microbiome
Immune Dysregulation
Post-COVID-19 Conditions
Dysfunctional nerve or brain signaling
Microvascular blood clotting and endothelial dysfunction
Autoimmunity


Persistent reservoirs of SARS-CoV-2 in tissues
Immune Dysregulation
Microvascular blood clotting and endothelial dysfunction
Dysfunctional nerve or brain signaling

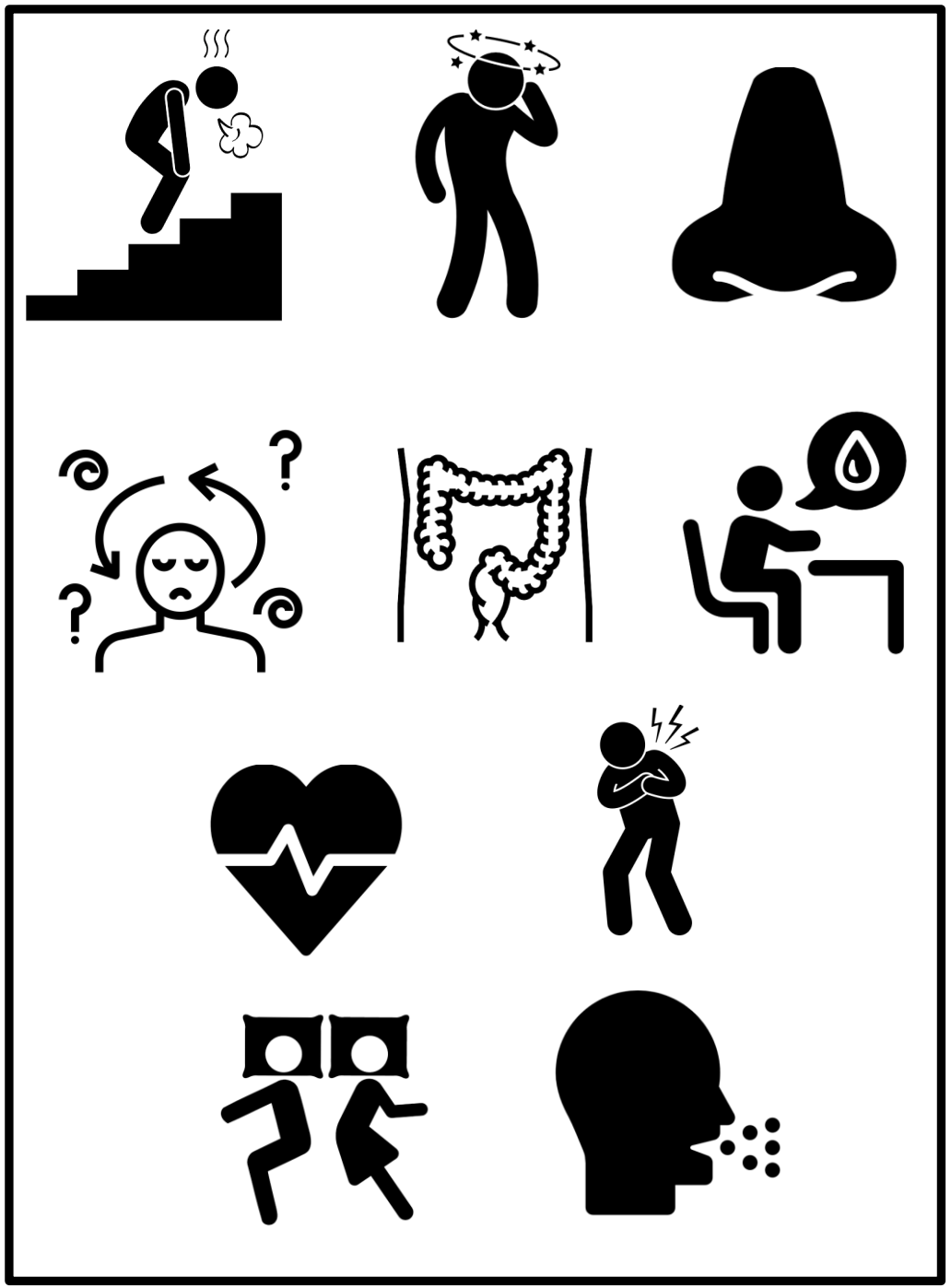

Viral Persistence
Chronic Inflammation
Clotting Dysfunction
Autonomic Dysfunction



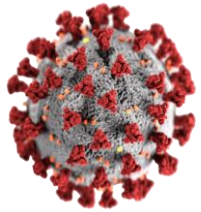
1. Performed plasma metabolomics among patients with long COVID.

2. Metabolite profile distinct from those who recovered symptom-free.

3. Serotonin levels most notably depleted in acute and post-acute COVID-19.



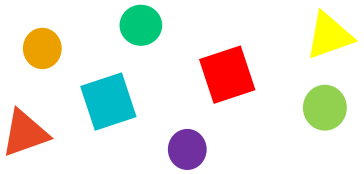
Associated with Lower Serotonin Levels



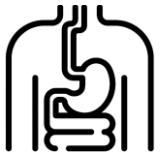
Serotonin decreases was seen in SARS-CoV-2 and other systemic virus models.

Persistent viral infection was associated with higher levels of interferon-stimulated genes also seen in long COVID patients.

Serotonin

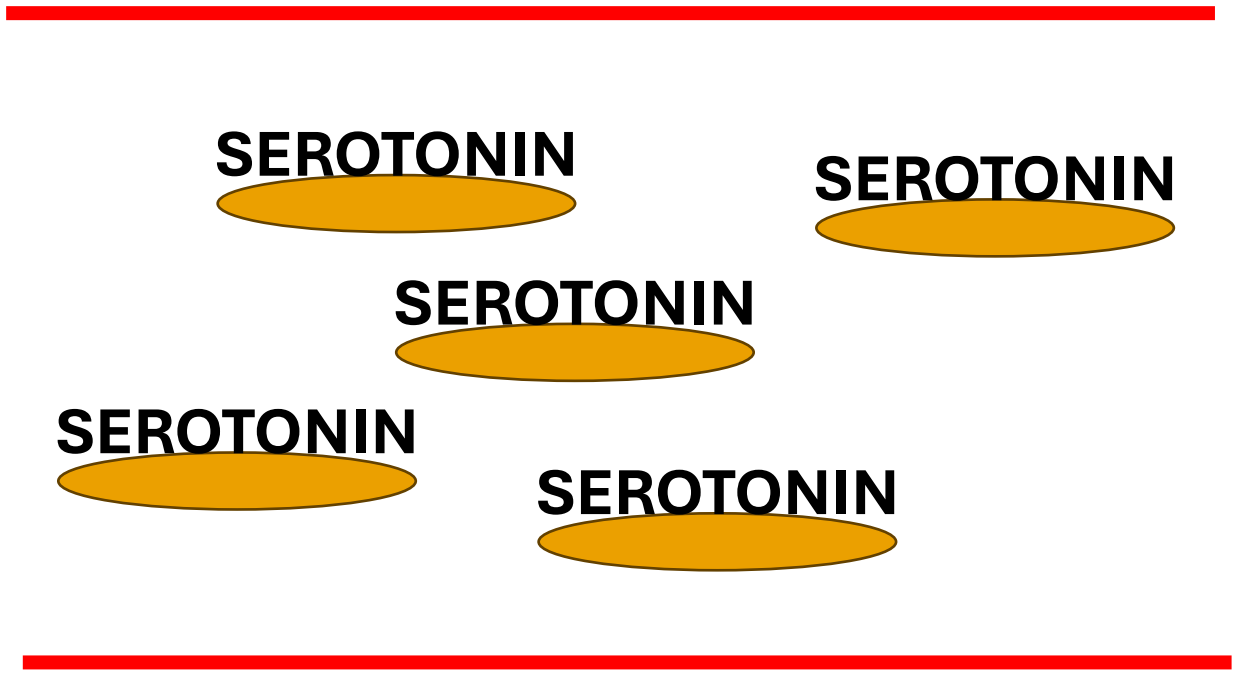


Serotonin levels recovered in those that cleared infection but not those with chronic infection or persistent inflammation.

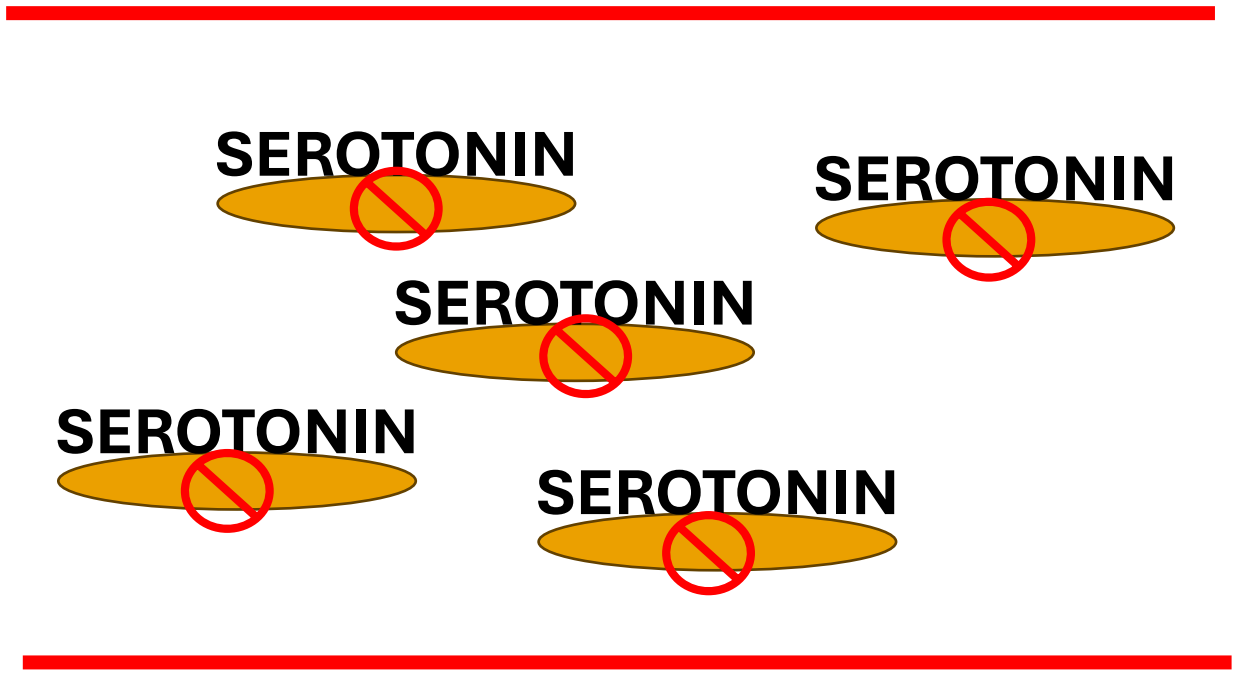


Most serotonin in our bodies is produced in the GI tract from dietary tryptophan; people with acute COVID-19 and long COVID have reduce plasma tryptophan levels.

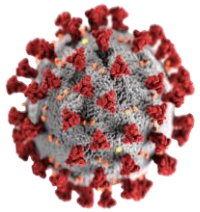
Circulating serotonin stored on platelets.



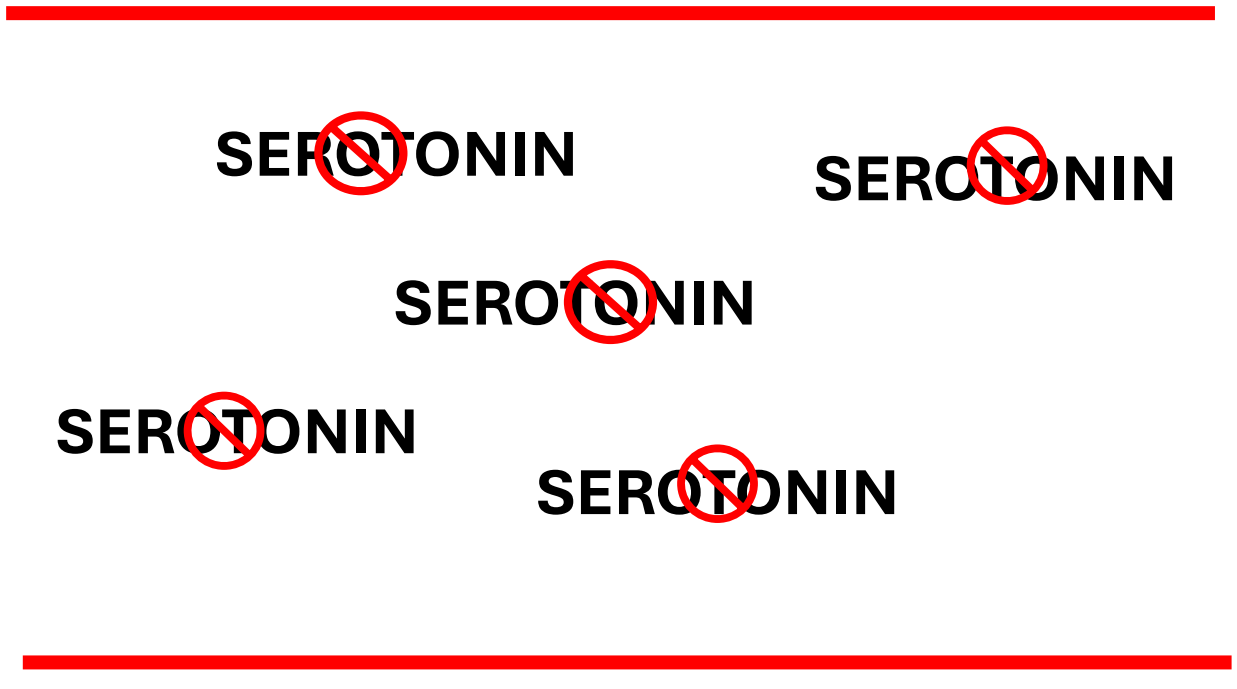
Circulating serotonin stored on platelets.



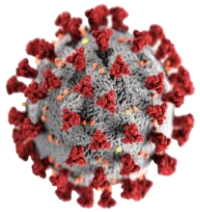
Viral inflammation drives platelet hyperactivation and consumption.



Circulating serotonin stored on platelets.

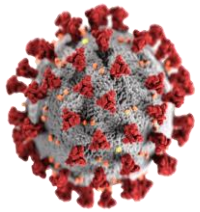


Viral inflammation drives platelet hyperactivation.



Circulating serotonin stored on platelets.

Viral inflammation drives platelet hyperactivation.



Serotonin

Serotonin

- **Hippocampus responsible for short-term memories and requires serotonin as a key player for its function.**
- **Serotonin in the brain is unaffected by viral inflammation so peripheral serotonin levels associated with cognitive impairment.**
- **Reductions of serotonin impact vagal neuros and then go on to affect the hippocampus.**

https://cv.nmhealth.org/long-covid/

https://www.aafp.org/news/health-of-the-public/20180219nchsdepression.html

The NEW ENGLAND JOURNAL of MEDICINE

Perspective

OCTOBER 12, 2023

Do Pandemics Ever End?

Joelle M. Abi-Rached, M.D., Ph.D., and Allan M. Brandt, Ph.D.

“The declaration of the end of a pandemic therefore marks a critical point when the value of a human life becomes a variable of actuarial significance – in other words, when a government determines that the social, economic, and political costs of saving a life exceed the benefits of doing so....

It is neither epidemiology nor any political declaration that determines the end of a pandemic, but the normalization of mortality and morbidity by means of a disease’s routinization and endemicization – what in the context of the COVID-19 pandemic has been called ’living with the virus.’ ”

~ Joelle M. Abi-Rached, MD, PhD and Allan M. Brandt, PhD

Acute COVID-19

Asymptomatic

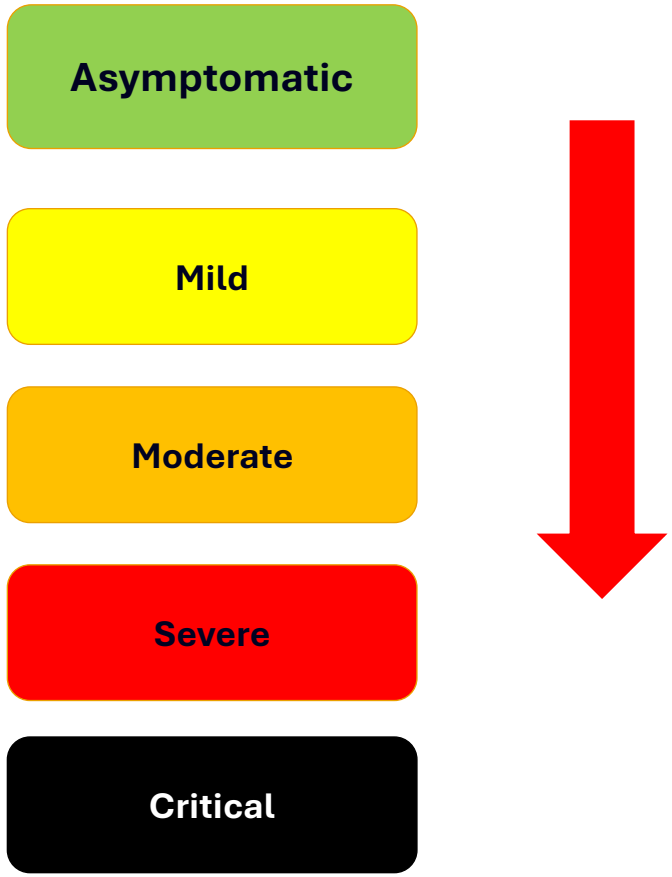
Mild

Moderate

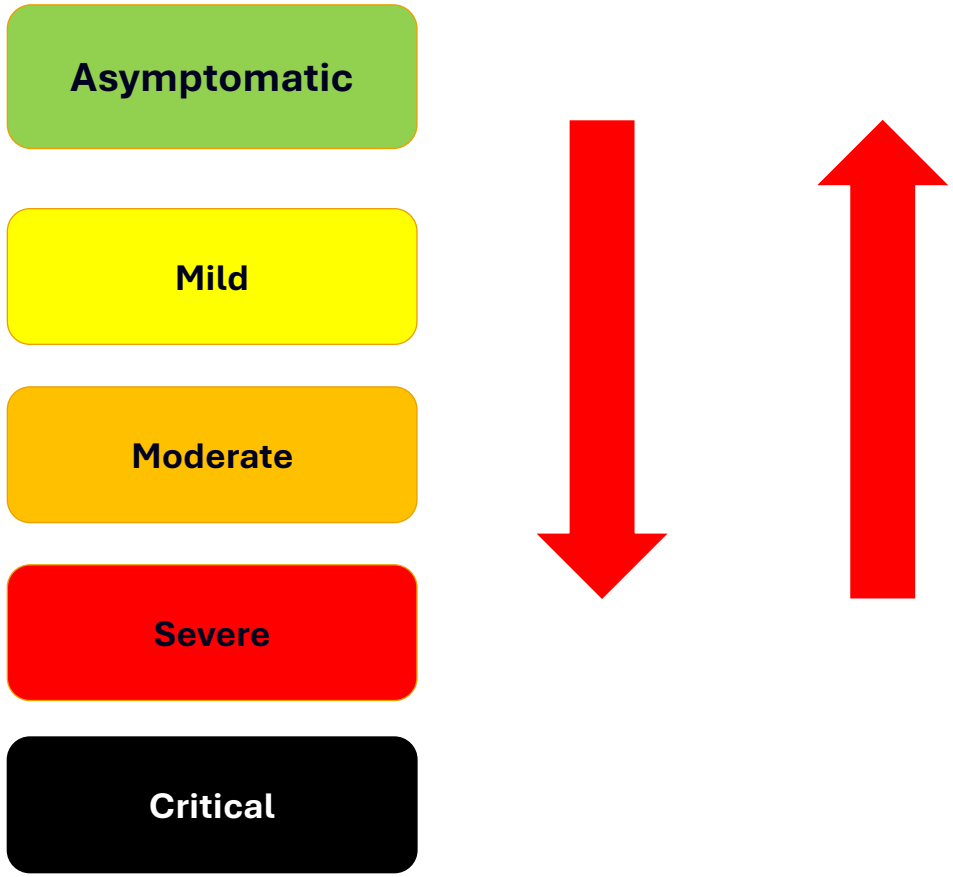
Severe

Critical

Acute COVID-19



Acute COVID-19



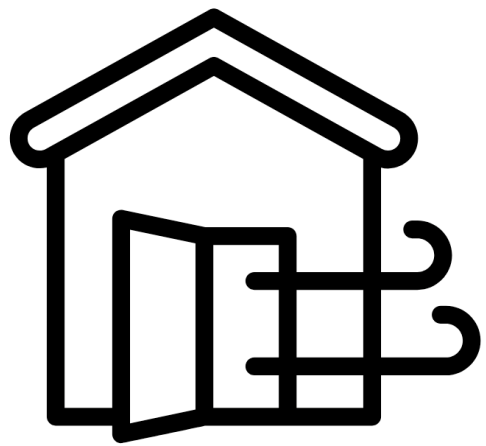
Post COVID-19 conditions become more common.

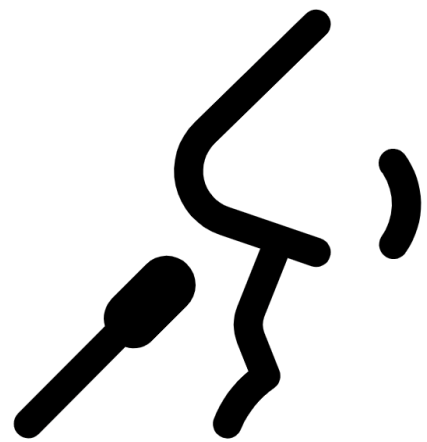
Risk of infection and severe acute COVID-19

Risk of post-COVID-19 conditions

Stay up to date with recommended vaccinations

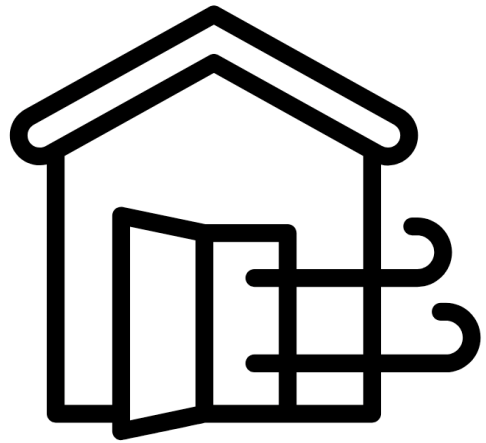
Stay up to date with recommended vaccinations

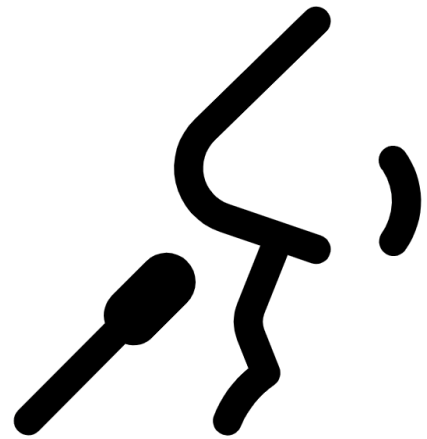




Stay up to date with recommended vaccinations

Get treated early if eligible





Questions?

Eric J. Chow, MD, MS, MPH
Chief of Communicable Disease Epidemiology and Immunizations
Public Health – Seattle & King County
erchow@kingcounty.gov

Acknowledgements – Noun Project

- United States by Joel Wisneski
- Exhaustion by Gan Khoon Lay
- Headache by b farias
- Dizzy by Gan Khoon Lay
- Cough by Asep Yopie Hardi Noer
- Shortness of breath by Gan Khoon Lay
- Chest pain by Gan Khoon Lay
- Nose by Xinh Studio
- Insomnia by Ayub Irawan
- Depression by Narakorn Chanchittakarn
- Globe by Nick Novell
- Heart by Academic Technologies
- Lungs by Karina
- Kidney by Mello
- Red blood cells by Lucas Helle
- Colon by Turkkub
- Joint by Vectors Market
- Brain by Cedric Villain
- Pancreas by Suncheli Project
- Group of people Oksana Latysheva
- Disorientation by Nithinan Tatah, TH
- Couple in bed by Alvaro Cabrera
- Heart by AmruID
- Thirst by Adrien Coquet
- Step by Step by Adrien Coquet
- Family by TukTuk Design
- Gender by Three Six Five
- Antibody by Lea Lortal
- Immune Cell by Ims.icon
- Bacteria by myiconfinder
- Epithelium by dDara
- Clogged Artery by Peter Van Driel
- Neuron by Lea Lortal
- Sneeze by Akhmad Taufiq
- Adult by Alexander Gruzdev
- Mouse by Iconic
- DNA by pictranoosa
- Stomach by Podgornaia Elena
- Swab by The Iconz
- Face Mask by Milinda Courey
- Ventilation by Andre Buand
- Pills by Verrena

Additional Resources

- CDC timeline of COVID-19 events: https://www.cdc.gov/museum/timeline/covid19.html
- World Health Organization clinical case definition of post COVID-19 condition by Delphi Consensus: https://www.who.int/publications/i/item/WHO-2019-nCoV-Post_COVID-19_condition-Clinical_case_definition-2021.1
- National Institute for Health and Care Excellence (NICE) Long COVID-19 Guidelines: https://www.nice.org.uk/guidance/ng188/resources/covid19-rapid-guideline-managing-the-longterm-effects-of-covid19-pdf-51035515742
- European Centre for Disease Prevention and Control systematic review of post COVID-19 condition prevalence: https://www.ecdc.europa.eu/sites/default/files/documents/Prevalence-post-COVID-19-condition-symptoms.pdf
- Department of Health and Human Services: Services and Supports for Longer-Term Impacts of COVID-19: https://www.covid.gov/assets/files/Services-and-Supports-for-Longer-Term-Impacts-of-COVID-19-08012022.pdf
- Department of Health and Human Services: National Research Action Plan on Long COVID: https://www.covid.gov/assets/files/National-Research-Action-Plan-on-Long-COVID-08012022.pdf
- COVID.gov: What is Long COVID?: https://www.covid.gov/longcovid/definitions
- Infectious Disease Society of America: Post-COVID Conditions: https://www.idsociety.org/covid-19-real-time-learning-network/disease-manifestations--complications/post-covid-syndrome

Additional Resources

- CDC: Post-COVID Conditions: Information for Healthcare Providers: https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-conditions.html
- CDC: Post-COVID Conditions: CDC Science: https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-science.html
- CDC Datasets: Post-COVID Conditions: https://data.cdc.gov/NCHS/Post-COVID-Conditions/gsea-w83j
- Kaiser Family Foundation: Long COVID: What do the Latest Data Show? https://www.kff.org/policy-watch/long-covid-what-do-latest-data-show/#:~:text=As%20of%20January%2016%2C%202023%2C%2015%25%20of%20all%20adults,are%20no%20longer%20reporting%20symptoms.
- CDC COCA Call: Evaluating and Supporting Children and Adolescents Presenting with Post-COVID Conditions:https://emergency.cdc.gov/coca/calls/2023/callinfo_022323.asp
- CDC COCA Call: Evaluating and Supporting Patients Presenting with Cardiovascular Symptoms Following COVID: https://emergency.cdc.gov/coca/calls/2022/callinfo_092022.asp
- CDC COCA Call: What Clinicians Need to Know about Multisystem Inflammatory Syndrome in Children: https://emergency.cdc.gov/coca/calls/2022/callinfo_021022.asp
- CDC COCA Call: Updates on Multisystem Inflammatory Syndrome in Children (MIS-C): Epidemiology, Case Definition, and COVID-19 Vaccination: https://emergency.cdc.gov/coca/calls/2022/callinfo_120822.asp

Additional Resources

- CDC COCA Call: Evaluating and Supporting Patients Presenting with Cognitive Symptoms Following COVID: https://emergency.cdc.gov/coca/calls/2022/callinfo_050522.asp
- CDC COCA Call: Evaluating and Supporting Patients Presenting with Fatigue Following COVID-19: https://emergency.cdc.gov/coca/calls/2021/callinfo_093021.asp
- CDC COCA Call: Evaluating and Caring for Patients with Post-COVID Conditions: https://emergency.cdc.gov/coca/calls/2021/callinfo_061721.asp
- CDC COCA Call: Treating Long COVID: Clinician Experience with Post-Acute COVID-19 Care: https://emergency.cdc.gov/coca/calls/2021/callinfo_012821.asp
- CDC COCA Call: Evaluating and Supporting Patients with Long COVID in Returning to Work: https://emergency.cdc.gov/coca/calls/2023/callinfo_061523.asp

References

1. Allyn B. Fauci Estimates That 100,000 to 200,000 Americans Could Die from the Coronavirus. Accessed January 21, 2024. https:// www.npr.org /sections/coronavirus-live-updates/2020/03/29/823517467/fauci-estimates-that-100-000-to-200-000-americans-could-die-from-the-coronavirus
2. Macnofsky R, Chow EJ. Seasons of Coronavirus Disease 2019. *Open Forum Infect Dis*. Jun 2021;8(6):ofab146. doi:10.1093/ofid/ofab146
3. Bach K. Is 'long Covid' worsening the labor shortage? Accessed July 18, 2023. https://www.brookings.edu/articles/is-long-covid-worsening-the-labor-shortage/
4. New York State Insurance Fund. NYSIF Releases Report on Long-Term Impacts of COVID-19. Accessed January 21, 2024. https://ww3.nysif.com/ en / footerpages /column1/ aboutnysif / nysif_news /2023/20230124longcovid
5. The COVID-19 Longhauler Advocacy Project. Calculations and Formulas: Mathematical Breakdown and Formulas for Long COVID Calculations. Accessed January 21, 2024.
6. Jason LA, Mirin AA. Updating the National Academy of Medicine ME/CFS prevalence and economic impact figures to account for population growth and inflation. *Fatigue: Biomedicine, Health & Behavior*. 2021;9(1):1-5. doi:doi.org/10.1080/21641846.2021.1878716
7. Solve Long COVID Initiative. Long COVID Impact on Adult Americans: Early Indicators Estimating Prevalence and Cost. Accessed January 21, 2024. https://solvecfs.org/wp-content/uploads/2022/04/Long_Covid_Impact_Paper.pdf
8. Callard F, Perego E. How and why patients made Long Covid. *Soc Sci Med*. Jan 2021;268:113426. doi:10.1016/j.socscimed.2020.113426
9. EnSpark Consulting. What We Heard: Engagement Report for National Academies of Sciences, Engineering, and Medicine Committee on Examining the Working Definition for Long COVID. Accessed July 18, 2023. https://www.nationalacademies.org/documents/embed/link/LF2255DA3DD1C41C0A42D3BEF0989ACAECE3053A6A9B/file/DD8E87E8161DD0ED2EA0625D300E9C2F72CC0AAE9038?noSaveAs=1
10. Centers for Disease Control and Prevention. Post-COVID Conditions: Information for Healthcare Providers. Accessed January 21, 2024. https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-conditions.html
11. Davis HE, Assaf GS, McCorkell L, et al. Characterizing long COVID in an international cohort: 7 months of symptoms and their impact. *EClinicalMedicine*. Aug 2021;38:101019. doi:10.1016/j.eclinm.2021.101019
12. Bull-Otterson L, Baca S, Saydah S, et al. Post–COVID Conditions Among Adult COVID-19 Survivors Aged 18–64 and ≥65 Years — United States, March 2020–November 202. *MMWR Morbidity and Mortality Weekly Report*. 2022;71(21):713-717.
13. Kompaniyets L, Bull-Otterson L, Boehmer TK, et al. Post-COVID-19 Symptoms and Conditions Among Children and Adolescents - United States, March 1, 2020-January 31, 2022. *MMWR Morb Mortal Wkly Rep*. Aug 5 2022;71(31):993-999. doi:10.15585/mmwr.mm7131a3

References

14. Thaweethai T, Jolley SE, Karlson EW, et al. Development of a Definition of Postacute Sequelae of SARS-CoV-2 Infection. *JAMA*. Jun 13 2023;329(22):1934-1946. doi:10.1001/jama.2023.8823
15. American Academy of Physical Medicine and Rehabilitation. PASC Consensus Guidance. Accessed January 21, 2024. https://www.aapmr.org/members-publications/covid-19/pasc-guidance#:~:text=PASC%20Consensus%20Guidance&text=AAPM%26R%20understands%20the%20need%20for,requiring%20PM%26R%20intervention%2C%20is%20necessary.
16. Ballering AV, van Zon SKR, Olde Hartman TC, Rosmalen JGM, Lifelines Corona Research I. Persistence of somatic symptoms after COVID-19 in the Netherlands: an observational cohort study. *Lancet*. Aug 6 2022;400(10350):452-461. doi:10.1016/S0140-6736(22)01214-4
17. Pazukhina E, Andreeva M, Spiridonova E, et al. Prevalence and risk factors of post-COVID-19 condition in adults and children at 6 and 12 months after hospital discharge: a prospective, cohort study in Moscow (StopCOVID). *BMC Med*. Jul 6 2022;20(1):244. doi:10.1186/s12916-022-02448-4
18. Stephenson T, Shafran R, De Stavola B, et al. Long COVID and the mental and physical health of children and young people: national matched cohort study protocol (the CLoCk study). *BMJ Open*. Aug 26 2021;11(8):e052838. doi:10.1136/bmjopen-2021-052838
19. European Centre for Disease Prevention and Control. Prevalence of post COVID-19 condition symptoms: a systematic review and meta-analysis of cohort study data, stratified by recruitment setting. Accessed December 2, 2023. https://www.ecdc.europa.eu/sites/default/files/documents/Prevalence-post-COVID-19-condition-symptoms.pdf
20. Chen C, Haupert SR, Zimmermann L, Shi X, Fritsche LG, Mukherjee B. Global Prevalence of Post-Coronavirus Disease 2019 (COVID-19) Condition or Long COVID: A Meta-Analysis and Systematic Review. *J Infect Dis*. Nov 1 2022;226(9):1593-1607. doi:10.1093/infdis/jiac136
21. Burns A. Kaiser Family Foundation. Long COVID: what do the latest data show? Accessed July 19, 2023. https://www.kff.org/policy-watch/long-covid-what-do-latest-data-show/
22. Davis HE, McCorkell L, Vogel JM, Topol EJ. Long COVID: major findings, mechanisms and recommendations. *Nat Rev Microbiol*. Mar 2023;21(3):133-146. doi:10.1038/s41579-022-00846-2
23. Osmanov IM, Spiridonova E, Bobkova P, et al. Risk factors for post-COVID-19 condition in previously hospitalised children using the ISARIC Global follow-up protocol: a prospective cohort study. *Eur Respir J*. Feb 2022;59(2)doi:10.1183/13993003.01341-2021
24. Boyton RJ, Altmann DM. The immunology of asymptomatic SARS-CoV-2 infection: what are the key questions? *Nat Rev Immunol*. Dec 2021;21(12):762-768. doi:10.1038/s41577-021-00631-x
25. Ortona E, Buonsenso D, Carfi A, Malorni W, Long Covid Kids study g. Long COVID: an estrogen-associated autoimmune disease? *Cell Death Discov*. Apr 13 2021;7(1):77. doi:10.1038/s41420-021-00464-6
26. Sudre CH, Murray B, Varsavsky T, et al. Attributes and predictors of long COVID. *Nat Med*. Apr 2021;27(4):626-631. doi:10.1038/s41591-021-01292-y

References

27. Romano SD, Blackstock AJ, Taylor EV, et al. Trends in Racial and Ethnic Disparities in COVID-19 Hospitalizations, by Region - United States, March-December 2020. *MMWR Morb Mortal Wkly Rep*. Apr 16 2021;70(15):560-565. doi:10.15585/mmwr.mm7015e2

28. Mackey K, Ayers CK, Kondo KK, et al. Racial and Ethnic Disparities in COVID-19-Related Infections, Hospitalizations, and Deaths : A Systematic Review. *Ann Intern Med*. Mar 2021;174(3):362-373. doi:10.7326/M20-6306

29. Khullar D, Zhang Y, Zang C, et al. Racial/Ethnic Disparities in Post-acute Sequelae of SARS-CoV-2 Infection in New York: an EHR-Based Cohort Study from the RECOVER Program. *J Gen Intern Med*. Apr 2023;38(5):1127-1136. doi:10.1007/s11606-022-07997-1

30. Hentschel CB, Abramoff BA, Dillingham TR, Pezzin LE. Race, ethnicity, and utilization of outpatient rehabilitation for treatment of post COVID-19 condition. *PM R*. Nov 2022;14(11):1315-1324. doi:10.1002/pmrj.12869

31. Bowe B, Xie Y, Al-Aly Z. Acute and postacute sequelae associated with SARS-CoV-2 reinfection. Nature Medicine; 2022.

32. Antonelli M, Penfold RS, Merino J, et al. Risk factors and disease profile of post-vaccination SARS-CoV-2 infection in UK users of the COVID Symptom Study app: a prospective, community-based, nested, case-control study. *Lancet Infect Dis*. Jan 2022;22(1):43-55. doi:10.1016/S1473-3099(21)00460-6

33. Al-Aly Z, Bowe B, Xie Y. Long COVID after breakthrough SARS-CoV-2 infection. *Nat Med*. Jul 2022;28(7):1461-1467. doi:10.1038/s41591-022-01840-0

34. Nehme M, Vetter P, Chappuis F, Kaiser L, Guessous I, CoviCare Study T. Prevalence of Post-Coronavirus Disease Condition 12 Weeks After Omicron Infection Compared With Negative Controls and Association With Vaccination Status. *Clin Infect Dis*. May 3 2023;76(9):1567-1575. doi:10.1093/cid/ciac947

35. Azzolini E, Levi R, Sarti R, et al. Association Between BNT162b2 Vaccination and Long COVID After Infections Not Requiring Hospitalization in Health Care Workers. *JAMA*. Aug 16 2022;328(7):676-678. doi:10.1001/jama.2022.11691

36. Xie Y, Choi T, Al-Aly Z. Association of Treatment With Nirmatrelvir and the Risk of Post-COVID-19 Condition. *JAMA Intern Med*. Jun 1 2023;183(6):554-564. doi:10.1001/jamainternmed.2023.0743

37. Ioannou GN, Berry K, Rajeevan N, et al. Effectiveness of Nirmatrelvir-Ritonavir Against the Development of Post-COVID-19 Conditions Among U.S. Veterans : A Target Trial Emulation. *Ann Intern Med*. Nov 2023;176(11):1486-1497. doi:10.7326/M23-1394

38. Congdon S, Narrowe Z, Yone N, et al. Nirmatrelvir/ritonavir and risk of long COVID symptoms: a retrospective cohort study. *Sci Rep*. Nov 11 2023;13(1):19688. doi:10.1038/s41598-023-46912-4

39. Xie Y, Choi T, Al-Aly Z. Molnupiravir and risk of post-acute sequelae of covid-19: cohort study. *BMJ*. Apr 25 2023;381:e074572. doi:10.1136/bmj-2022-074572

References

40. Fung KW, Baye F, Baik SH, McDonald CJ. Nirmatrelvir and Molnupiravir and Post-COVID-19 Condition in Older Patients. *JAMA Intern Med*. Dec 1 2023;183(12):1404-1406. doi:10.1001/jamainternmed.2023.5099
41. Yeoh YK, Zuo T, Lui GC, et al. Gut microbiota composition reflects disease severity and dysfunctional immune responses in patients with COVID-19. *Gut*. Apr 2021;70(4):698-706. doi:10.1136/gutjnl-2020-323020
42. Liu Q, Mak JWY, Su Q, et al. Gut microbiota dynamics in a prospective cohort of patients with post-acute COVID-19 syndrome. *Gut*. Mar 2022;71(3):544-552. doi:10.1136/gutjnl-2021-325989
43. Su Y, Yuan D, Chen DG, et al. Multiple early factors anticipate post-acute COVID-19 sequelae. *Cell*. Mar 3 2022;185(5):881-895 e20. doi:10.1016/j.cell.2022.01.014
44. Wong AC, Devason AS, Umana IC, et al. Serotonin reduction in post-acute sequelae of viral infection. *Cell*. Oct 26 2023;186(22):4851-4867 e20. doi:10.1016/j.cell.2023.09.013
45. Abi-Rached JM, Brandt AM. Do Pandemics Ever End? *N Engl J Med*. Oct 12 2023;389(15):1349-1351. doi:10.1056/NEJMp2306631

Extra Slides

Case Definitions

[redacted]

Original research

OPEN ACCESS

Long COVID (post-COVID-19 condition) in children: a modified Delphi process

Terence Stephenson ,[1] Benjamin Allin,[2] Manjula D Nugawela,[1] Natalia Rojas,[1] Emma Dalrymple,[1] Snehal Pinto Pereira ,[3] Manas Soni,[4] Marian Knight ,[2] Emily Y Cheung,[1] Isobel Heyman ,[1] CLoCk Consortium, Roz Shafran[1]

Original research

OPEN ACCESS

Long COVID (post-COVID-19 condition) in children: a modified Delphi process

Terence Stephenson ,[1] Benjamin Allin,[2] Manjula D Nugawela,[1] Natalia Rojas,[1] Emma Dalrymple,[1] Snehal Pinto Pereira ,[3] Manas Soni,[4] Marian Knight ,[2] Emily Y Cheung,[1] Isobel Heyman ,[1] CLoCk Consortium, Roz Shafran[1]

History of confirmed SARS-CoV-2 infection

One or more persisting physical symptoms for at least 12 weeks from onset of COVID-19; may continue or develop after infection

Cannot be explained by an alternative diagnosis

Symptoms impact everyday functioning

>335,000,000

US Population
(as of July 2023)

>103,000,000

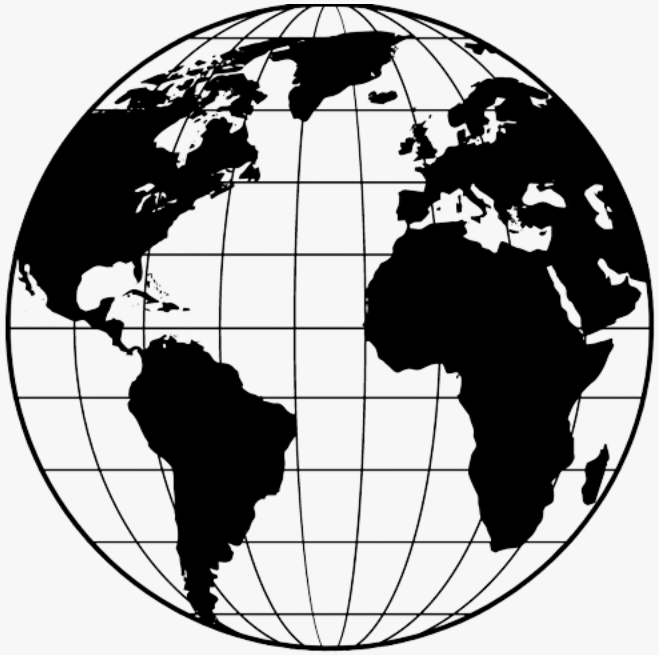
confirmed cases of COVID-19
(as of February 2023)

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

- Case counts are not an accurate assessment of community burden
- Changes in testing behavior and decreased access to testing
- Ending of WHO and US federal government PHE changed reporting requirements
- CDC seroprevalence study suggest that 78% of adults and older adolescents have had infection by December 2022

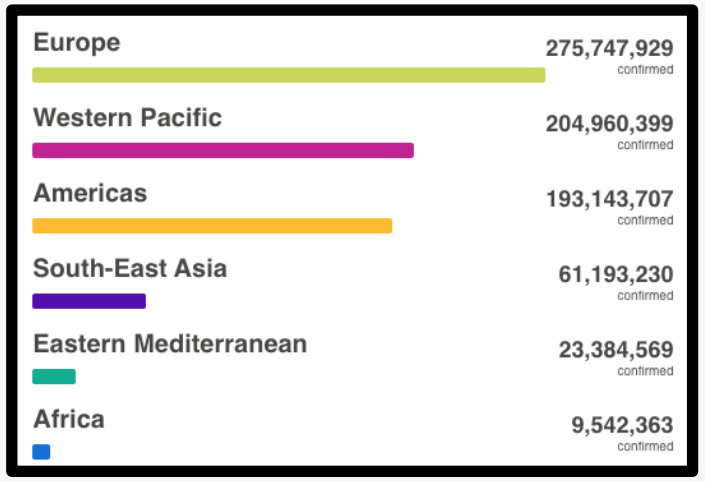
https://covid.cdc.gov/covid-data-tracker/#datatracker-home

https://covid.cdc.gov/covid-data-tracker/#nationwide-blood-donor-seroprevalence-2022



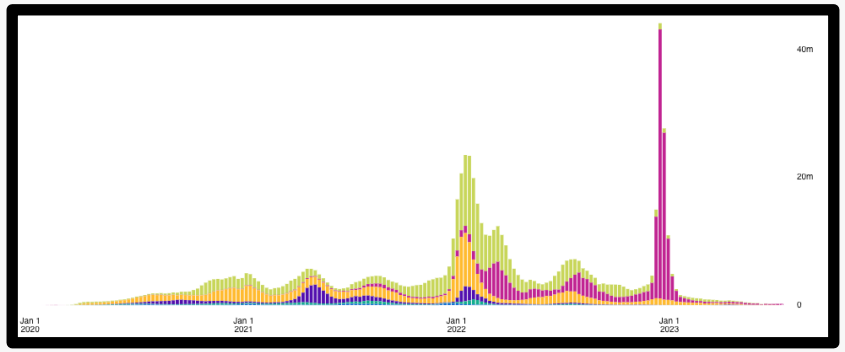
- Higher prevalence of post-COVID-19 conditions in Asia (51%) than in Europe (44%) or USA (31%)

Chen C, Haupert SR, Zimmermann L, Shi X, Fritsche LG, Mukherjee B. Global Prevalence of Post-Coronavirus Disease 2019 (COVID-19) Condition or Long COVID: A Meta-Analysis and Systematic Review. *J Infect Dis*. Nov 1 2022;226(9):1593-1607. doi:10.1093/infdis/jiac136

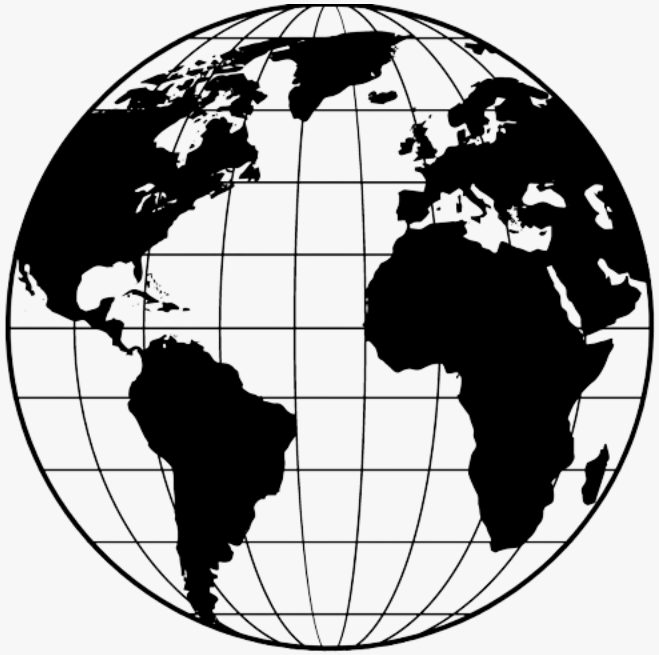


- Higher prevalence of post-COVID-19 conditions in Asia (51%) than in Europe (44%) or USA (31%)*

*This may be due, in part, to reporting and testing biases.



Chen C, Haupert SR, Zimmermann L, Shi X, Fritsche LG, Mukherjee B. Global Prevalence of Post-Coronavirus Disease 2019 (COVID-19) Condition or Long COVID: A Meta-Analysis and Systematic Review. *J Infect Dis*. Nov 1 2022;226(9):1593-1607. doi:10.1093/infdis/jiac136



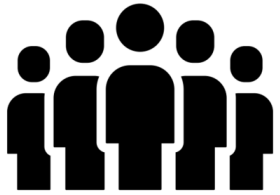
- Higher prevalence of post-COVID-19 conditions in Asia (51%) than in Europe (44%) or USA (31%)
- Symptoms reported for post-COVID-19 conditions appears similar among studies done outside of the US

Chen C, Haupert SR, Zimmermann L, Shi X, Fritsche LG, Mukherjee B. Global Prevalence of Post-Coronavirus Disease 2019 (COVID-19) Condition or Long COVID: A Meta-Analysis and Systematic Review. *J Infect Dis*. Nov 1 2022;226(9):1593-1607. doi:10.1093/infdis/jiac136

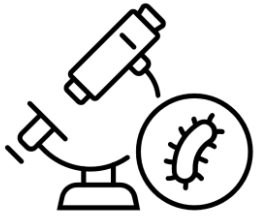
A clinical case definition of post-COVID-19 condition by a Delphi consensus

Joan B Soriano, Srinivas Murthy, John C Marshall, Pryanka Relan, Janet V Diaz, on behalf of the WHO Clinical Case Definition Working Group on Post-COVID-19 Condition

Multi-specialty Clinicians



COVID-19 Survivors

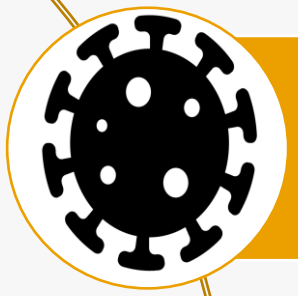


Researchers

Policymakers

Representation From All WHO Regions and World Bank Income Levels

Definition of a post-COVID-19 condition:



History of probable or confirmed SARS-CoV-2 infection

Symptoms usually present at 3 months from onset of COVID-19 lasting at least 2 months

Cannot be explained by an alternative diagnosis

Notable symptom characteristics:

- Impact the everyday function of the individual

Notable symptom characteristics:

- Impact the everyday function of the individual
- Can be new following recovery from acute COVID-19 or carry over from the initial infection

Notable symptom characteristics:

- Impact the everyday function of the individual
- Can be new following recovery from acute COVID-19 or carry over from the initial infection
- May fluctuate or relapse over time

Notable symptom characteristics:

- Impact the everyday function of the individual
- Can be new following recovery from acute COVID-19 or carry over from the initial infection
- May fluctuate or relapse over time
- No minimum number of symptoms required for the diagnosis

Notable symptom characteristics:

- Impact the everyday function of the individual
- Can be new following recovery from acute COVID-19 or carry over from the initial infection
- May fluctuate or relapse over time
- No minimum number of symptoms required for the diagnosis
- A separate definition for children has been developed

Table 1a. Basic diagnostic laboratory testing to consider for patients with post-COVID conditions

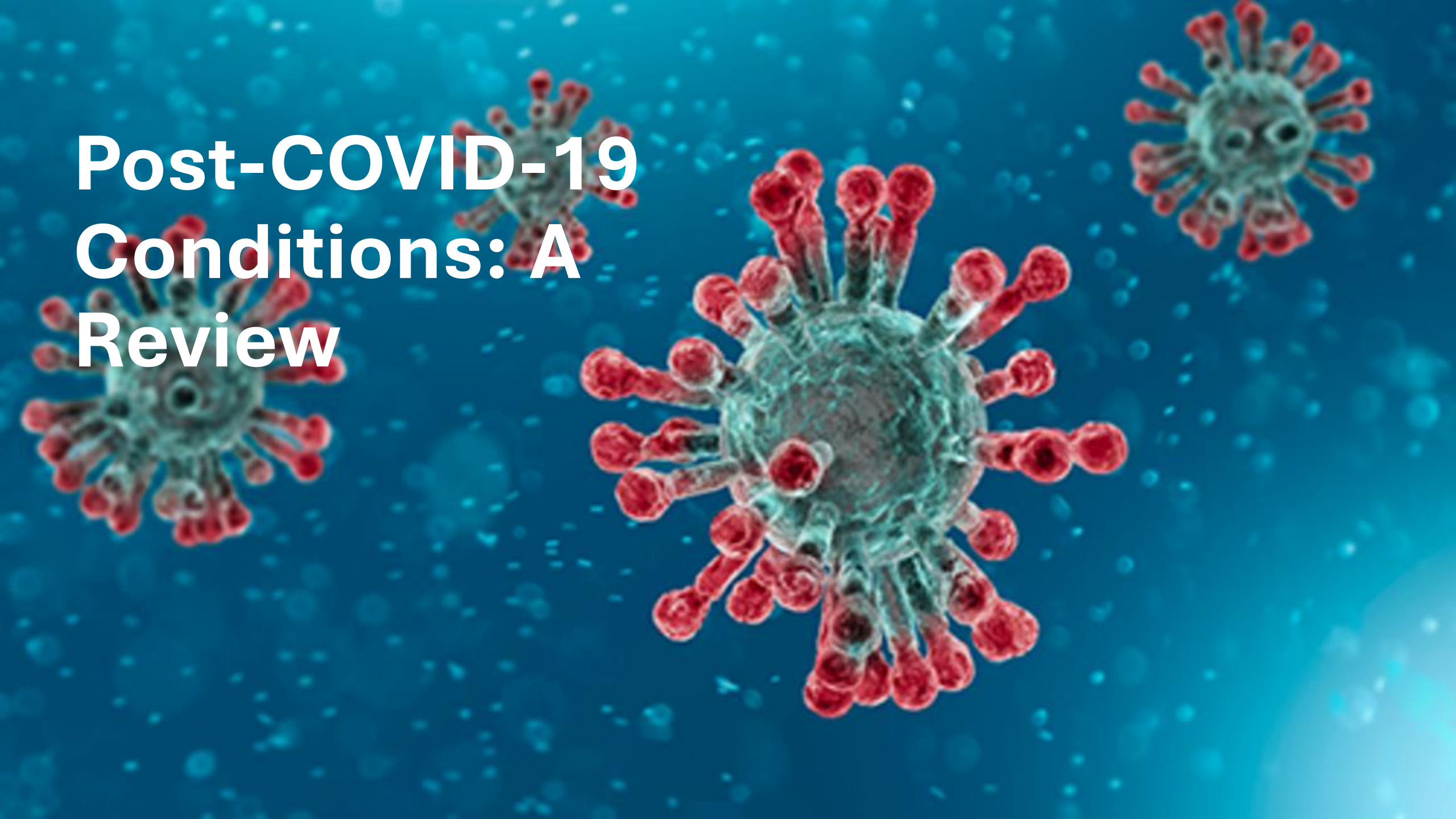
Category	Laboratory Tests
Blood count, electrolytes, and renal function	Complete blood count with possible iron studies to follow, basic metabolic panel, urinalysis
Liver function	Liver function tests or complete metabolic panel
Inflammatory markers	C-reactive protein, erythrocyte sedimentation rate, ferritin
Thyroid function	TSH and free T4
Vitamin deficiencies	Vitamin D, vitamin B12

Table 1b. Specialized diagnostic laboratory testing to consider for patients with post-COVID conditions

Category	Laboratory Tests
Rheumatological conditions	Antinuclear antibody, rheumatoid factor, anti-cyclic citrullinated peptide, anti-cardiolipin, and creatine phosphokinase
Coagulation disorders	D-dimer, fibrinogen
Myocardial injury	Troponin
Differentiate symptoms of cardiac versus pulmonary origin	B-type natriuretic peptide

https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-conditions.html

Post-COVID-19 Conditions: A Review

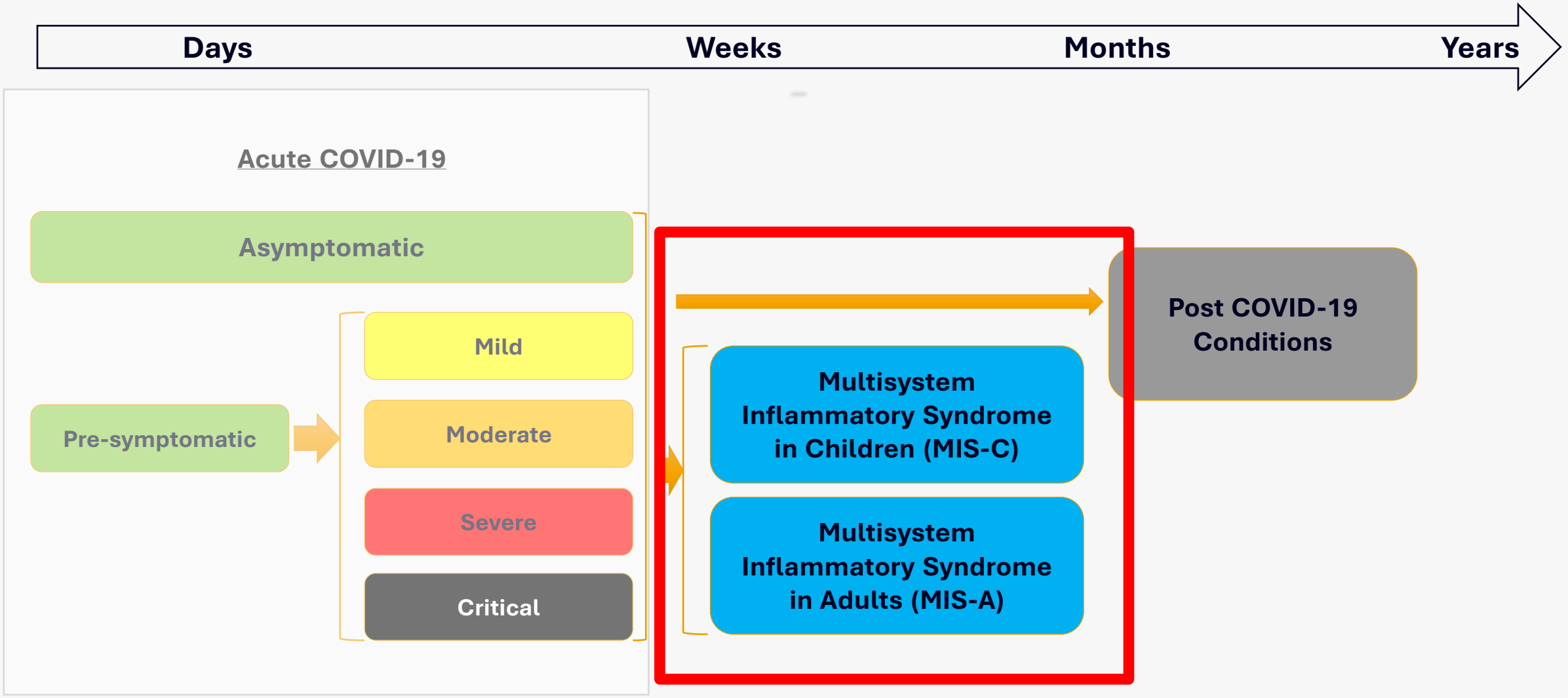


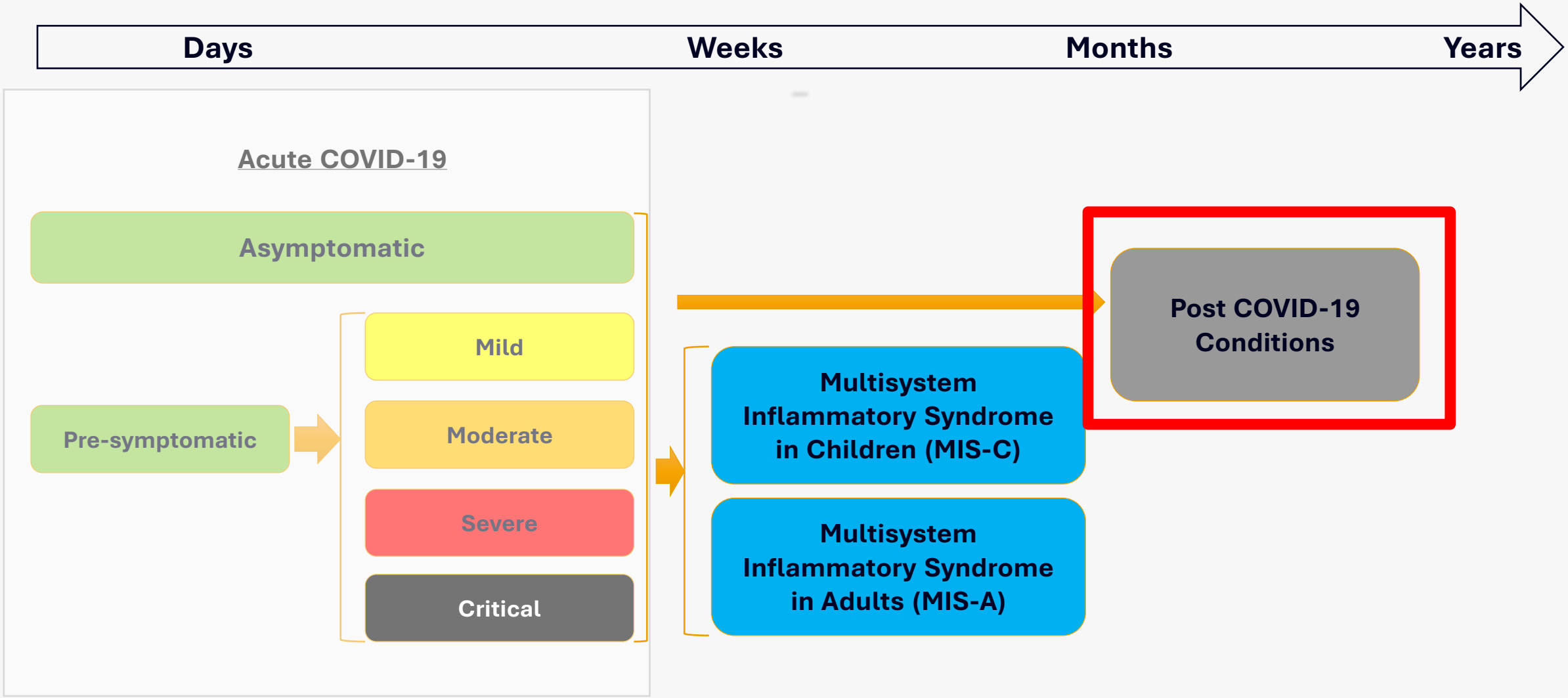
Acute COVID-19

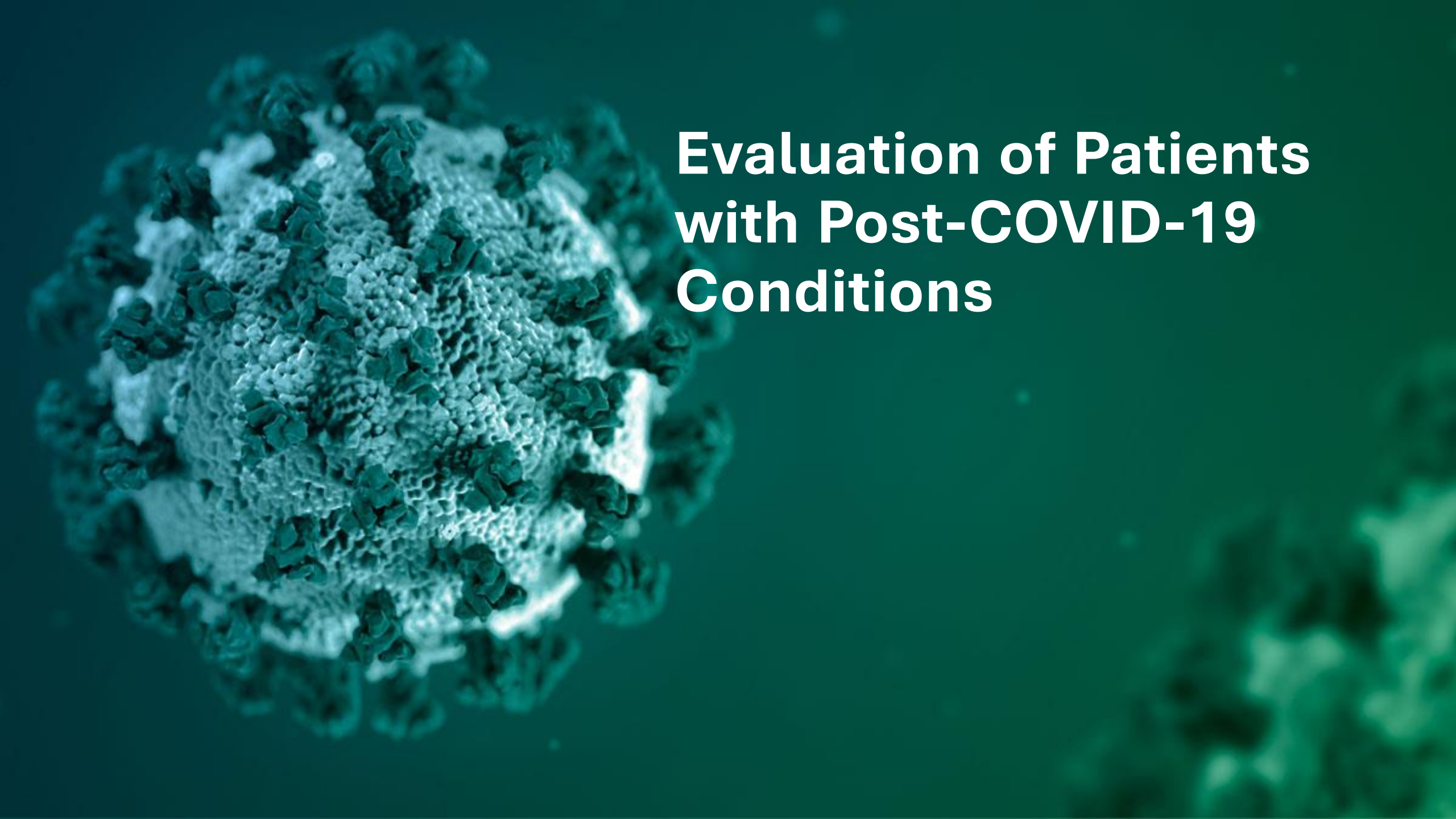
Asymptomatic

Pre-symptomatic

- **Mild**
- **Moderate**
- **Severe**
- **Critical**


Days
Weeks
Months
Years
Acute COVID-19
Asymptomatic
Pre-symptomatic
Mild
Moderate
Severe
Critical
Multisystem Inflammatory Syndrome in Children (MIS-C)
Multisystem Inflammatory Syndrome in Adults (MIS-A)
Post COVID-19 Conditions


Days
Weeks
Months
Years
Acute COVID-19
Asymptomatic
Pre-symptomatic
Mild
Moderate
Severe
Critical
Multisystem Inflammatory Syndrome in Children (MIS-C)
Multisystem Inflammatory Syndrome in Adults (MIS-A)
Post COVID-19 Conditions

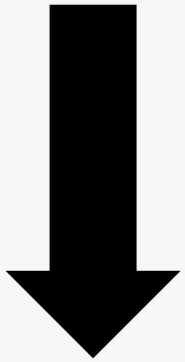


Evaluation of Patients with Post-COVID-19 Conditions

When evaluating a patient in clinic for a post-COVID-19 condition...

determining where to start can feel daunting.

There is currently no gold standard approach to evaluation.



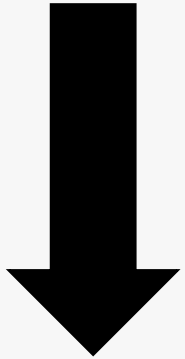
Validate

Targeted Evaluations

Evaluate for life threatening conditions

Rehabilitation

Validate



Targeted Evaluations

Evaluate for life threatening conditions

Rehabilitation

Validate

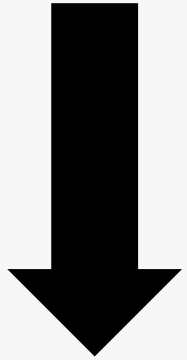
Targeted Evaluations

Evaluate for life threatening conditions

Rehabilitation

Validate

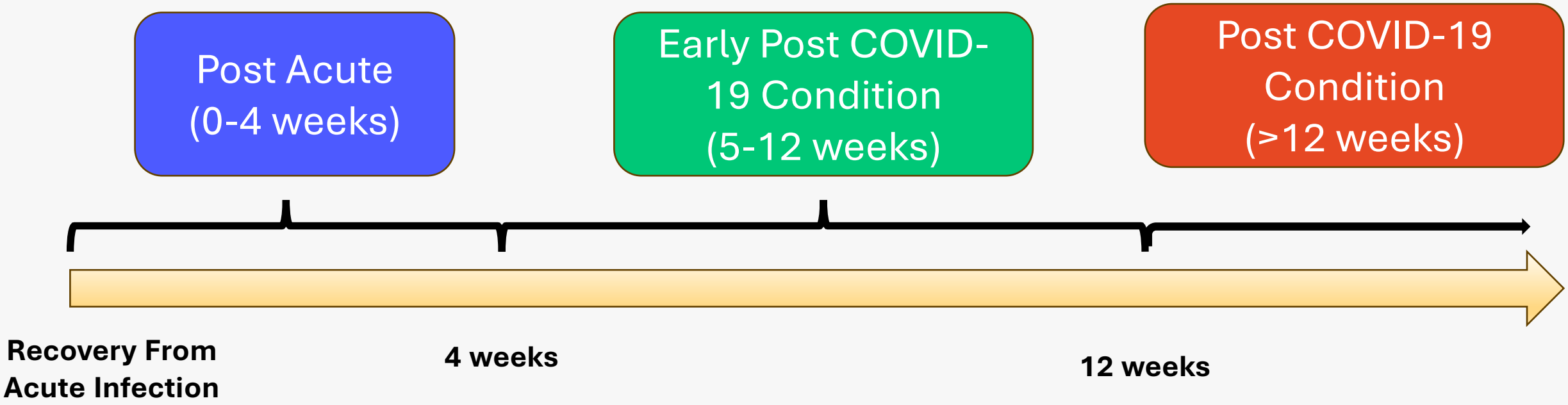
Targeted Evaluations



Evaluate for life threatening conditions

Rehabilitation

Thinking about acute infection recovery in phases.



60-day Outcomes Among Patients Hospitalized with COVID-19

- Early in the pandemic before vaccines and current subvariants
- 12.6% were discharged to skilled nursing or rehabilitation facility
- 6.7% died within 60 days (10.4% of those requiring ICU)
- 15.1% were re-hospitalized

Invite patients to tell their story.

Important history details:

1. Acute COVID-19 history
2. Symptom onset and duration
3. Impact on daily activities

Evaluate for life threatening conditions and common actionable diagnoses.

Understanding the implications of broad testing

- Increased risk of incidental findings
- Patient anxiety about abnormal results without clinical significance
- Risk/harm associated with invasive or radiologic procedures
- Cost and time to the patient for appointments and workup

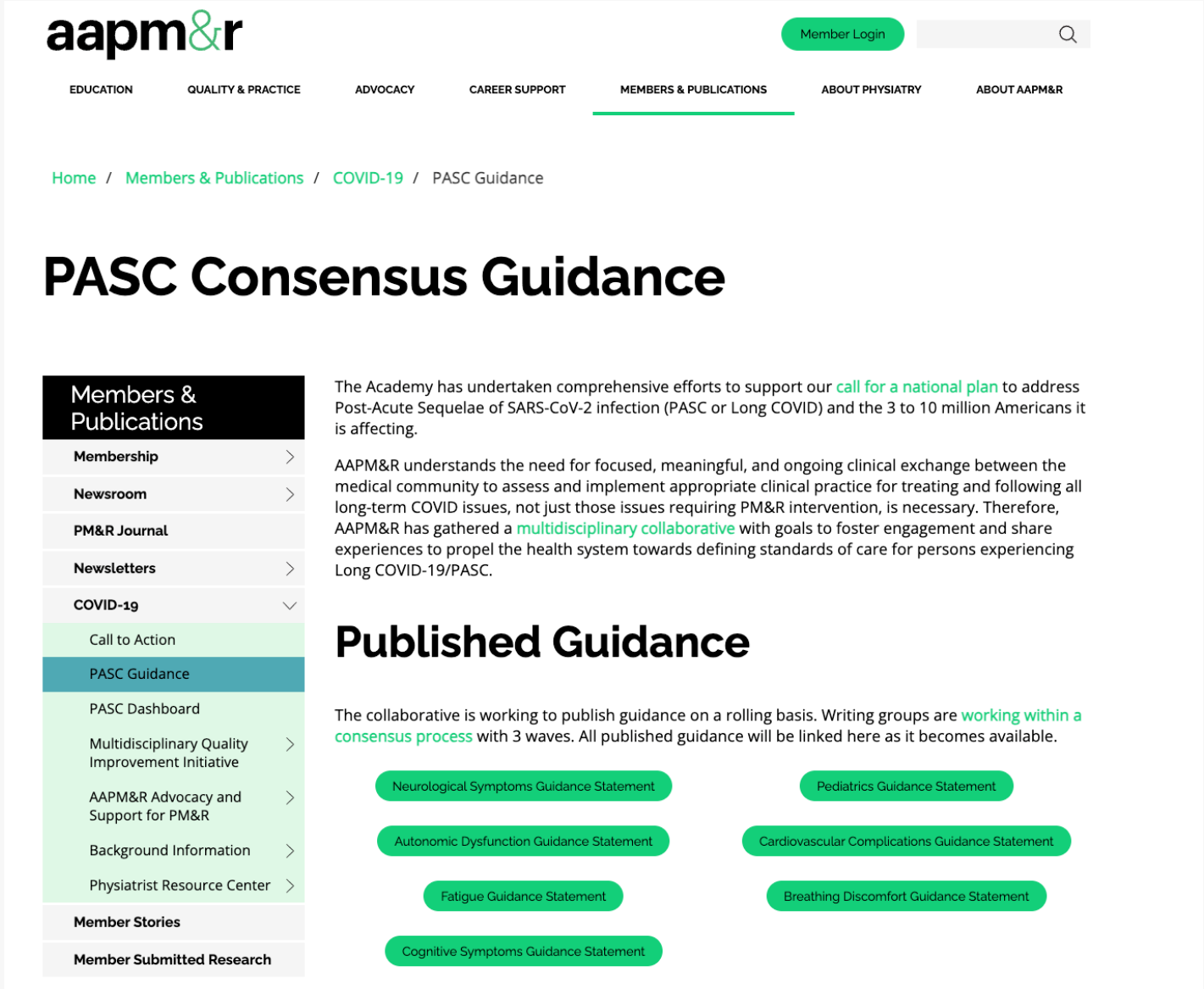
- There is no definitive single or collective tests to diagnose post-COVID-19 conditions

- SARS-CoV-2 testing may be warranted to rule out re-infection.

- May consider expanded testing for those with symptoms beyond 12 weeks

Decision to not do additional testing or the absence of abnormal findings should not lead to dismissal of patient's symptoms.

Symptom and Diagnosis Focused Management



- Neurological Symptoms
- Automatic Dysfunction
- Fatigue
- Cognitive Symptoms
- Cardiovascular Complications
- Breathing Discomfort
- Pediatrics

Evaluating and Supporting Patients with Long COVID in Returning to Work

Print

Evaluating and Supporting Patients with Long COVID in Returning to Work

Clinician Outreach and Communication Activity (COCA) Call

Thursday, June 15, 2023

- **Low and slow**
- **Gradual increases**
- **Titrated work hours**

- **Holistic support and validation of symptoms** is a key aspect of care; this can include referral to patient support services such as social work where needed

- **Holistic support and validation of symptoms** is a key aspect of care; this can include referral to patient support services such as social work where needed

- **Support groups** can help people connect who are affected by similar conditions

- **Holistic support and validation of symptoms** is a key aspect of care; this can include referral to patient support services such as social work where needed

- **Support groups** can help people connect who are affected by similar conditions

- **Management with pharmaceutical medications or supplements** can be beneficial if indicated for the specific illness.

- **Holistic support and validation of symptoms** is a key aspect of care; this can include referral to patient support services such as social work where needed

- **Support groups** can help people connect who are affected by similar conditions

- **Management with pharmaceutical medications or supplements** can be beneficial if indicated for the specific illness.

- **Structural racism and healthcare disparities can impact marginalized communities**
  - Individuals with disabilities
  - People experiencing homelessness or people in correctional facilities
  - Individuals with substance use disorders

- **Holistic support and validation of symptoms** is a key aspect of care; this can include referral to patient support services such as social work where needed

- **Support groups** can help people connect who are affected by similar conditions

- **Management with pharmaceutical medications or supplements** can be beneficial if indicated for the specific illness.

- **Structural racism and healthcare disparities can impact marginalized communities**
  - Individuals with disabilities
  - People experiencing homelessness or people in correctional facilities
  - Individuals with substance use disorders

- **Removing barriers** to accessing care including the availability of telehealth visits to those with internet access

Thank you for joining us and being part of the Power of Providers!

powerofproviders@doh.wa.gov
https://doh.wa.gov/pop/
(360) 236-2662

Washington State Department of HEALTH

DOH 820-266