Evaluating and Supporting Patients Presenting with Cardiovascular Symptoms Following COVID

Clinician Outreach and Communication Activity (COCA) Call

Tuesday, September 20, 2022

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Objectives

At the conclusion of today's session, the participant will be able to accomplish the following:

1. Describe cardiovascular symptoms and complications associated with post-COVID conditions.

2. Determine which clinical assessments and tests are needed for a patient with cardiovascular symptoms.

3. Apply health equity considerations to clinical care, activity management, and reconditioning of long COVID patients.

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- Using the Zoom Webinar System
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Today's Presenters

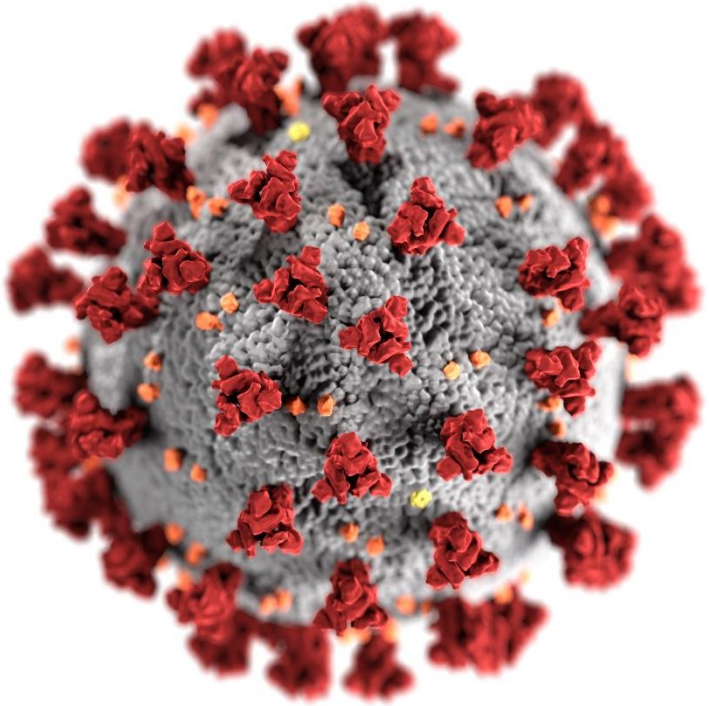
Miriam Nji, MD, MPH
Medical Epidemiologist
Post-COVID Conditions Team
Chronic Viral Diseases Branch
National Center for Emerging and Zoonotic Infectious Diseases
Centers for Disease Control and Prevention

Alba Azola, MD, FAAPMR
Assistant Professor
Co-director of the Post-Acute COVID-19 Team (JH PACT) Program
Department of Physical Medicine and Rehabilitation
Johns Hopkins University School of Medicine

Jonathan Whiteson, MD, FAAPMR
Medical Director, Cardiac and Pulmonary Rehabilitation
Co-Director, NYU Post COVID Care Program
Rusk Rehabilitation, NYU Langone Health

Overview of Post-COVID Conditions

Miriam Nji, MD, MPH
Medical Epidemiologist
Post-COVID Conditions Team
Chronic Viral Diseases Branch



cdc.gov/coronavirus

Post-COVID conditions

- **Post-COVID conditions (PCC)** are the wide range of new, returning, or ongoing health problems people can experience four or more weeks after SARS-CoV-2 infection, *including by patients who had initial mild or asymptomatic infection*
  - Comprise a spectrum of physical and mental health consequences
  - Conditions are heterogenous and may be attributable to different underlying pathophysiologic processes
- Also known as post-acute sequelae of SARS-CoV-2 or Long COVID

Post-COVID Conditions: CDC Science (cdc.gov)

A framework of phenotypes for conditions following SARS-CoV-2 infection

General Consequences of Illness and Hospitalization

- Post ICU-syndrome
- Other complications of illness and treatment

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

- System-specific pathology (e.g., lung fibrosis, stroke)
- Clinically significant symptoms with unclear pathology (e.g., ME/CFS*-like, dysautonomia)

Conditions frequently overlap, patients may experience any combination

*Myalgic Encephalomyelitis/Chronic Fatigue Syndrome

People at risk of post-COVID conditions

- Can occur in **anyone** with history of SARS-CoV-2 infection including:
  - Clinically-presumptive or PCR-confirmed acute SARS-CoV-2 infection
  - Mild, moderate, and severe acute infection, including initially asymptomatic infection
  - All demographics: age, sex, race
  - Previously healthy persons with no underlying illness
- Disproportionately affected groups include people with:
  - Severe initial illness
  - Female sex
  - Pre-existing conditions
  - Older age
  - Infection without prior vaccination

Thompson et al. Nature Communications. 2022

Koudi et al. npj Vaccines. 2022

Symptoms seen in post-COVID conditions

General symptoms

- Tiredness or fatigue that interferes with daily life
- Symptoms that get worse after physical or mental effort (also known as “post-exertional malaise”)
- Fever

Cardiovascular and Respiratory symptoms

- Difficulty breathing or shortness of breath
- Cough
- Chest pain
- Fast-beating or pounding heart (also known as heart palpitations)

Digestive symptoms

- Diarrhea
- Stomach pain

Neurological symptoms

- Difficulty thinking or concentrating (sometimes referred to as “brain fog”)
- Headache
- Sleep problems
- Dizziness when you stand up (lightheadedness)
- Pins-and-needles feelings
- Change in smell or taste
- Depression or anxiety

Other symptoms

- Joint or muscle pain
- Rash
- Changes in menstrual cycles

Long COVID or Post-COVID Conditions | CDC

Long COVID data from Household Pulse Survey

- Data collected July 27 – August 8, 2022
  - Internet surveys were representative of the non-institutionalized U.S. population
  - Report of symptoms lasting ≥3 months and not present prior to having COVID-19
  - Symptoms currently present – persons with COVID-19 as denominator
- 17% of US adults who ever had COVID-19 currently report Long COVID
- Report of Long COVID differs by select sociodemographic characteristics and disability status
  - Females (20.3%) compared to males (13.2%)
  - Non-Hispanic Asian adults less likely to have current Long COVID (10%), compared to non-Hispanic White (16.9%), non-Hispanic Black (14.4%), and Hispanic (17.7%)
  - Adults with a disability (34.9%) compared to adults without a disability (14.6%)

Long COVID - Household Pulse Survey - COVID-19 (cdc.gov)

Modeling to estimate U.S. burden of activity-limiting post-COVID conditions

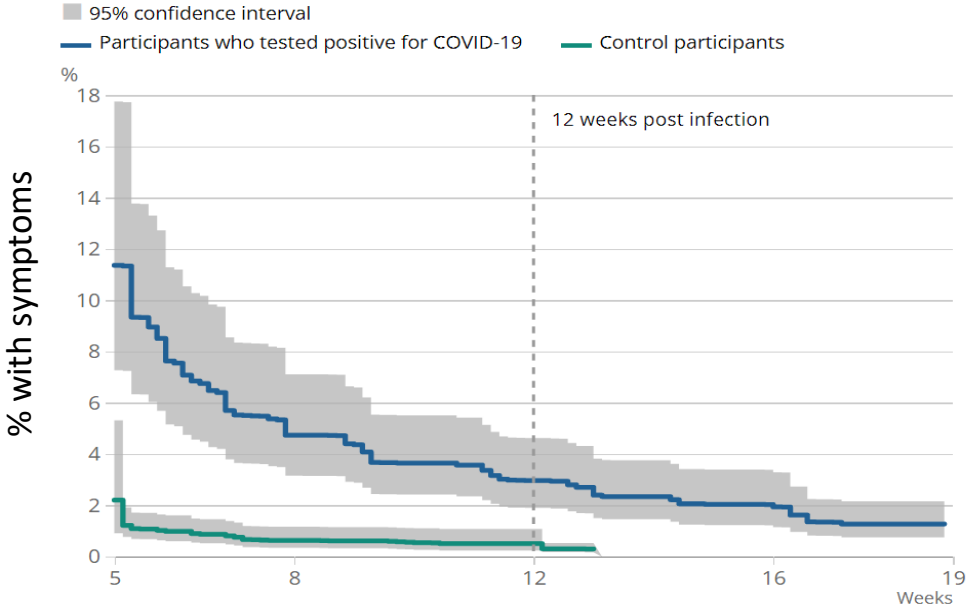
- **On November 1, 2021, at least 3.0–5.0 million adults estimated to have activity-limiting PCC**
- Activity-limiting PCC estimated to occur **following 8.3–13.8% of SARS CoV-2 infections** identified February 1, 2020–September 30, 2021
- Data sources
  - Number at risk: SARS-CoV-2 infections in US adults reported to CDC Feb. 2020–Sept. 2021
  - PCC Risk: UK population-based household testing/survey data for adults who self-reported activity-limiting symptoms at various intervals after infection
- These results are based on currently available data, have limitations
- Model may be iteratively updated to incorporate new data

Point Prevalence Estimates of Activity-Limiting Long-Term Symptoms among U.S. Adults ≥1 Month After Reported SARS-CoV-2 Infection, November 1, 2021 | The Journal of Infectious Diseases | Oxford Academic (oup.com)

Disease course of post-COVID conditions

- Most patients recover in 4 weeks and the proportion reporting symptoms decreases between 4-12 weeks
- Improvement slows around 12 weeks after infection
- Women and men follow same pattern, but more women report symptoms

UK Coronavirus Infection Survey: Report of symptoms lasting 4 or more weeks- April 2020 – August 2021



Source: Office for National Statistics - Coronavirus Infection Survey

Technical article, figure 2. Office for National Statistics (ons.gov.uk)

The impact of post-COVID conditions

- People with post-COVID conditions may suffer:
  - Significant morbidity which can range from mild to debilitating
  - Limitation in completing activities of daily living
  - Increased use of health resources

- Extent and duration of disability associated with persistent symptoms is unclear

- Data collection and analysis ongoing regarding the impact of post-COVID conditions in different sociodemographic groups
  - Existing health disparities for COVID-19 are expected to persist with post-COVID conditions

Al-Aly et al. Nature 594, 259–264 (2021)
Rogers-Brown et al. MMWR 2021

Self knowledge check question

- Who can present with persistent symptoms following COVID-19?
  A. Patients with severe acute disease
  B. Older adults
  C. Those with asymptomatic acute infection
  D. Patients with underlying medical conditions associated with risk
  E. All the above

Self knowledge check answer

- The correct answer is
  - E. All the above

- Anyone can present with post-COVID conditions. Even though certain patient factors such as severity of illness, preexisting health conditions, and older age are associated with increased risk of persistent symptoms, it is evident that **anyone with previous SARS-CoV-2 infection** can present with post-COVID conditions.

Cardiovascular complications following acute SARS-CoV-2 infection

Cardiovascular symptoms

- Most common include
  - Chest pain
  - Dyspnea
  - Palpitations
- Range from mild to incapacitating
- More common among hospitalized patients, HR= 1.80 [1.71–1.89]

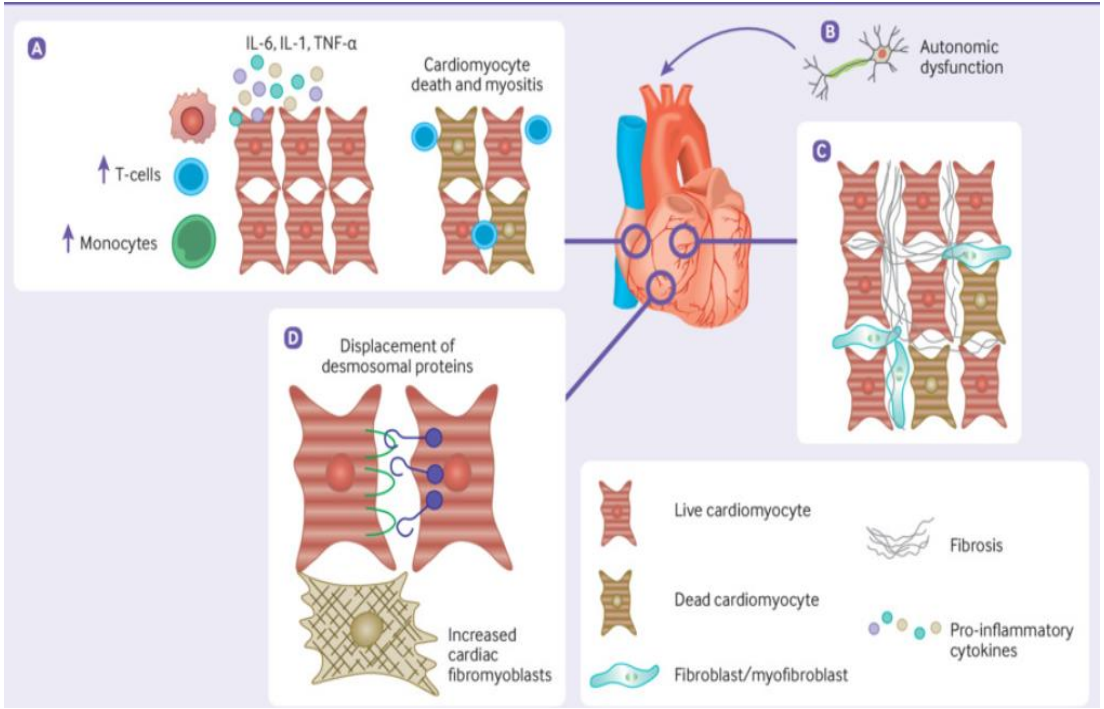
Cardiovascular disorders

- Increased incidence within 12 months of SARS-CoV-2 infection compared with controls
  - Cerebrovascular disorders
  - Dysrhythmias
  - Ischemic/non-ischemic heart disease
  - Heart failure
  - Thromboembolism
- The risk is evident regardless of age, race, sex, and other cardiovascular risk factors

Xie et al. Nature Medicine, 2022
Huang et al. The Lancet 2021
Wiemken et al. Clin Inf Dis, ciac661, 2022
ACC Consensus Decision Pathway on PASC, 2022

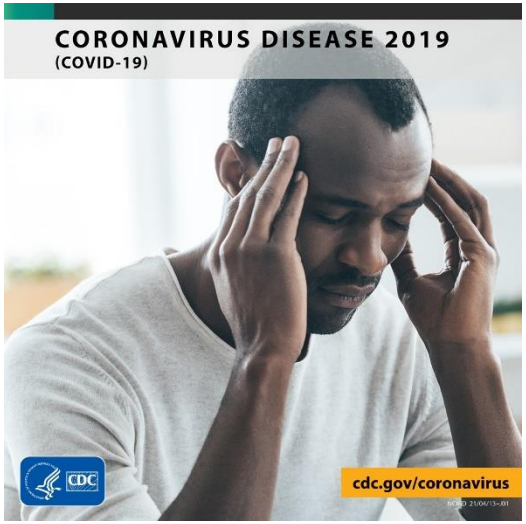
Several factors may play a role in the pathogenesis of cardiovascular sequelae

- Cytokine-mediated inflammation can cause myositis and cardiomyocyte death
- Chronic inflammation and cellular damage may result in fibrosis
- Autonomic dysfunction can lead to postural orthostatic tachycardia syndrome (POTS)



BMJ 2021;374:n1648

Information for healthcare providers on evaluating and caring for patients with post-COVID conditions



- Most post-COVID conditions can be diagnosed and managed by primary care
- Many post-COVID conditions may be diagnosed based on history and physical exam, routine tests may be normal
- Consider conservative diagnostic approach in the first 4 to 12 weeks
- Symptoms persisting beyond three months should prompt further evaluation
- **Listen to and validate patients' experiences and partner with patients to identify achievable health goals**

Key Points | Evaluating and Caring for Patients with Post-COVID Conditions | CDC

U.S. ICD-10-CM code for post-COVID conditions
(as of October 1, 2021)
U09.9 Post COVID-19 condition

2022 timeline for coordinating a government-wide response to long-term effects of COVID-19

April

President's memo organized government-wide response to address Long COVID and the longer-term impacts of COVID-19

Conducted listening sessions with community members, patients, and partners

14 agencies collaborated to identify existing federal services available and outline a national research agenda

Applies to those experiencing

Long COVID and associated conditions
Behavioral health challenges
Bereavement

August

Released two reports

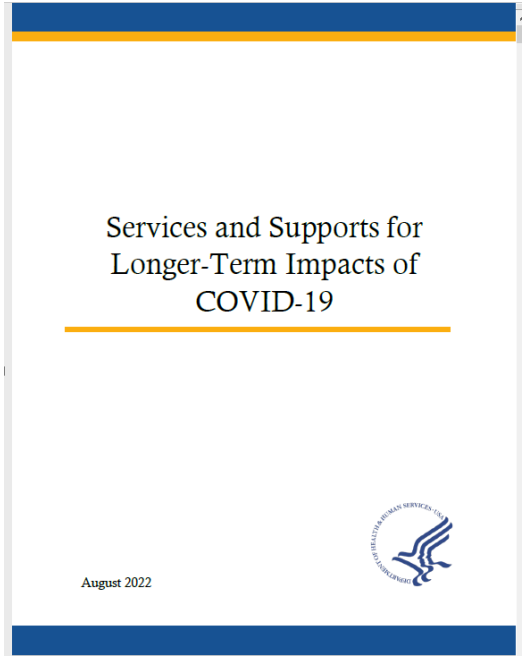
1. Services and Supports for Longer-Term Impacts of COVID-19
2. National Research Action Plan on Long COVID

www.covid.gov/longcovid

Services and Supports for Longer-Term Impacts of COVID-19

Purpose
To outline the mechanisms across USG that assist people who are experiencing needs related to the longer-term effects of COVID-19.

Catalogs over 200 existing services and supports available to individuals experiencing Long COVID, health care workers who work with and treat individuals experiencing Long COVID, individuals experiencing longer-term impacts of COVID-19, including mental health and substance use challenges, and individuals dealing with losing a caregiver, family member, or loved one to COVID-19.



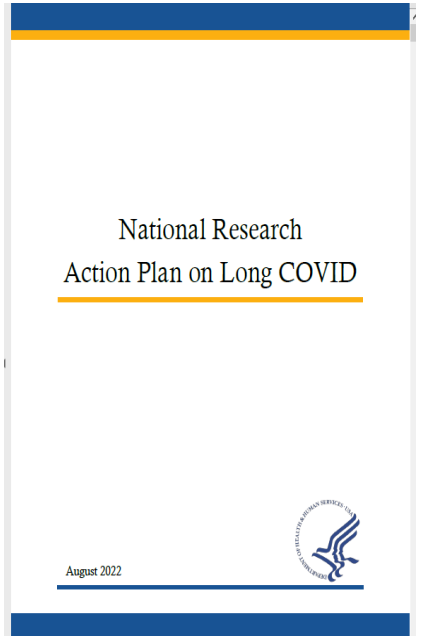
National Research Action Plan on Long COVID

Purpose

To advance progress in prevention, diagnosis, and treatment of Long COVID; and provision of services and supports for individuals, families, and communities experiencing Long COVID.

Audience

- Intended for U.S. government agencies and to inform Congress and researchers both public and private, including academia.
- Relevant to state policymakers, foundations and other funders of research, healthcare and service personnel, public health partners, Long COVID patients and advocacy groups, pharmaceutical companies, and the general public.



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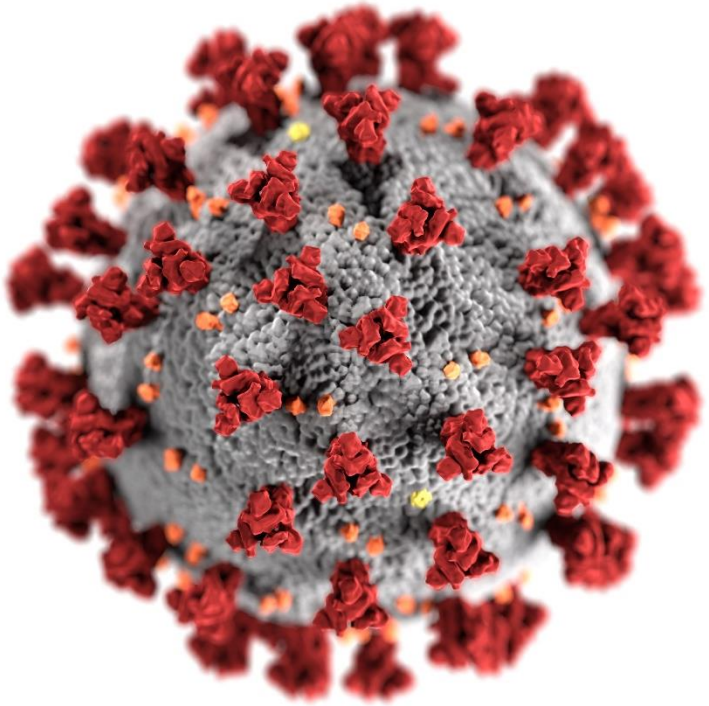

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Evaluating and Supporting Patients Presenting with Cardiovascular Symptoms Following COVID-19

September 20, 2022

Faculty

Alba Azola, MD, FAAPMR

Jonathan Whiteson, MD, FAAPMR

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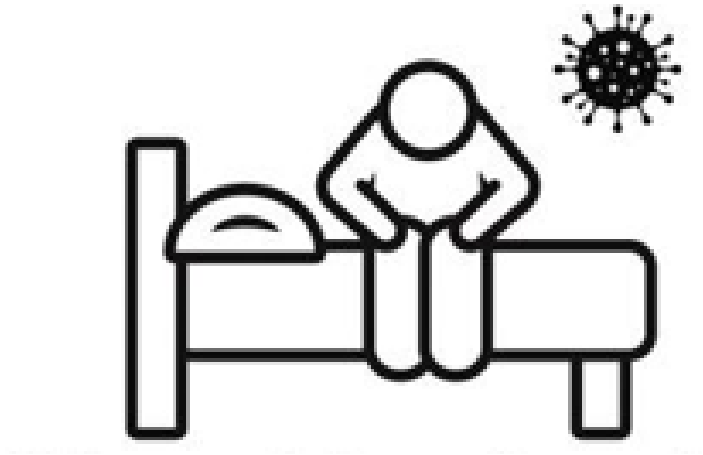
Millions of Americans have survived COVID-19



Months later, many still struggle to function normally

Learning Objectives

- Identify and diagnose cardiovascular symptoms and complications in individuals with post-acute sequelae of SARS-CoV-2 (PASC)
- Utilize PASC Consensus Guidance Statement recommendations to assess patients with cardiovascular symptoms
- Identify appropriate treatments for PASC-related cardiovascular problems
- Identify health equity considerations and examples in PASC-related conditions

NOTE: These Consensus Guidance Statements are intended to reflect current best practices in patient assessment, testing, and treatments. They should not preclude clinical judgment and must be applied in the context of the specific patient, with adjustments for patient preferences, comorbidities, and other factors.

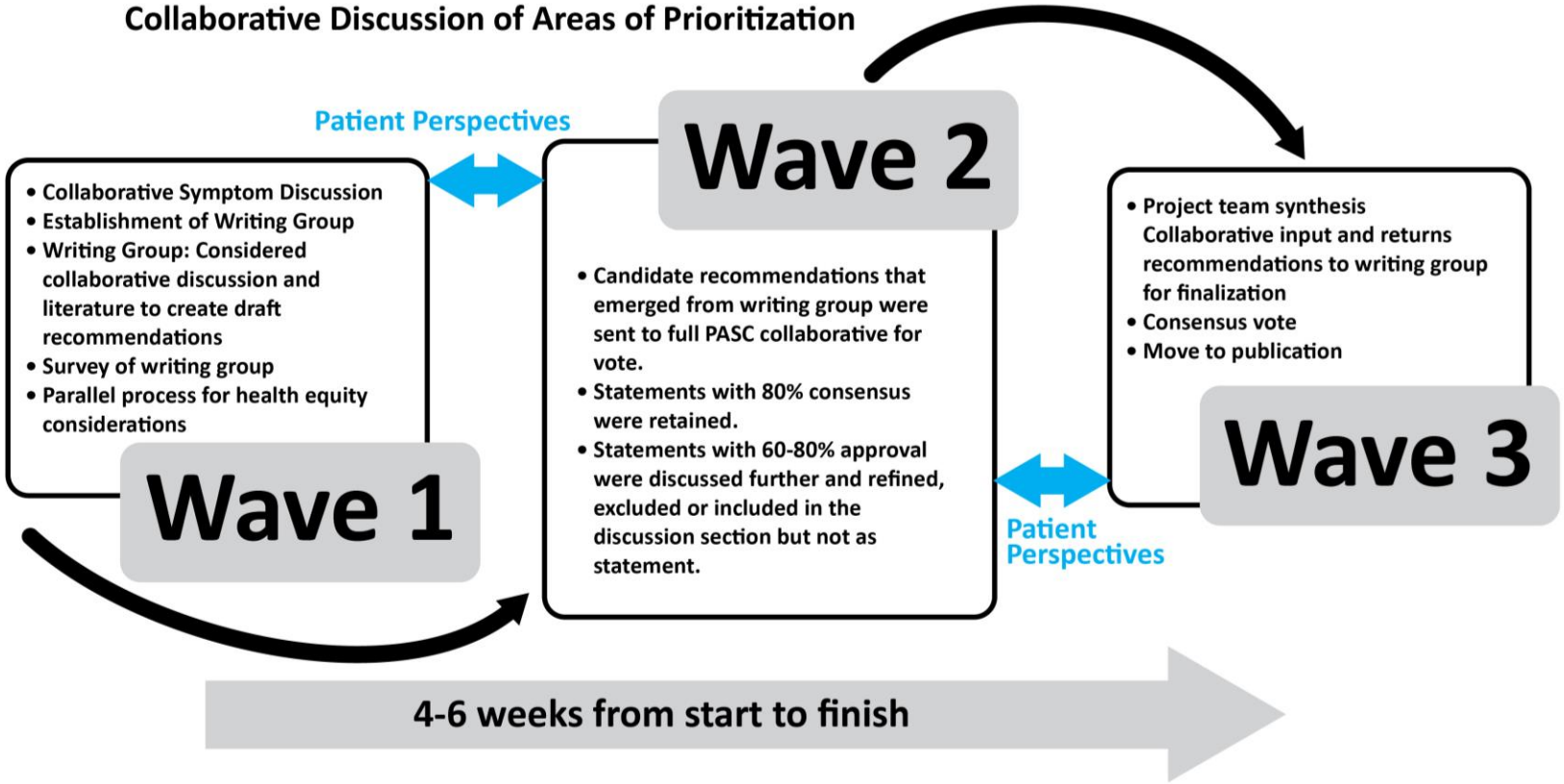
Consensus Guidance Statements

This consensus guidance statement is one in a series extending across the breadth of the most prevalent or recognized post-acute sequelae of SARS-CoV-2(PASC):

- Fatigue
- Breathing issues
- Cognitive Symptoms
- **Cardiovascular Symptoms and Complications**
- Autonomic Dysfunction (forthcoming)
- Pediatrics (forthcoming)
- Neurological Issues (forthcoming)
- Mental Health (forthcoming)

Consensus Guidance Statement on Cardiovascular Complications in PASC

Consensus Statement Methodology



Cardiovascular Symptoms and Complications are Common Among Patients with PASC

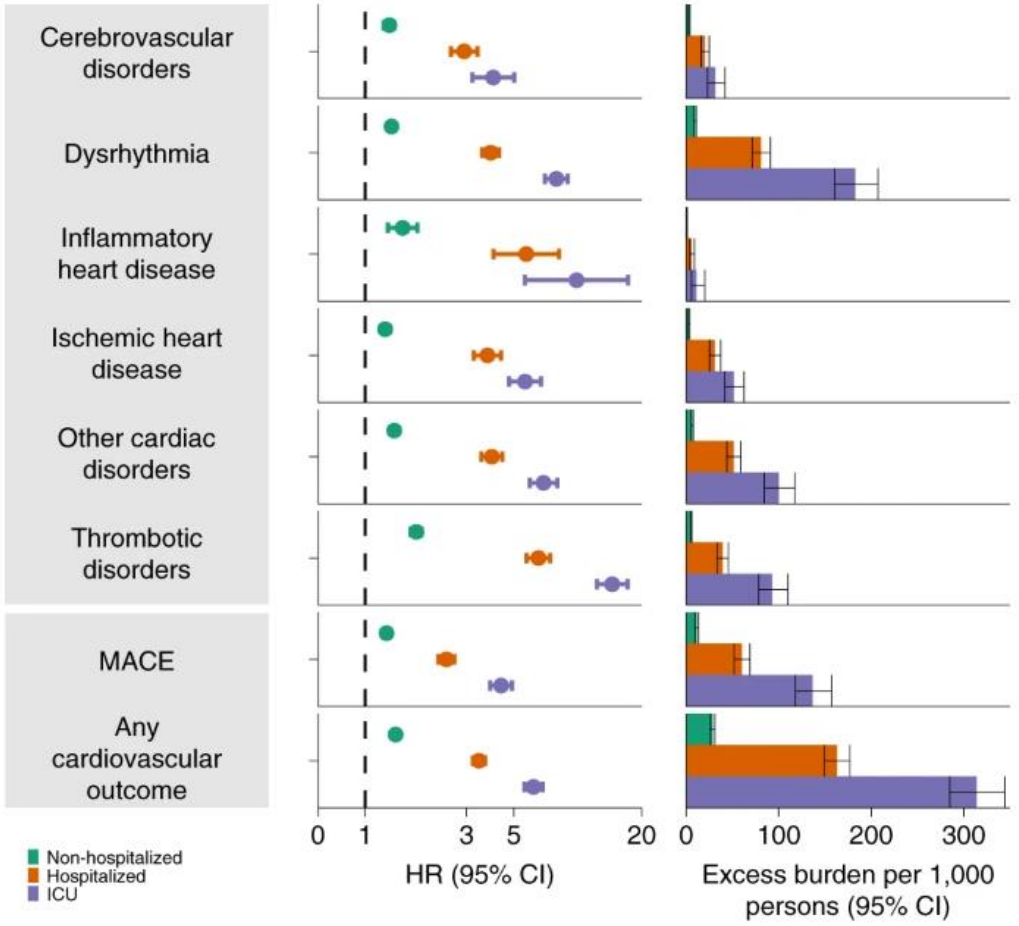
- True for patients hospitalized for COVID-19 as well as those with milder illness
- Chest pain, dyspnea, and palpitations most common
- Frequent reason for clinical care among patients following COVID-19

Incidence of Cardiovascular Complications

- Myocardial injury: 7–40%
- Acute heart failure: 23–33% among hospitalized patients
- Right ventricular (RV) dysfunction: 16–35%
- RV dilation: 12–15%
- Arrhythmias: 18% (atrial fibrillation/flutter most common)
  - 4–6% are life-threatening
- Venous thromboembolism: 15–21% in hospitalized patients

Cenko et al. Cardiovascular Research, cvab298. 2021
Chang et al. Am J Med Sci. 2021

Long Term Cardiovascular outcomes of COVID 19



- Risks and burdens were evident even among individuals who were not hospitalized
- Graded increased risk across the severity spectrum of the acute phase of COVID-19

Xie, Y., Xu, E., Bowe, B., & Al-Aly, Z. (2022). Long-term cardiovascular outcomes of COVID-19. *Nature medicine*, *28*(3), 583-590.

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Assessment of Cardiovascular Complications: Patient History

- Review of predisposing comorbidities
  - Coronary artery disease
  - Diabetes
- Prior cardiovascular events
- Severity of acute COVID-19 illness
  - Mild, moderate, severe
  - Relevant hospitalization
  - Care in the intensive care unit (ICU)
  - Need for ventilator
  - Extra-corporeal membrane oxygenation (ECMO)
  - Timeline of symptom evolution

Assessment of Cardiovascular Complications: Patient History (continued)

- Most common new or worsening cardiac symptoms:
  - Chest pain, palpitations, shortness of breath, near- or syncopal episodes, exercise intolerance, fatigue

- Tests conducted to date:
  - Labs, electrocardiogram, echocardiogram, chest imaging, other cardiac work-up

- Medication history:
  - Medications that may impact symptoms, signs, or assessment parameters

Assessment of Cardiovascular Complications: Patient History (continued)

Symptoms should be characterized to understand contributing factors that **limit activity** including:

- Onset (new, acute, or chronic)
- Frequency
- Intensity
- Aggravating and alleviating factors

Assessment of Cardiovascular Complications: Initial Evaluation

Clinicians should conduct a thorough examination of the cardiovascular system including:

- Routine vital signs – Heart Rate [HR], Blood Pressure [BP]
- Pulse oximetry
- Auscultation of heart and lungs
- Peripheral pulses and bruits
- Signs of volume overload

Assessment of Cardiovascular Complications: Initial Evaluation (continued)

For individuals reporting dizziness, lightheadedness, and syncope/presyncope, clinicians should:

- Further characterize the perceived dizziness, lightheadedness vs. room spinning sensation

- Differentiate between central or peripheral etiologies that warrant specialist referral

Assessment of Cardiovascular Complications: Initial Evaluation (continued)

To differentiate cardiovascular from autonomic dysfunction:

- check orthostatic blood pressure and heart rate response in supine and standing position

If abnormal or symptoms are concerning for autonomic dysfunction:

- continue evaluation as per the autonomic dysfunction guideline including a 10-min active stand test

Assessment of Cardiovascular Complications: Initial Evaluation (continued)

Obtain standardized measures of activity performance to:

- compare to normal control values and
- guide the initial activity prescription

Repeat the standardized measures of activity performance at follow-up visits to:

- quantify functional changes and
- guide progression of the activity prescription

Note: Some patients with PASC, such as those with post exertional malaise, may not tolerate exercise.

Self-Knowledge Check Question

1. **Common cardiovascular symptoms in patients with PASC may include:**

   A. Chest pain

   B. Palpitations

   C. Exercise intolerance

   D. Shortness of breath

   E. All the above

Self-Knowledge Check Answer

Answer: E. All the above

Rationale: Some patients may experience cardiovascular symptoms after COVID-19. These symptoms commonly include chest pain, palpitations, exercise intolerance, and shortness of breath.

Self-Knowledge Check Question

2. What tests can be done to differentiate cardiovascular from autonomic dysfunction?

A. Routine vital signs (blood pressure, heart rate)
B. Orthostatic blood pressure and heart rate response in supine and standing positions
C. Echocardiogram
D. Chest imaging
E. Do nothing

Self-Knowledge Check Answer

Answer: B. Orthostatic blood pressure and heart rate response in supine and standing positions

Rationale: Certain symptoms can be caused by cardiovascular or autonomic dysfunction. To differentiate cardiovascular from autonomic dysfunction, first check for orthostatic changes by measuring the blood pressure and heart rate in supine and standing positions. Other tests and imaging may be recommended following initial orthostatic assessments.

Assessment of Cardiovascular Complications

Where diagnosis is uncertain, or symptoms are progressing or severe, consider referral to a cardiologist for more detailed assessment.

Consider:

- Computed tomography of the chest
- Cardiac magnetic resonance imaging
- Cardiac stress testing
- Cardiopulmonary exercise testing

Treatment Recommendations for Cardiovascular Complications

Management of risk factors for cardiovascular disease, such as:

- Dyslipidemia
- Diabetes
- Hypertension
- Overweight/obesity
- Sedentary lifestyle
- Tobacco use, and
- Depression

Treatment Recommendations for Cardiovascular Complications (continued)

Education components can include:

- Lifestyle modifications
- Diet/nutrition
- Activity/exercise
- Medications
- Risk factors
- Disease process
- Reassurance

Treatment Recommendations for Cardiovascular Complications (continued)

For individuals diagnosed with new or worse:

- Complex arrhythmias
- Structural heart disease
- Coronary heart disease
- Ventricular dysfunction

…evaluate and manage in conjunction with a cardiologist

Treatment Recommendations for Cardiovascular Complications (continued)

Individuals with a recent history of cardiac events and diagnosis, including:

- Myocardial infarction
- Stable angina
- Coronary intervention (percutaneous coronary intervention including angioplasty or cardiac stenting)
- Systolic heart failure with ejection fraction ≤ 35%
- Heart surgery such as coronary artery bypass surgery
- Heart valve repair or replacement
- Heart or heart-lung transplant

…qualify for and should be **referred to cardiac rehabilitation**

Treatment Recommendations for Cardiovascular Complications (continued)

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Athletes should be evaluated, counseled, and guided on staged return to play and sports performance.

Athletes may resume exercise training when the following criteria have been met:

1. Recent SARS-CoV-2 infection, who are asymptomatic and have abstained from exercise for 3 days during self-isolation

2. Recent SARS-CoV-2 infection who experienced mild or moderate non-cardiopulmonary symptoms, which have resolved

3. Remote infection >3 months ago without ongoing cardiopulmonary symptoms and require no additional testing

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Health Equity Considerations and Examples

- Racial/Ethnic Minority Groups
- Biological Sex
- Gender
- Age
- Environmental Exposure
- Disability
- Religion
- Immigration History

Example 1: Health Equity Considerations and Examples PASC: Cardiovascular Symptoms

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Category	Comment	What is Known	Clinical Considerations
Biologic Sex Example: Female adults	Knowledge of areas of potential bias are important for clinicians to recognize and intentionally counteract in order to provide equitable healthcare.	**Biologically female adults have some differences in cardiac risk factors compared to male adults.** For example, they go through menopause with ensuing physiologic changes (e.g., hormonal, sarcopenia). Pregnancy has been reported to be a risk factor for more severe COVID-19 infection.	Sex-related disparities have been reported and **female adults may be underdiagnosed and undertreated for cardiac conditions**, including referrals for cardiac rehabilitation. Thus, it is important for clinicians to be aware of the potential for underdiagnosis or misdiagnosis and ensure that this group receives optimal care.

Example 2: Health Equity Considerations and Examples PASC: Cardiovascular Symptoms

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Category	Comment	What is Known	Clinical Considerations
Racial/ ethnic minority groups *Example: People who identify as Black (including African-American), American-Indian/Alaska Native, Pacific Islander, Asian-American, and Mixed Race, and/or Latino/Hispanic (ethnicity)*	Individuals who identify with groups that have been historically, socially, or economically marginalized may be at higher risk for COVID-19 related morbidity and mortality.	Historically marginalized racial/ethnic minority groups have higher rates of COVID-19 infection and lower rates of access to health care services and these disparities are influenced by social determinants of health (SDOH). The NACMI (North American COVID-19 and STEMI) registry demonstrated ST-segment elevation myocardial infarction (STEMI) in COVID positive patients disproportionately involving individuals from racial/ethnic minority groups (50%) with diabetes mellitus.	**Individuals from racial/ethnic minority groups have been reported to have lower referral rates to cardiac rehabilitation than people classified as White/Caucasian**. Treating physicians should determine what type of rehabilitation interventions and/or programs will be most beneficial as well as considering other factors such as cost and availability. Every effort should be made to close gaps in health disparities and ensure optimal care for people who identify with racial/ethnic minority groups.

Summary

- Cardiovascular symptoms and conditions are common in COVID-19 and may persist in individuals with PASC
- A thorough evaluation for risk factors and the presence of pre-existing or new cardiovascular disease is recommended, in conjunction with a cardiologist
- Management includes lifestyle changes, risk factor modification, cardiovascular disease management – tests, medications, referral to cardiac rehabilitation when indicated
- Health care disparities impact outcome of individuals with PASC and cardiovascular conditions and must be sought and managed appropriately

A Call to Action…

- Pre-pandemic trends project a significant rise in cardiovascular disease over the next 30 years.
- Projections further influenced by:
  - COVID-19 pandemic— less activity, increased weight, increased stress, poor attendance to clinic, and poorer risk factor management.
  - Significant health disparities: racial, gender, disability status
- Our paper is not just about managing individuals with PASC and CV symptoms or disease, but it is about **setting them on a trajectory and supporting them into the future for optimum health.**

Future Directions

- **Improved control of cardiovascular risk factors is likely to improve outcomes in acute COVID-19**
  - Data are still coming in to support this hypothesis

- **PASC-related cardiovascular complications common in individuals infected with alpha and delta variants of SARS-CoV-2 COVID-19**
  - Unvaccinated individuals at higher risk
  - Yet to be seen if PASC-related cardiovascular complications will differ in those infected with different variants and fully vaccinated

- **Health disparities thought to impact the risk of SARS-CoV-2 infection and PASC are also risk factors for cardiovascular disease**
  - Yet to be seen if efforts to improve health equity in vulnerable populations will have a positive impact on cardiovascular complications in PASC

Thank You…

To Ask a Question

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- Those who will participate in the on-demand activity and wish to receive continuing education should complete the online evaluation between **October 25, 2022,** and **October 25, 2024,** and use course code **WD4520-092022.** The access code is **COCA092022.**

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- **What:** Video recording
- **Where:** On the COCA Call webpage https://emergency.cdc.gov/coca/calls/2022/callinfo_092022.asp

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