


Long COVID: Diagnosis and Management




Tiffany Walker, MD

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Atlanta, GA



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Financial Relationships With Ineligible Companies  
(Formerly Described as Commercial Interests by  
the ACCME) Within the Last 2 Years:

Dr Walker has no financial relationships with ineligible companies to  
disclose. (Updated 03/16/23)

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Learning Objectives

After attending this presentation, learners will be able to:

1. Describe Long COVID epidemiology and identify symptoms

2. Characterize Long COVID physiology

3. Describe diagnostic and management approaches

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Long COVID Case

- 52F with obesity, COVID-19 vaccinated
- CC: Fatigue and Forgetfulness
  - Fatigue
  - Memory, concentration difficulties
  - Palpitations
  - Sleep impairment
- Abnormalities: (+) Cognitive screen, D-dimer: 980, CRP: 10

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WHO Case Definition

- Prior SARS-CoV-2 infection
- Symptoms 3 months from the onset
  - New onset since recovery or persist
  - May fluctuate or relapse over time
- Cannot be explained by an alternative diagnosis
- Impact on everyday functioning

A clinical case definition of post COVID-19 condition : [https://www.who.int/publications/i/item/WHO-2019-nCoV-Post\\_COVID-19\\_condition](https://www.who.int/publications/i/item/WHO-2019-nCoV-Post_COVID-19_condition)  
 Clinical case definition 2023.1

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Incidence

Morbidity and Mortality Weekly Report (MMWR)

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

Weekly / May 01, 2022 / 71(21);2119–2127

On May 24, 2022, this report was posted online as an MMWR Early Release.

Lara B. Otterson, PhD<sup>1</sup>; Sarah Baca<sup>1</sup>; Sharon Saydah, PhD<sup>2</sup>; Tapan K. Bhatnagar, PhD<sup>3</sup>; Steven K. Arora, PhD<sup>4</sup>; Lauren M. Harris, MD<sup>5</sup> (corresponding author)

Age group, y	No. of patients (column N)		No. of patients with a† incident condition (column N*)		Relative risk difference†	No. of COVID-19 survivors with a post COVID condition†
	Case patients	Control patients	Case patients	Control patients		
18–64	274,347 (54.1)	1,281,168 (25.8)	90,111 (25.4)	174,237 (34.6)	20.9	175
≥65	98,819 (29.3)	589,188 (25.5)	44,840 (45.4)	138,002 (18.5)	26.9	144
Total	353,166 (59.8)	1,870,356 (25.6)	134,951 (38.2)	312,239 (16.5)	22.2	319

1. Bull-Otterson L, Baca S, Saydah S, et al. MMWR Morb Mortal Wkly Rep 2022

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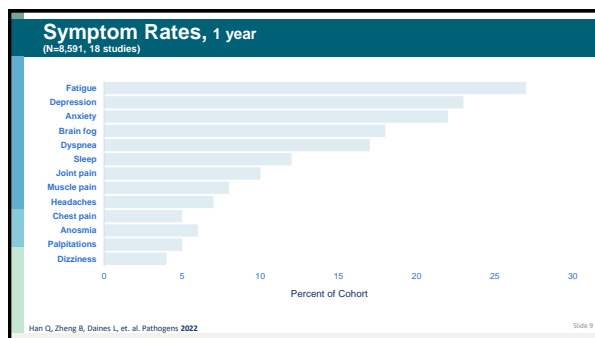
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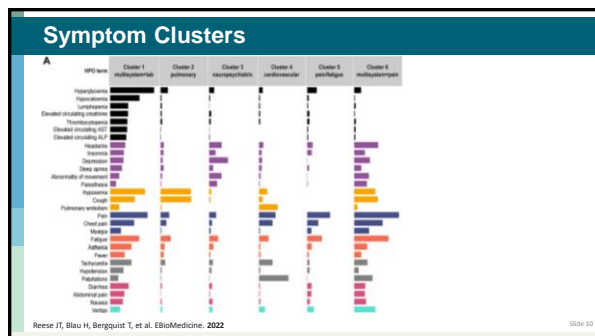
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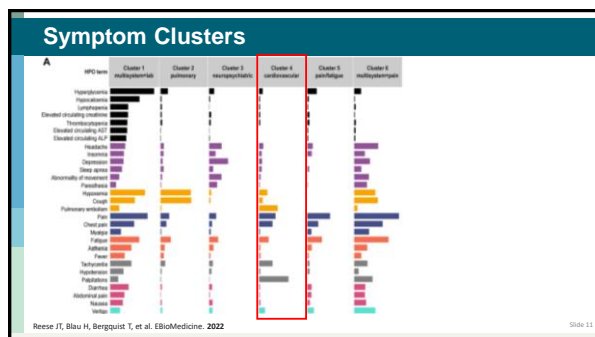
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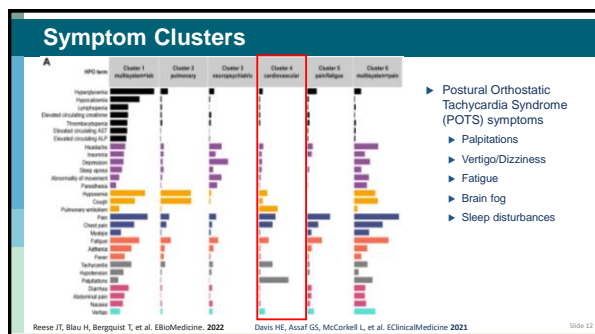
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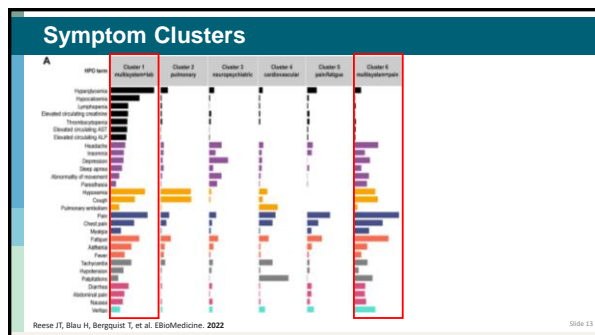
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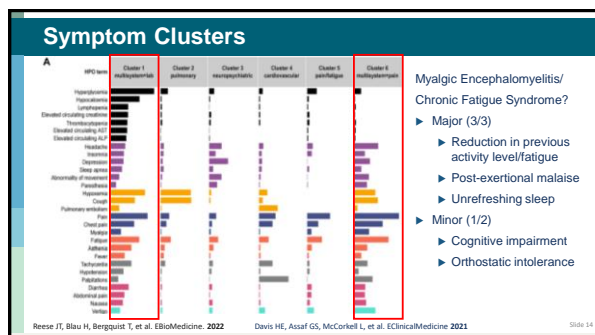
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## Learning Objectives

After attending this presentation, learners will be able to:

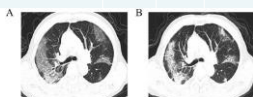
1. Describe Long COVID epidemiology and identify symptoms
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3. Describe diagnostic and management approaches

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## Pulmonary Function

PASC duration	N	Mild/ Severe COVID-19	FEV1	FVC	FEV1/FVC	TLC	DLCO
6 months	349	25%/75%	6%	4%	6%	16%	33%
12 months	244	23%/77%	4%	4%	4%	13%	36%

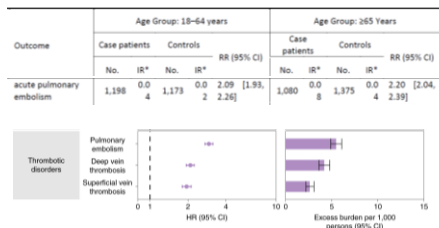


Huang L, Yao Q, Gu X, et al. Lancet 2021  
Huang C, Huang L, Wang Y, et al. Lancet 2021

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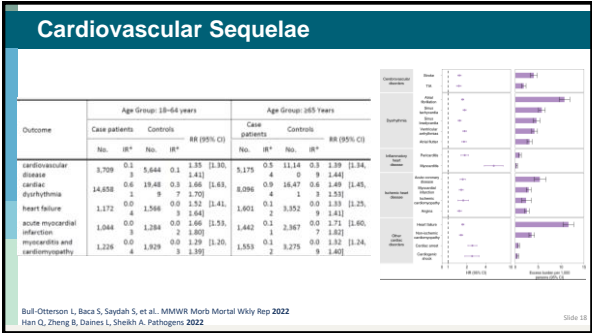
## VTE/PE



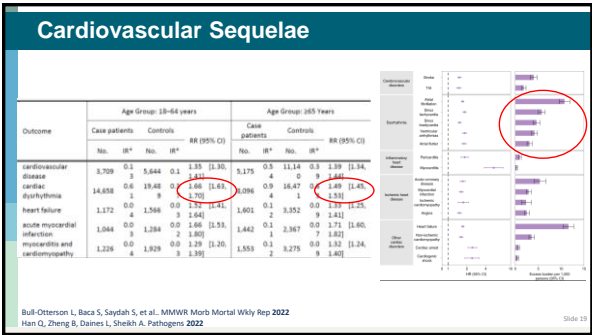
Bull-Otterson L, Baca S, Saydah S, et al. MMWR Morb Mortal Wkly Rep 2022  
Han Q, Zheng B, Daines L, Sheikh A. Pathogens 2022

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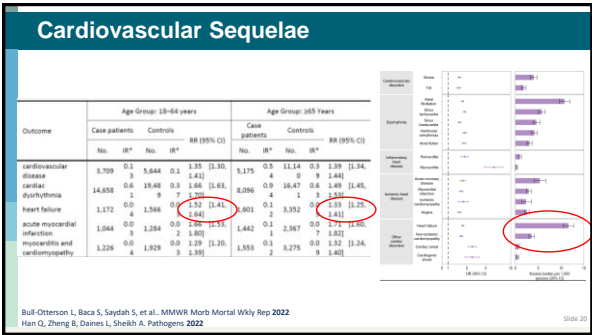
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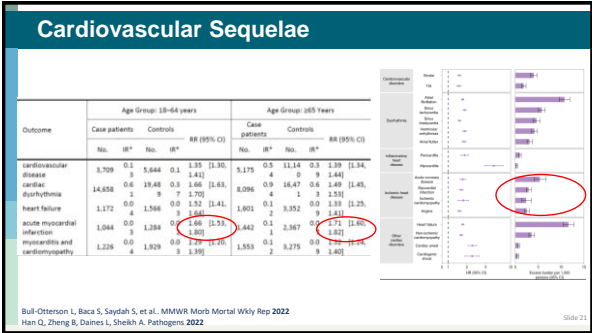
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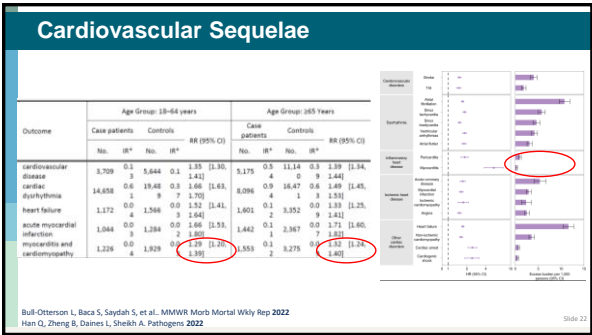
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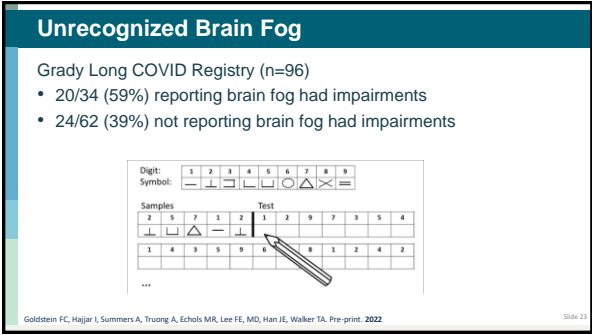
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## Does my patient have Long COVID?

Do they meet the WHO Case Definition?

YES

They have Long COVID

NO

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## Recommended Laboratory Testing

Table 3a. Basic diagnostic laboratory testing to consider for patients with post-COVID conditions

CATEGORY	LAB 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

CDC. Caring for people with post-COVID condition. <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/care-post-covid.html#access> Slide 26

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## Targeted Laboratory Testing

Table 3b. More specialized diagnostic laboratory testing to consider for patients with post-COVID conditions

CATEGORY	LAB 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

\* The specialized diagnostic tests should be ordered in the context of suggestive findings on history and physical examination (e.g., testing for rheumatological conditions in patients experiencing arthralgias).

CDC. Caring for people with post-COVID condition. <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/care-post-covid.html#access> Slide 30

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CDC. Caring for people with post-COVID condition. <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/care-post-covid.html#access> Slide 31

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### Targeted Diagnostic Testing

Table 4b. Selected functional and other testing tools for evaluating people with post-COVID conditions

CATEGORY	TOOLS
Exercise capacity	1-minute sit-to-stand test
	2-minute step test
	10 Meter Walk Test (10MWT)
	6-minute walk
Balance and fall risk	BEBQ Balance Scale
	Tinetti Gait and Balance Assessment Tool
Other	Tikable testing (e.g., for POTS)
	Orthostatic HR assessment

CDC. Caring for people with post-COVID condition. <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/care-post-covid.html#access> Slide 12

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### Targeted Diagnostic Testing

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Additional diagnostics

- Pulmonary function tests
- CT chest
- V/Q scan
- EKG
- TTE
- EMG/Nerve conduction
- Polysomnography
- Neurocognitive testing
- Endoscopy
- Gastric emptying study

CDC. Caring for people with post-COVID condition. <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/care-post-covid.html#access> Slide 13

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### Psychiatric Assessment Tools

Psychiatric conditions	General Anxiety Disorder-7 (GAD-7)
	Patient Health Questionnaire-9 (PHQ-9)
	PTSD Checklist for DSM-5 (PCL-5)

CDC. Caring for people with post-COVID condition. <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/care-post-covid.html#access> Slide 14

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Management



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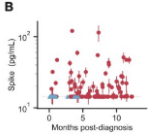
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Nirmatrelvir/Ritonavir

- Persistent viral reservoir
  - SARS-CoV-2 detected in gut biopsies 4 months post-infection
  - Spike antigen detected up to 12 months post-infection
- Nirmatrelvir/Ritonavir Trials
  - 15-day course
  - Primary outcomes
    - Composite symptom scores
    - Symptom specific patient reported outcomes
    - Quality of life scales



Gaebler C, Wang Z, Lorenzi JCC, et al. Nature 2021

Swank Z, Senussi V, Manickas-Hill Z, et al. Clin Infect Dis 2022

<https://clinicaltrials.gov/ct2/show/NCT05688091>

<https://clinicaltrials.gov/ct2/show/NCT05576662>

<https://clinicaltrials.gov/ct2/show/NCT05595369>

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NHLBI RECOVER Initiative

- Define natural history, risk factors, pathobiology, treatment
- 17,000 meta cohort
- Geographically distributed hubs
- Comprehensive surveys
- Specimen collection for biorepository
- Triggered diagnostic testing
- Clinical trials under development



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## Summary

- Long COVID may affect 20-25% of COVID-19 survivors
- Common symptoms: fatigue/PEM, dyspnea, brain fog, sleep, pain syndromes, dizzy, palpitations, anxiety/depression
- Multiple Long COVID phenotypes
- Work-up and management should be guided by clinical suspicion
- Validate your patient

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## Question-and-Answer Session

IAS-USA

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