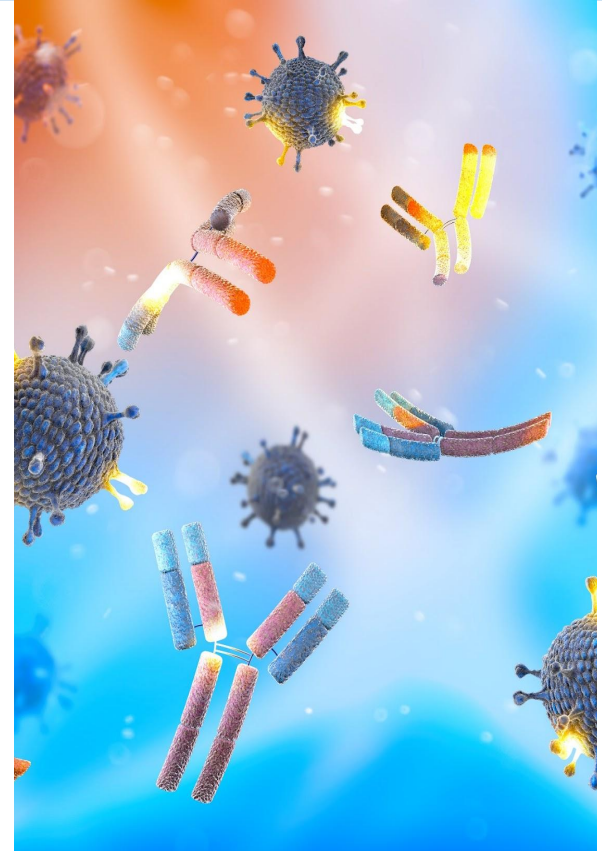


POST-COVID Conditions

Candice K. Smith, MD
Pediatric ID
Tanner Clinic

Objectives

- Be able to define the condition of Long or Post-Acute Covid
- Review the presentation and pathology of post covid conditions
- The evaluation and management of patients with Post-Acute Covid



Other names in the research

long COVID

post-acute COVID-19

long-term effects of COVID

post-acute COVID syndrome

chronic COVID,

long-haul COVID

Post-acute sequelae of COVID-19 (PASC)



Definitions

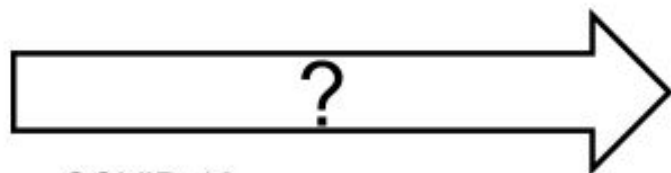
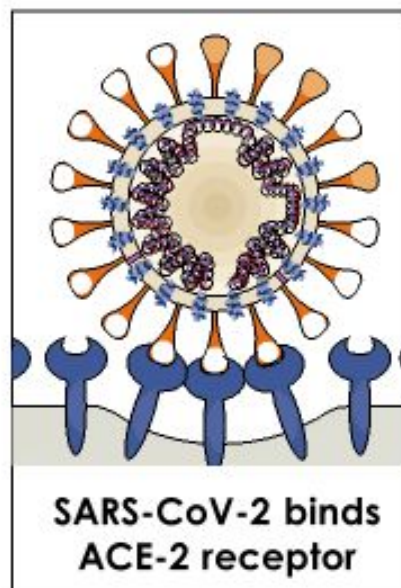
Acute COVID-19 – Symptoms of COVID-19, up to four weeks following the onset of illness.

Post-COVID condition – Broad range of symptoms (physical and mental) and symptom clusters that develop during or after COVID-19, continue for ≥ 2 months (ie, three months from the onset of illness), have an impact on the patient's life, and are not explained by an alternative diagnosis.



What is affected in acute COVID-19?

SARS-CoV-2 → COVID-19



COVID-19

**Widespread
thrombosis and
microangiopathy**

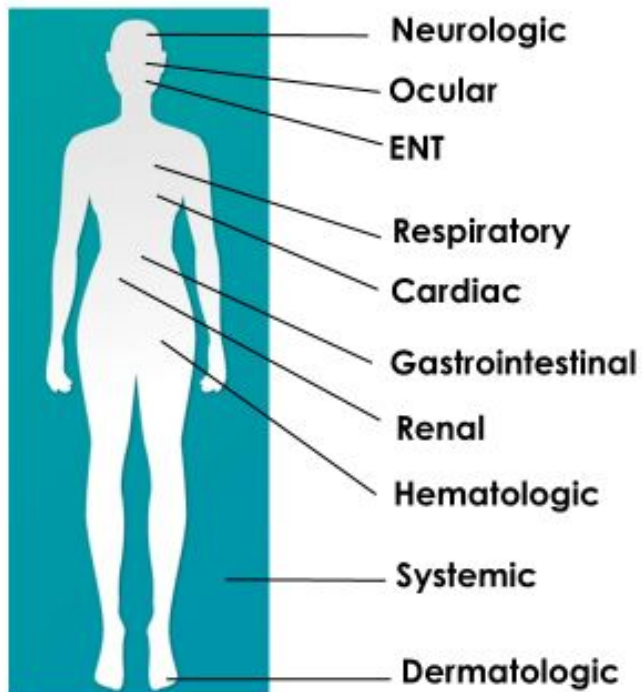
Influenza A

**Inflammatory gene expression in patients
who died of COVID-19 vs. Influenza A**



**Patient with severe
COVID-19**

Almost Every Organ System is Affected



Systemic Manifestations

- **Fever** in >75% if hospitalized, but only 25-50% on admission
- **Myalgias** 10-50%
- **Fatigue** 20-40%



Respiratory Manifestations

- Cough 45-80% (dry > productive)
- Dyspnea 20-55% (more common if hospitalized)
- URI symptoms (HA, sore throat, rhinorrhea) <20%
- Triad of fever, cough, SOB in 31% of outpatients, 68% of inpatients



GI Manifestations

- N/V or diarrhea in up to 34% (higher end in US studies)
- Three meta-analyses: prevalence of N/V diarrhea is only 5-9%
- Can be the only symptom at presentation in 3-14%
- Shedding in stool is common, but implications for transmission unclear



Cardiac Manifestations

- Arrhythmias 7-17%
- Cardiomyopathy (noted in an early ICU report but not seen in other ICU studies)
- Cardiac injury (trop leak) in 7-28% → associated with ↑ risk complications, death
- Multiple case reports of myocarditis – also a recent report of high rates of occult myocarditis on cardiac MRI in recovered patients



ENT Manifestations

- Taste or smell disorder in 34-89%
- Can occur before other symptoms appear and rarely (<5%) can be the only symptom
- Can occur without nasal congestion so may be due to a direct effect of the virus (can infect olfactory neurons in hamsters)
- Most (>85%) patients have resolution of symptoms by 30 days



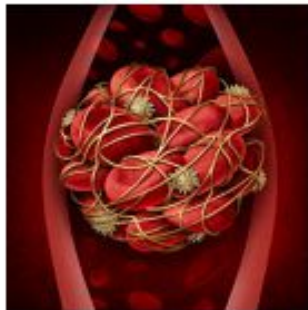
Ocular Manifestations

- Ocular symptoms in 1-32%
 - Conjunctivitis most common
 - Others: itching, foreign body sensation
- May be more common in severe disease



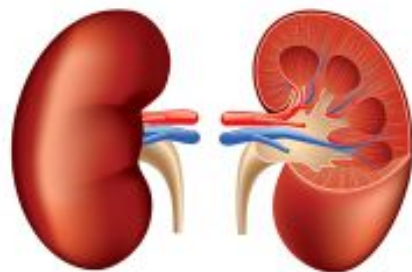
Hematologic Manifestations

- Hypercoagulability in severe cases – thrombotic events in 15-50% of hospitalized patients with COVID (higher in ICU)
- Mostly DVT/PE, and risk appears to be higher with elevated D-dimer levels
- Role of therapeutic anticoagulation is controversial – limited data to support and risk/benefit unclear



Renal Manifestations

- Acute kidney injury in 3-11% of hospitalized patients (more common in ICU)
- Requires renal replacement therapy in 2-7% (higher in ICU) – appears to have high risk of clotting the circuit
- May be due to direct viral effects (high ACE2 expression in the kidney), inflammation, or hemodynamic shifts



Dermatologic Manifestations

- Rash seen in <1% to 20%: erythematous, urticarial, vesicular
- "COVID toes"? → Most recent data does not show a casual link, may be due to environmental factors



Neurologic Manifestations



- Neurologic findings in 36-57% of hospitalized patients
- Usually early in disease (except stroke, impaired consciousness)
- May be more common in patients with severe COVID
- Cognitive dysfunction can be seen in recovered patients

Most common neurologic manifestations:

- Muscle injury/myalgia
- Confusion
- HA
- Dizziness
- Impaired consciousness
- Stroke

COVID-19 and Stroke

- Stroke in ~2-4%
 - Ischemic >> hemorrhagic, venous thrombosis
 - More common than stroke associated with influenza
 - Usually older patients
 - Small case series of stroke in young patients, some without clear vascular risk factors
- **Mechanism?:** unclear if a direct effect of the virus, hypercoagulability, inflammation, or severe medical illness in those with pre-existing vascular risk factors

GBS and COVID-19

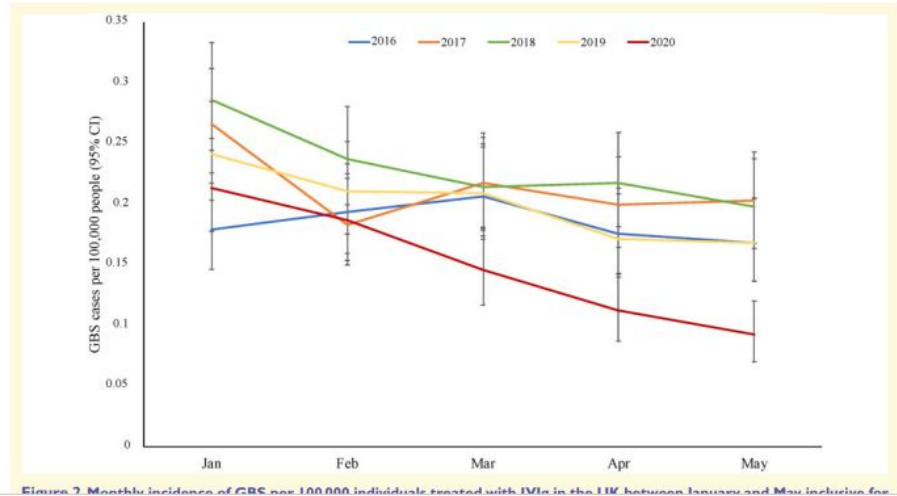
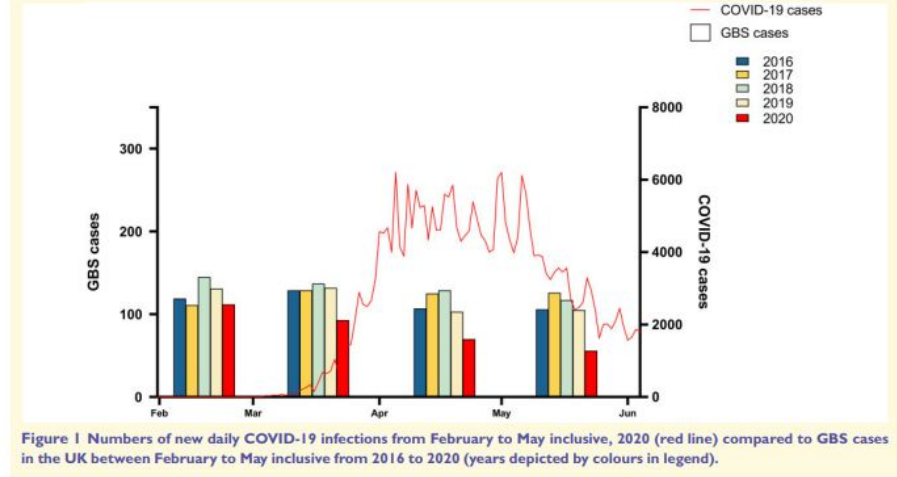
Presents 5-16 days post infection

In one series of five patients with COVID-19, the following diagnostic test features were observed

- Cerebrospinal fluid was typical of GBS patients with low or absent white cell count.
- Most patients have elevated protein level, although two of five patients in one series had normal levels. No cerebrospinal fluid (CSF) samples were positive for SARS-CoV-2.
- Electrodiagnostic studies were consistent with either the axonal variant of GBS or with a demyelinating process
- MRI showed nerve root enhancement in some but not all patients.

GBS and COVID-19

- GBS in the last two years has had an overall lower incidence thought to be because of an overall decrease in other infectious triggers
- UK studies looking at epidemiology have shown no association between COVID-19 and GBS



Post-Acute COVID

Type, proportion, and duration of persistent COVID-19 symptoms*

Persistent symptom [¶]	Proportion of patients affected by symptom	Approximate time to symptom resolution ^Δ
Common physical symptoms		
Fatigue	15 to 87% ^[1,2,6,9,14,16]	3 months or longer
Dyspnea	10 to 71% ^[1,2,6-9,14]	2 to 3 months or longer
Chest discomfort	12 to 44% ^[1,2]	2 to 3 months
Cough	17 to 34% ^[1,2,9,12]	2 to 3 months or longer
Anosmia	10 to 13% ^[1,3-5,9,11]	1 month, rarely longer
Less common physical symptoms		
Joint pain, headache, sicca syndrome, rhinitis, dysgeusia, poor appetite, dizziness, vertigo, myalgias, insomnia, alopecia, sweating, and diarrhea	<10% ^[1,2,8,9,11]	Unknown (likely weeks to months)
Psychologic and neurocognitive		
Post-traumatic stress disorder	7 to 24% ^[6,10,14]	6 weeks to 3 months or longer
Impaired memory	18 to 21% ^[6,15]	Weeks to months
Poor concentration	16% ^[6]	Weeks to months
Anxiety/depression	22 to 23% ^[2,7,8,10,12-14]	Weeks to months
Reduction in quality of life	>50% ^[8]	Unknown (likely weeks to months)

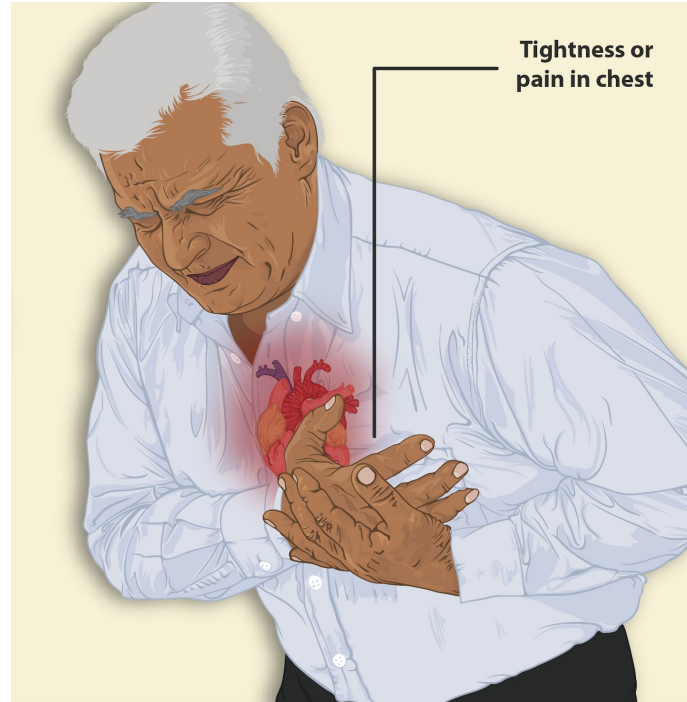
What are the most common persistent symptoms?

Fatigue (13 to 87 percent)

Dyspnea (10 to 71 percent)

Chest pain or tightness (12 to 44 percent)

Cough (17 to 34 percent)



Less Common symptoms

Anosmia-loss of smell

Joint pain-bone pain

Headache

Sicca syndrome

Rhinitis

Dysgeusia-distorted taste

Poor appetite

Dizziness (from orthostasis,
postural tachycardia, or vertigo)

Myalgias

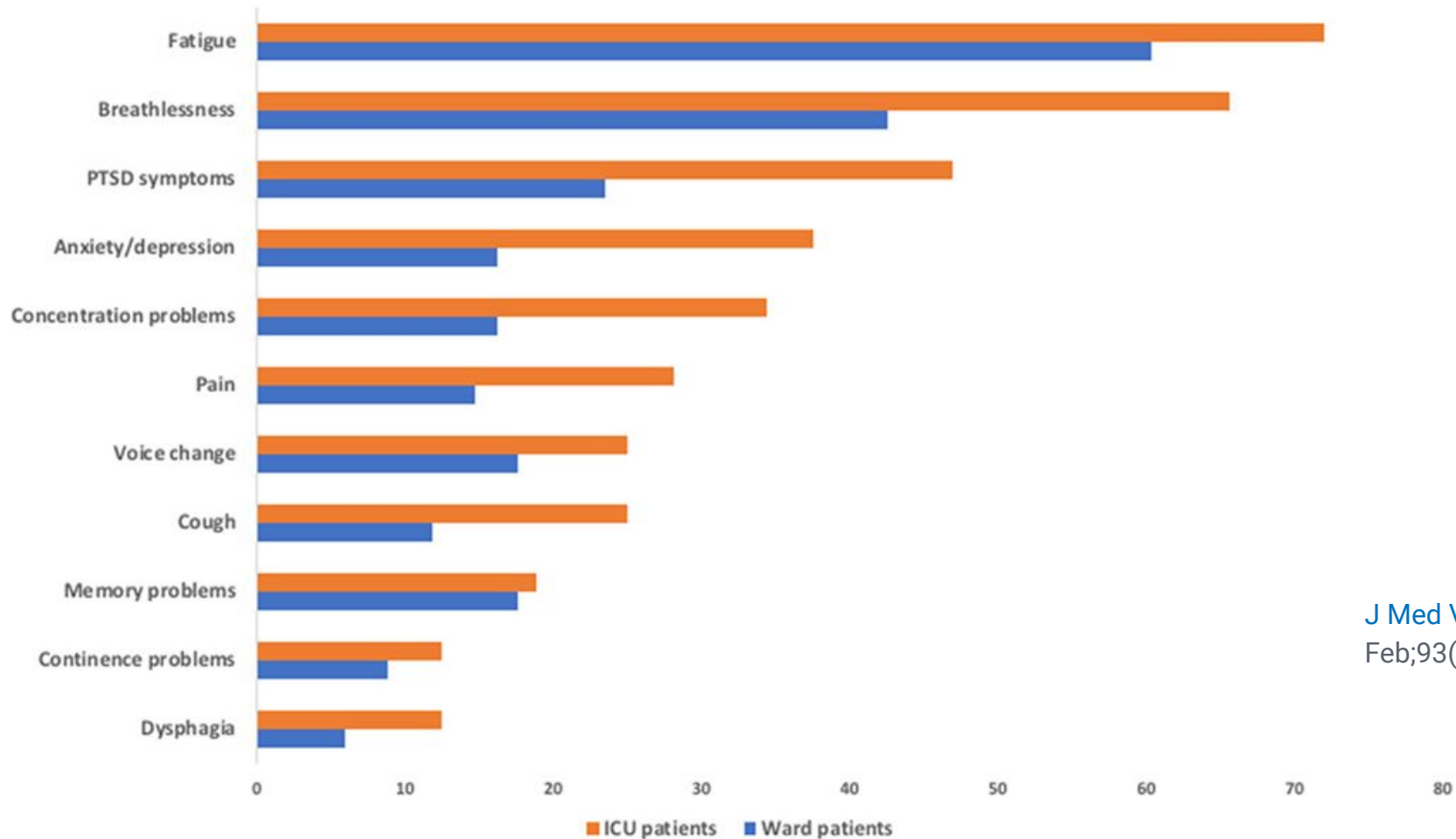
Insomnia

Alopecia

Sweating

Diarrhea

COVID-19 post-discharge symptoms prevalence (%)



J Med Virol. 2021
Feb;93(2):1013-1022

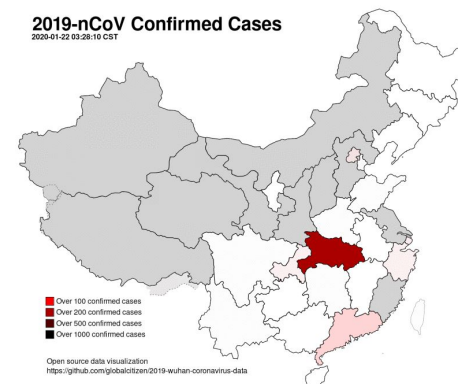
Table 2.

Symptoms at 1-Year Follow-up According to Disease Severity

Symptoms	Patients, No. (%)			Severe vs nonsevere	
	Enrolled patients (n = 2433)	Severe (n = 680)	Nonsevere (n = 1753)	OR (95% CI)	P value
Any one of the following symptoms	1095 (45.0)	367 (54.0)	728 (41.5)	1.31 (1.04-1.65)	.02
Fatigue	696 (27.7)	244 (35.9)	452 (25.8)	1.36 (1.10-1.68)	.004
Sweating	424 (16.9)	156 (22.9)	268 (15.3)	1.26 (0.99-1.61)	.06
Chest tightness	326 (13.0)	139 (20.4)	187 (10.7)	1.68 (1.29-2.19)	<.001
Anxiety	262 (10.4)	82 (12.1)	180 (10.3)	0.99 (0.72-1.34)	.92
Myalgia	198 (7.9)	76 (11.2)	122 (7.0)	1.36 (0.97-1.90)	.08
Palpitation	106 (4.2)	40 (5.9)	66 (3.8)	1.07 (0.68-1.68)	.78
Cough	104 (4.1)	46 (6.8)	58 (3.3)	1.55 (1.00-2.41)	.05
Shortness of breath	103 (4.1)	45 (6.6)	58 (3.3)	1.84 (1.17-2.88)	.008
Dizziness	82 (3.3)	26 (3.8)	56 (3.2)	0.92 (0.55-1.53)	.75
Expectoration	75 (3.0)	34 (5.0)	41 (2.3)	1.44 (0.86-2.43)	.17
Dyspnea	69 (2.7)	30 (4.4)	39 (2.2)	1.25 (0.73-2.15)	.41
Headache	57 (2.3)	22 (3.2)	35 (2.0)	1.41 (0.78-2.57)	.26
Edema of lower limbs	36 (1.4)	19 (2.8)	17 (1.0)	1.76 (0.82-3.75)	.15
Taste change	35 (1.4)	15 (2.2)	20 (1.1)	1.33 (0.64-2.77)	.45
Impaired sense of smell	32 (1.3)	17 (2.5)	15 (0.9)	2.59 (1.19-5.65)	.02
Sore throat	25 (1.0)	12 (1.8)	13 (0.7)	3.10 (1.31-7.32)	.01
Anorexia	20 (0.8)	8 (1.2)	12 (0.7)	1.60 (0.39-2.88)	.91
Diarrhea	18 (0.7)	6 (0.9)	12 (0.7)	1.62 (0.57-4.56)	.36
Hemoptysis	5 (0.2)	0	5 (0.3)	NA	NA
..

2019-nCoV Confirmed Cases

2020-01-22 03:28:10 CST



JAMA New Open
 . 2021 Sep
 1;4(9):e2127403

ICU- Patients 1-Year Follow Up

Table 2. Prevalence of Symptoms in Patients at 1-Year Survival Following Intensive Care Unit Treatment for COVID-19 (N = 246)

	Values at 1-y follow-up, No./total (%) [95% CI]
Physical symptoms	
Reported ≥1 physical symptom	→ 182/245 (74.3) [68.3-79.6]
Clinical Frailty Scale score, median (IQR) ^a	2 (2-3)
Exceeded frailty cutoff ^a	15/245 (6.1) [3.5-9.9]
Checklist Individual Strength-8–fatigue subscale score, median (IQR) ^b	29 (18-39)
Exceeded fatigue cutoff ^b	138/246 (56.1) [49.7-62.4]
New or worsened physical problems, No. of problems, median (IQR) ^c	2 (0-5)
Reported ≥1 physical problem	→ 165/246 (67.1) [60.8-72.9]
Mental symptoms	
Reported ≥1 mental symptom	64/244 (26.2) [20.8-32.2]
HADS scale-anxiety score, median (IQR) ^d	3 (1-6)
Exceeded anxiety cutoff ^d	44/246 (17.9) [13.3-23.3]
HADS scale-depression score, median (IQR) ^d	3 (1-5)
Exceeded depression cutoff ^d	45/246 (18.3) [13.7-23.7]
Impact of Event Scale-6 score, median (IQR) ^e	0.5 (0.2-1.2)
Exceeded posttraumatic stress disorder cutoff ^e	24/244 (9.8) [6.4-14.3]
Cognitive symptoms	
Cognitive Failure Questionnaire-14 score, median (IQR) ^f	24.8 (12.8-37.0)
Exceeded cognitive failure cutoff ^f	→ 39/241 (16.2) [11.8-21.5]

JAMA.
2022;327(6):559-565

Symptoms in Children and Adolescent- Less Prevalent



Table. Participant Characteristics, Most Frequently Reported Symptoms After Serologic Testing (October 2020 Through March-April 2021), and Self-rated Health Among Seropositive and Seronegative Children

	No. (%)	
	Seropositive (n = 109)	Seronegative (n = 1246)
Female sex	58 (53)	669 (54)
Age, y		
6-11	66 (61)	703 (56)
12-16	43 (39)	543 (44)
≥1 Symptom lasting >12 wk	4 (4)	28 (2)
Tiredness	3 (3)	10 (1)
Difficulty concentrating	2 (2)	8 (1)
Increased need for sleep	2 (2)	0
Congested or runny nose	1 (1)	3 (<1)
Stomachache	1 (1)	3 (<1)
Chest tightness	1 (1)	0
≥1 Symptom lasting >4 wk	10 (9)	121 (10)
Tiredness	7 (6)	51 (4)
Headache	5 (5)	39 (3)
Congested or runny nose	3 (3)	40 (3)
Stomachache	3 (3)	18 (1)
Sleep disturbances	3 (3)	14 (1)
Cough	2 (2)	15 (1)
Self-rated health ^a		
Excellent	43 (41)	497 (41)
Good	56 (53)	680 (55)
Fair	5 (5)	48 (4)
Poor	2 (2)	2 (<1)

Time to Recovery

A longer recovery course is expected for

- patients requiring hospitalization, older patients with preexisting comorbidities
- patients who experienced medical complications (eg, secondary bacterial pneumonia, venous thromboembolism)
- patients who had a prolonged stay in the hospital or ICU

However, data suggest that even patients with less severe disease who were never hospitalized, including those with self-reported COVID-19, have often reported prolonged and persistent symptoms -MMWR2020 Jul 31;69(30):993-998.

Hospitalized Patient (N=488) 60 days after going home

New/worsened symptoms

Persistent symptoms related to illness†	159
New or worsening symptoms related to illness	92
Continued loss of taste and/or smell	64
Cough	75
Shortness of breath/chest tightness/wheezing	81
Difficulty ambulating due to chest problems	44
Breathlessness walking up stairs	112
Oxygen use	32
New use of CPAP or other breathing machine when asleep	34

Return to normal activity

Unable to return to normal activity	188
New or worsening difficulty completing activities of daily living‡	58

Return to employment

Employed full- or part-time before COVID-19 hospitalization	195
Able to return to work by 60 d after discharge	117
Median days from discharge to work return (IQR)	27 (13-42)
Reduced hours and/or modified duties upon return to work due to health	30
Unable to return to work	78
Because of health	45
Because of job loss	21

Emotional impact

Emotionally affected at least mildly by health conditions	238
Emotionally affected at least moderately by health conditions	124
Health care use related to mental health	28

Mild Outpatients-University of Washington

Longitudinal -Prospective Study with a good portion of mild and asymptomatic infections

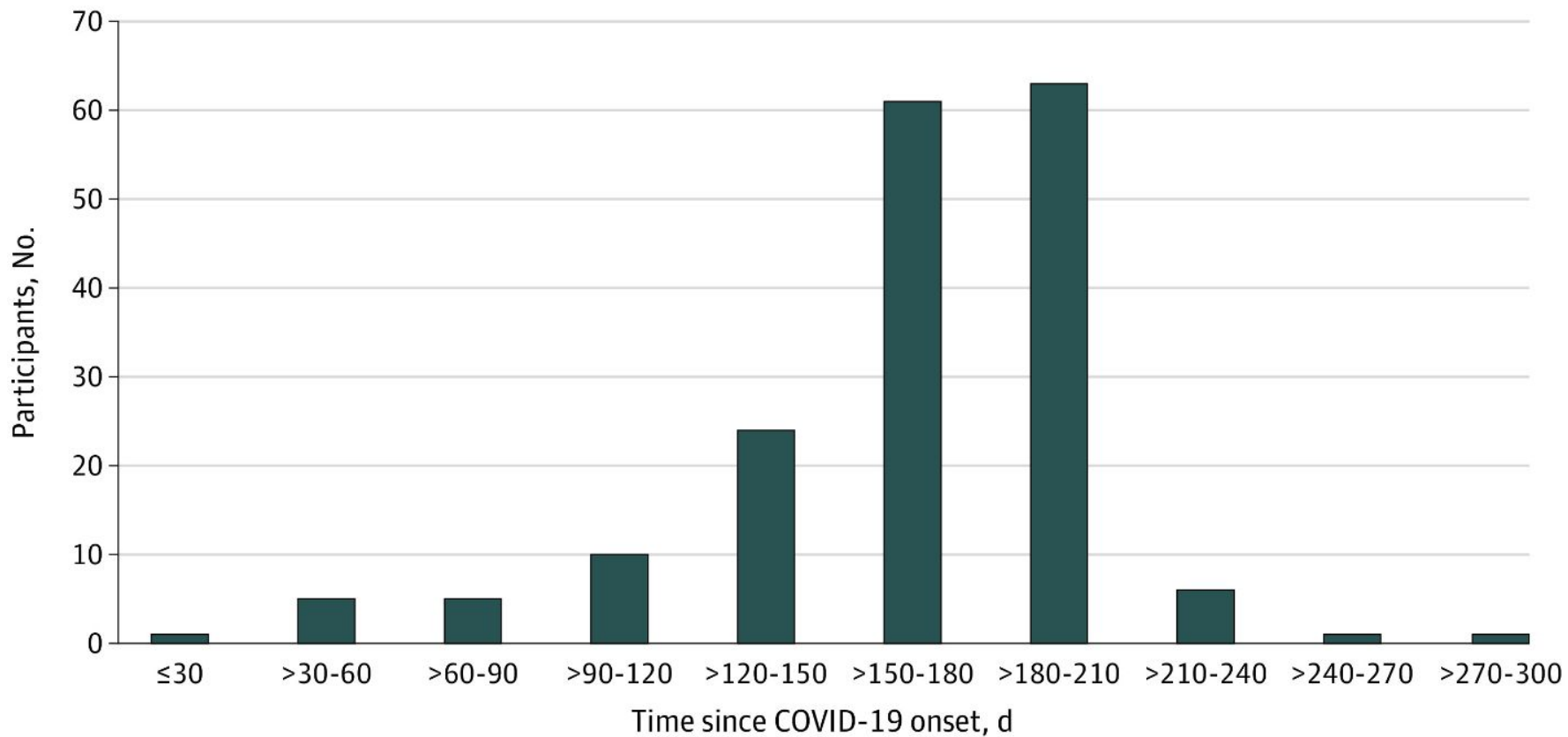
11(6.2%) were asymptomatic

150 (84.7%) were outpatients with mild illness,

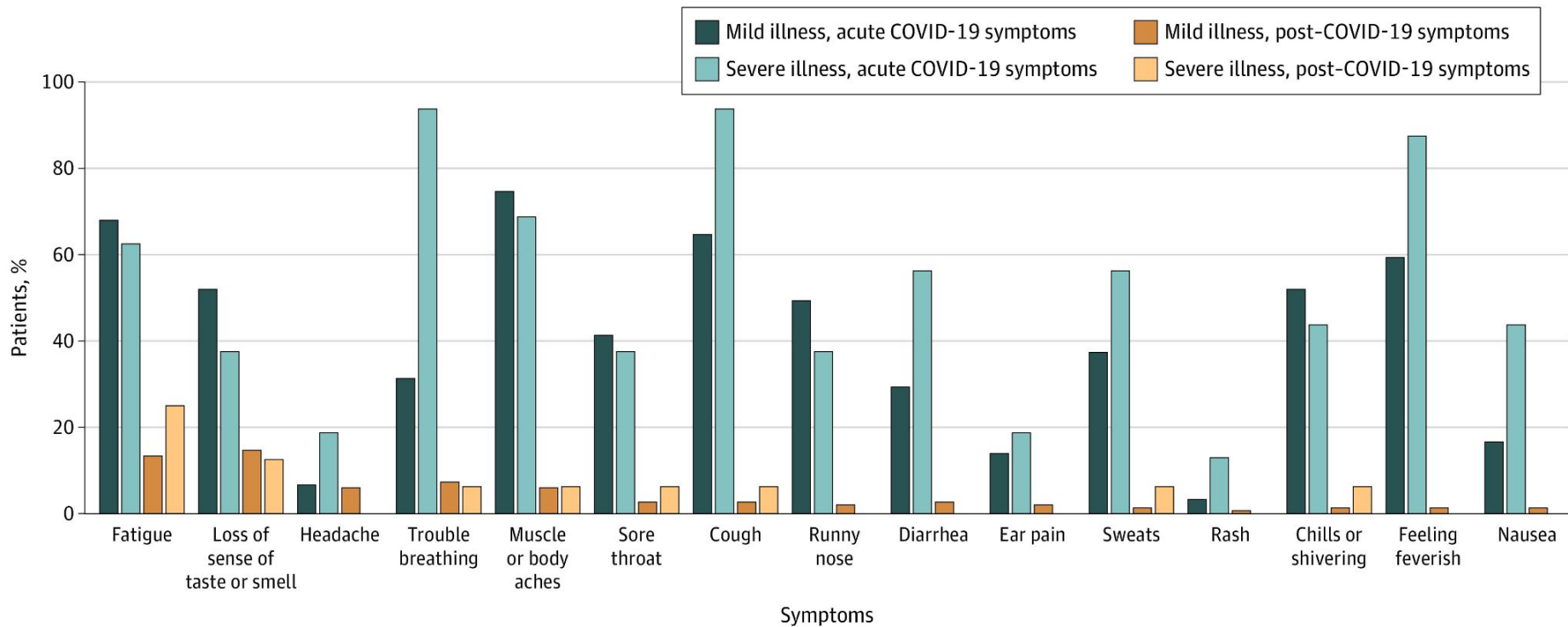
6 (9.0%) had moderate or severe disease requiring hospitalization

Most reports are 6-9 months post

A Survey completion by days after illness onset



B Percentage of participants who reported COVID-19 symptoms during acute illness and at follow-up



Mild Disease in Health Care Workers

Swedish survey of over 300 health care workers with mild disease, 26 percent had at least one moderate or severe symptom lasting more than two months, compared with 9 percent of seronegative control patients



15% had symptoms last longer than 8 months

80% of study participants were female

Table. The 10 Most Common Moderate to Severe Long-term Symptoms in Seropositive and Seronegative Participants

Duration of symptom, mo	No. (%)	
	Seropositive (n = 323)	Seronegative (n = 1072)
Any symptom		
≥2	84 (26.0)	95 (8.9)
≥4	69 (21.4)	77 (7.2)
≥8	48 (14.9)	36 (3.4)
Anosmia		
≥2	47 (14.6)	6 (0.6)
≥4	35 (10.8)	4 (0.4)
≥8	29 (9.0)	1 (0.1)
Fatigue		
≥2	27 (8.4)	57 (5.3)
≥4	22 (6.8)	47 (4.4)
≥8	13 (4.0)	16 (1.5)
Ageusia		
≥2	25 (7.7)	6 (0.6)
≥4	17 (5.3)	3 (0.3)
≥8	12 (3.7)	1 (0.1)
Dyspnea		
≥2	14 (4.3)	12 (1.1)
≥4	11 (3.4)	10 (0.9)
≥8	6 (1.9)	3 (0.3)
Sleeping disorder		
≥2	10 (3.1)	21 (2.0)
≥4	9 (2.8)	19 (1.8)
≥8	7 (2.2)	9 (0.8)

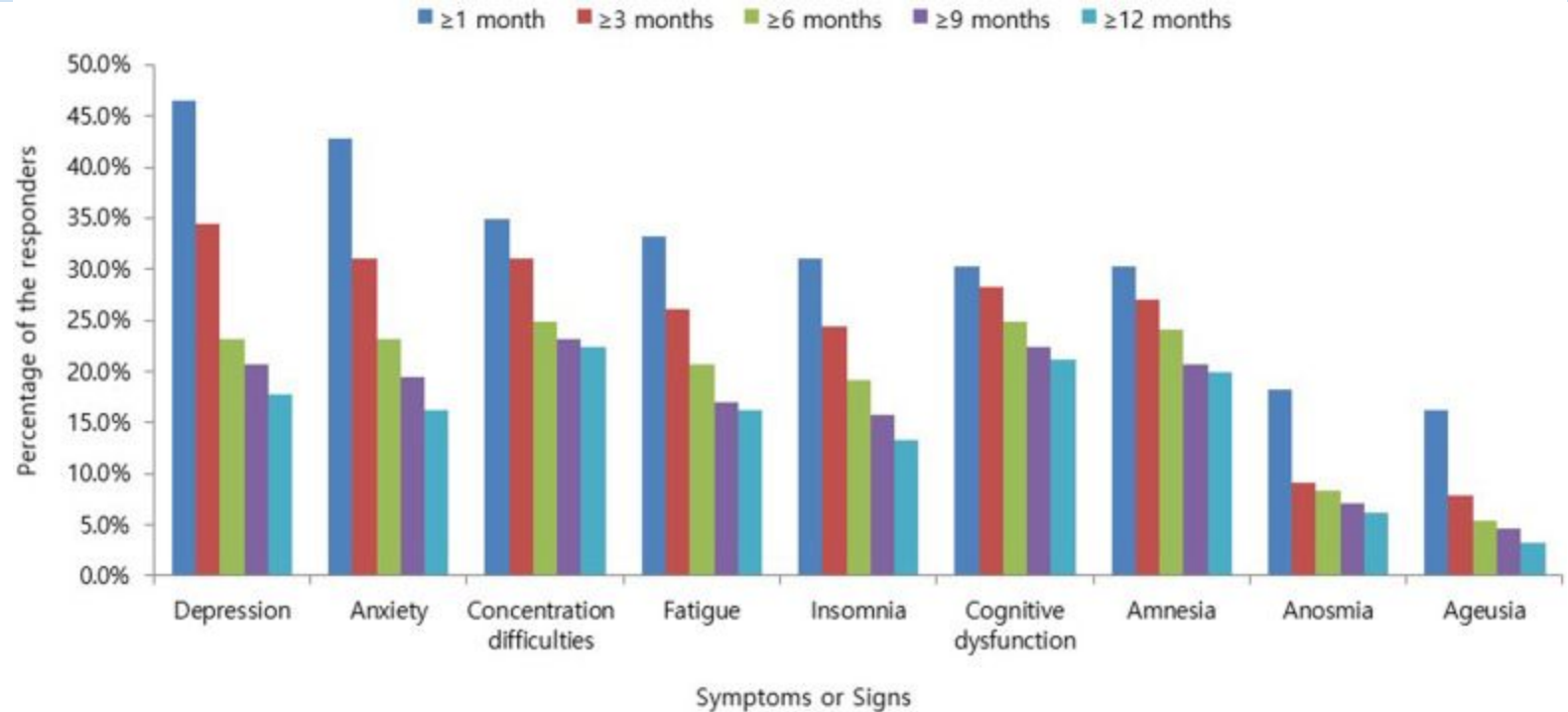
Headache		
≥2	9 (2.8)	34 (3.2)
≥4	8 (2.5)	24 (2.2)
≥8	5 (1.5)	11 (1.0)
Palpitations		
≥2	8 (2.5)	18 (1.7)
≥4	7 (1.9)	13 (1.2)
≥8	2 (0.6)	7 (0.7)
Concentration impairment		
≥2	7 (2.2)	12 (1.1)
≥4	6 (1.9)	9 (0.8)
≥8	2 (0.6)	2 (0.2)
Muscle/joint pain		
≥2	6 (1.9)	19 (1.8)
≥4	5 (1.5)	10 (0.9)
≥8	2 (0.6)	4 (0.4)
Memory impairment		
≥2	5 (1.5)	11 (1.0)
≥4	4 (1.2)	6 (0.6)
≥8	1 (0.3)	3 (0.3)

Psychological or Cognitive

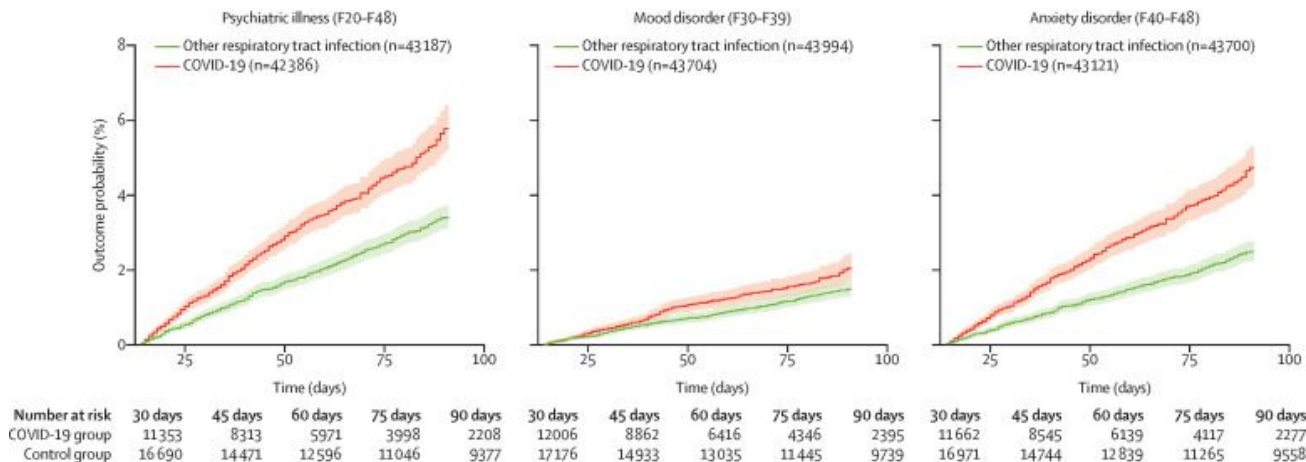
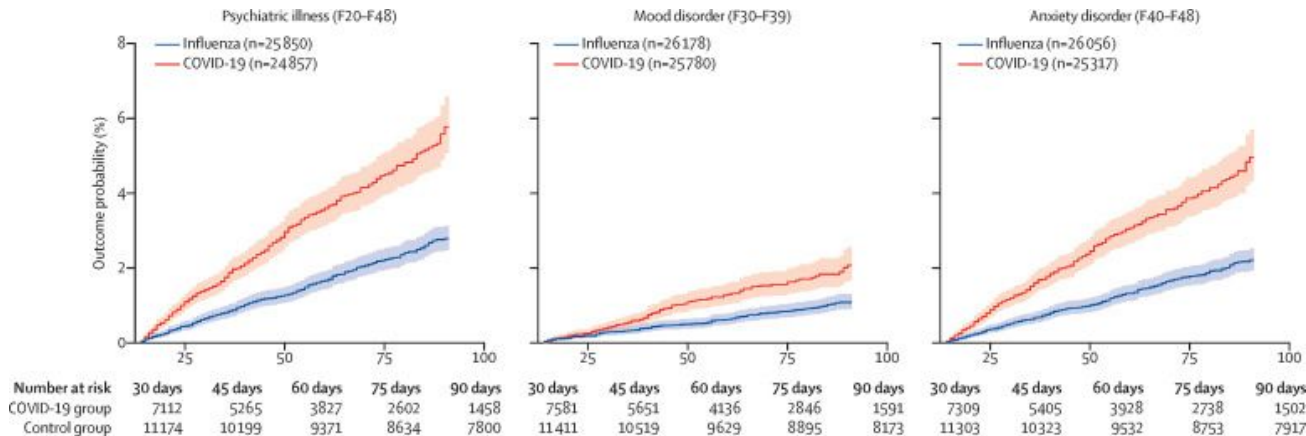
- Near 50% of COVID-19 survivors reported a worsened quality of life
- 22 % had anxiety/depression
- 23 % were found to have persistent psychological symptoms at three months



12 months of follow up- Case series from Korea



COVID 19 compared to other respiratory illnesses with psychiatric outcomes



Neurologic Prolonged Complications

How does COVID-19 affect the nervous system?

Pathology theories

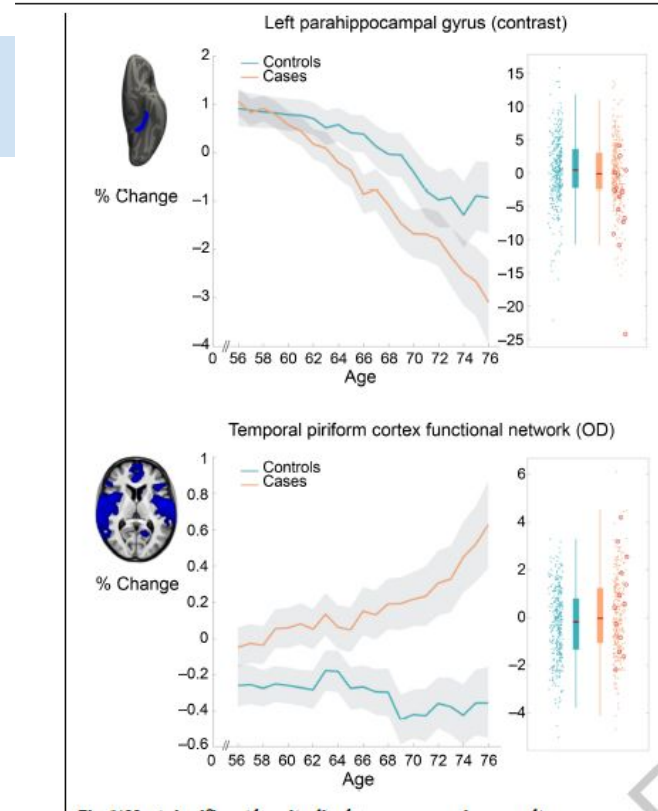
- Viral neurotropism
- Virus induced-neuroinflammation

80% of critical patients with COVID-19 have neurologic symptoms

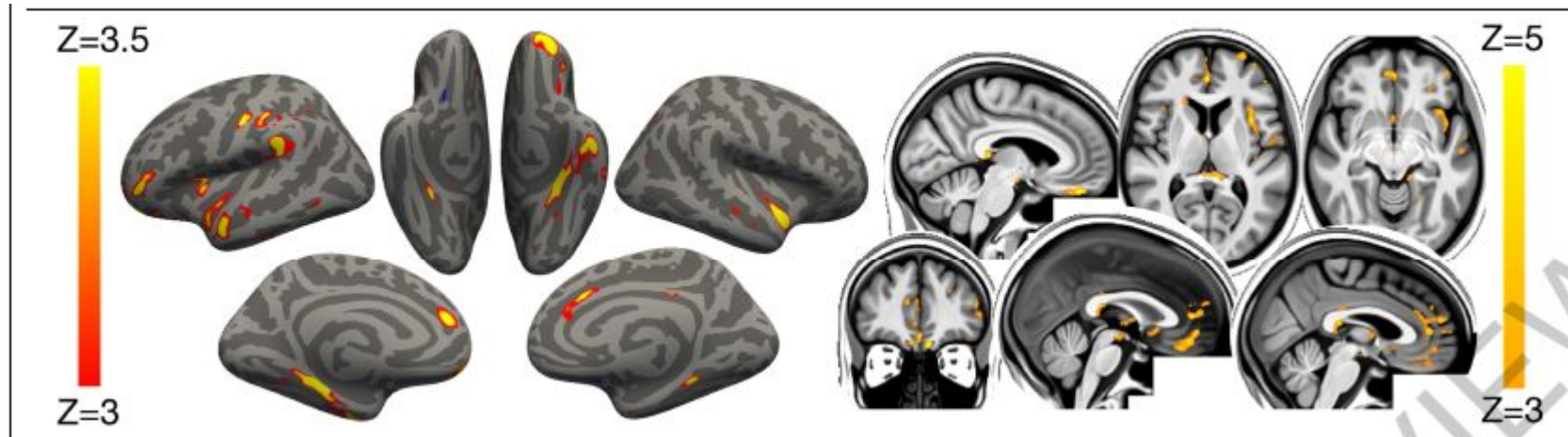
- Encephalopathy
- Cerebrovascular-thrombotic events/ischemia

Does Brain Structure Change?

- Prospective biobank study in the United Kingdom that included serial brain magnetic resonance imaging, age 51-81
- 401 patients developed COVID-19 between one scan and the next at a mean of five months after infection.
- Those who had COVID-19 had mostly mild infections that did not require hospitalization.
- Greater reductions in functional connectivity and structural measurements (gray matter thickness in the orbitofrontal and parahippocampal cortices and global brain size) compared with controls
- Findings did not change when 15 hospitalized patients removed from sample



Main Findings



- Greater reduction in grey matter thickness and tissue-contrast in the orbitofrontal cortex and parahippocampal gyrus
- Greater changes in markers of tissue damage in regions functionally-connected to the primary olfactory cortex
- Greater reduction in global brain size.

Does Cognitive Function Change?

Numeric and alphanumeric cognitive testing with changes documented

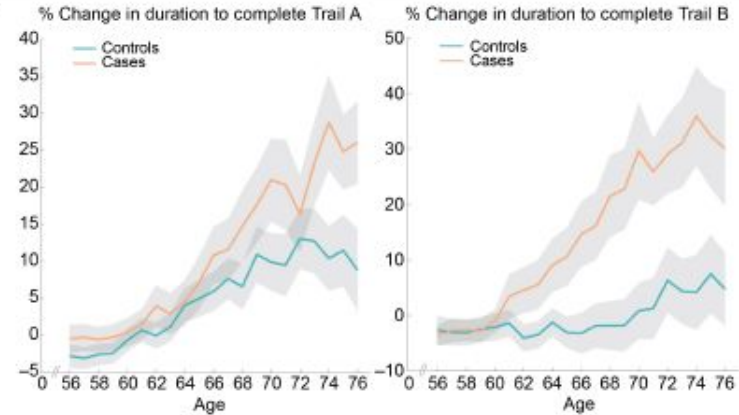


Fig. 3 | Percentage longitudinal change for SARS-CoV-2 positive participants and controls, in the duration to complete Trails A and B of the UK Biobank Trail Making Test. Absolute baseline (used to convert longitudinal change into percent change) estimated across the 785 participants. These curves were created using a 10-year sliding window across cases and controls (standard errors in grey).

Biomarkers of neuronal dysfunction

Measure

Plasma neurofilament light chain (pNfL)

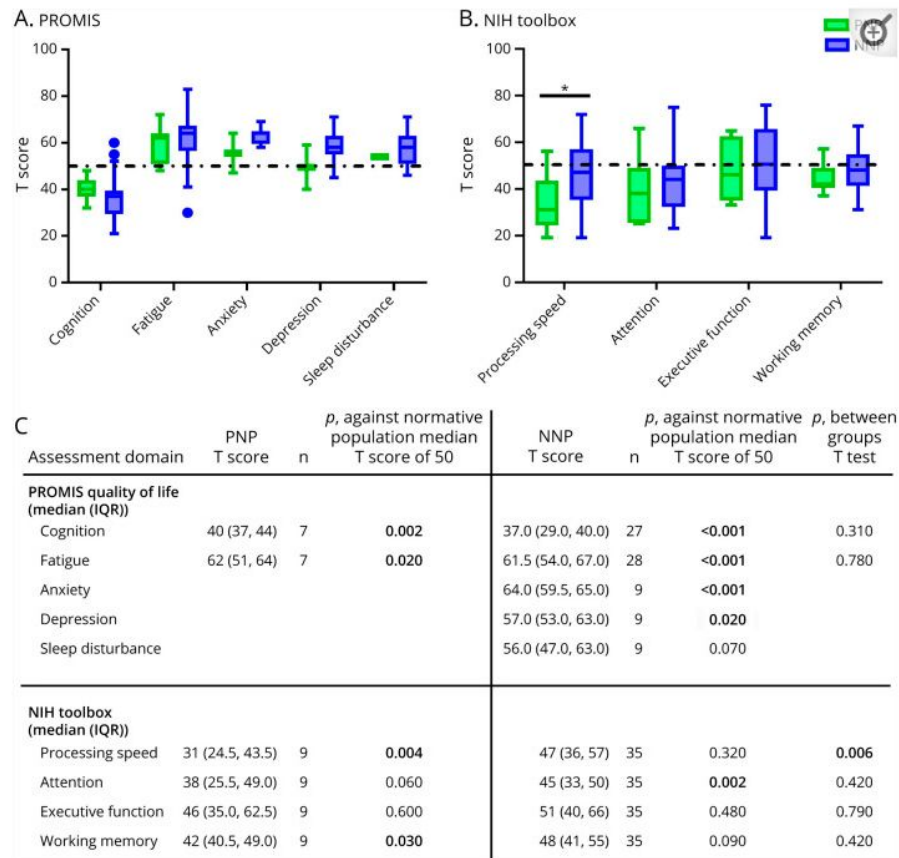
Plasma glial fibrillary acidic protein (pGFAP)

Plasma SARS-CoV-2 Nucleocapsid antigen (pN Ag)

Calculate

Neuroglial scores (pGFAP/pNfL) to estimate the relative contribution of astroglial and neuronal involvement.

Figure 3



Neuro-PASC Negatively Affects Quality Of Life and Cognition

Normalized and demographic-matched T score values for Patient-Reported Outcomes Measurement Information System (PROMIS-57; A) quality of life and NIH Toolbox (B) cognitive assessment for posthospitalized neuro-PASC patients (PNP) and nonhospitalized neuro-PASC patients (NNP). United States normative population T score mean/median of 50 ($\delta = 10$) is indicated by a broken black line. Scores lower than 50 for cognition, processing speed, attention, executive function, and working memory

Is EBV the cause of Long COVID?

- Small retrospective case series
- IgM VCA for EBV positive
30-50%
- More prevalent when steroids
are given
- More in age 50+
- More in Females

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Positive Epstein–Barr virus detection in coronavirus disease 2019 (COVID-19) patients

Ting Chen^{1,3}, Jiayi Song^{1,3}, Hongli Liu¹, Hongmei Zheng¹ & Changzheng Chen^{1,2,✉}

The objective of this study was to detect the Epstein–Barr virus (EBV) coinfection in coronavirus disease 2019 (COVID-19). In this retrospective single-center study, we included 67 COVID-19 patients with onset time within 2 weeks in Renmin Hospital of Wuhan University from January 9 to February 29, 2020. Patients were divided into EBV/SARS-CoV-2 coinfection group and SARS-CoV-2 infection alone group according to the serological results of EBV, and the characteristics differences between the two groups were compared. The median age was 37 years, with 35 (52.2%) females. Among these COVID-19 patients, thirty-seven (55.2%) patients were seropositive for EBV viral capsid antigen (VCA) IgM antibody. EBV/SARS-CoV-2 coinfection patients had a 3.09-fold risk of having a fever symptom than SARS-CoV-2 infection alone patients (95% CI 1.11–8.56; $P = 0.03$). C-reactive protein (CRP) ($P = 0.02$) and the aspartate aminotransferase (AST) ($P = 0.04$) in EBV/SARS-CoV-2 coinfection patients

How long will symptoms last?

Fatigue, weakness, and poor endurance – Fatigue is by far the most common symptom- profound and may last for three months or longer, particularly among ICU survivors

Dyspnea – most patient resolve slowly over two to three months, sometimes longer (eg, up to 12 months)

Chronic cough – resolved in the majority of patients by 3 months and rarely persisted by 12 months

Altered taste and smell – majority have complete or near-complete recovery at one month following acute illness. Those presenting with anosmia instead of hyposmia last longer, females have longer symptoms than males.

Neurocognitive symptoms – most resolved in 1 months, but can last up to 12 months

Psychological –most common is anxiety, may persist up to 6 months or more

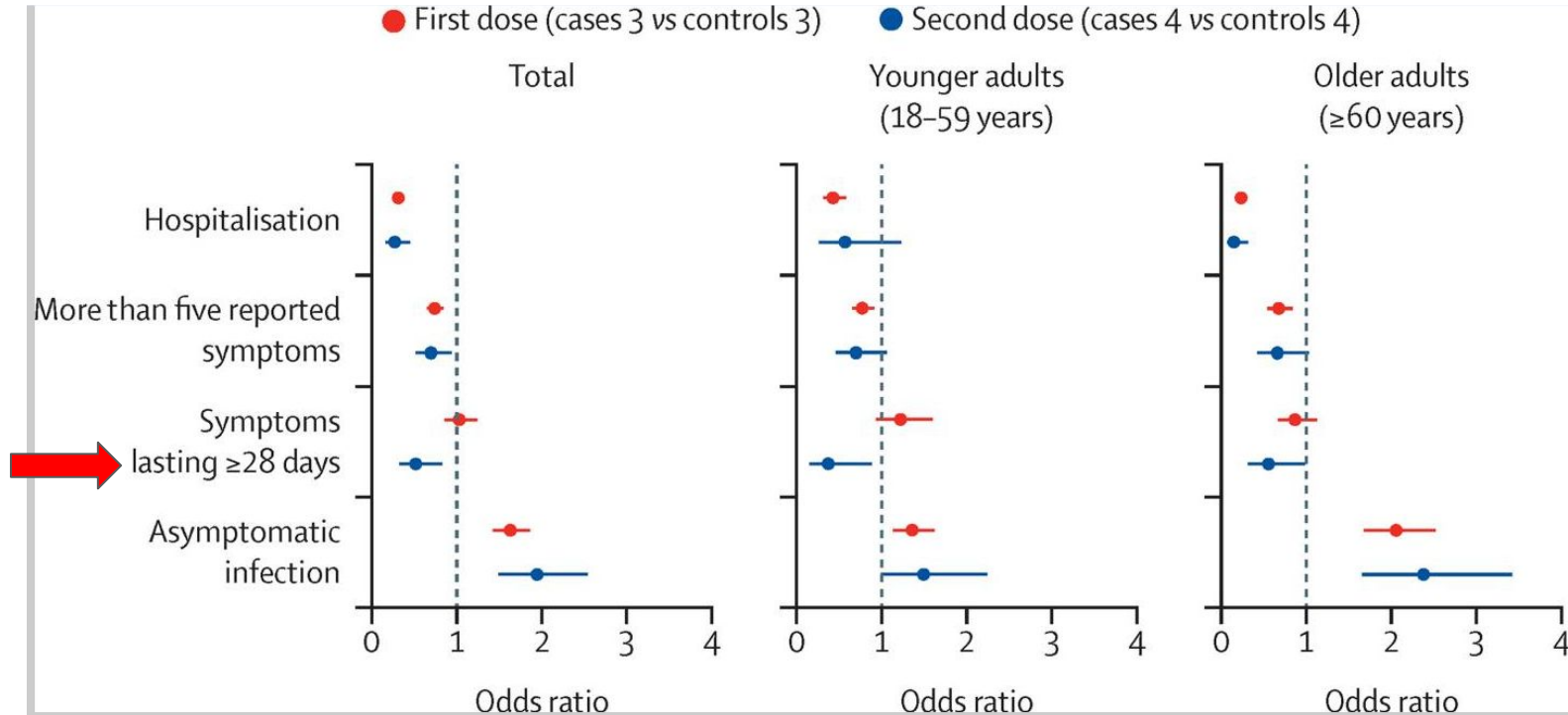
Prevention of Long COVID

1. Vaccination
2. most effective means by which to prevent post-COVID conditions also is to prevent COVID-19

(eg, vaccination, masking, social distancing, hand hygiene)



Effect of vaccination on prolonged symptoms



Management

Guidelines from several sources

COVID-19

Home Your Health Vaccines Cases & Data Work & School Healthcare Workers Health Depts Science More

Healthcare Workers

Testing +

Clinical Care -

Quick Reference

Clinical Care Guidance

Ending Isolation

Specific Patient Types +

Post-COVID Conditions: Overview

Post-COVID Conditions: Interim Guidance

Infection Control +

Post-COVID Conditions: Information for Healthcare Providers

Updated July 9, 2021 Print

This page provides an overview for healthcare providers. For more detailed information, see the [interim guidance on evaluating and caring for patients with post-COVID conditions](#). Or, for the general public, see a [brief summary of the long-term effects](#).

Background

Some patients who have been infected with SARS-CoV-2, the virus that causes COVID-19, have new, recurring, or ongoing symptoms and clinical findings four or more weeks after infection, sometimes after initial symptom recovery. Post-COVID conditions can occur in patients who have had varying degrees of illness during acute infection, including those who had mild or asymptomatic infections. Medical and research communities are still learning about these post-acute symptoms and clinical findings.

Post-COVID conditions are being referred to by a wide range of names, including long COVID, post-acute COVID-19, long-

Consensus statement

The Stanford Hall consensus statement for post-COVID-19 rehabilitation

Robert M Barker-Davies^{1,2} Oliver O'Sullivan^{1,3}
Kahawalage Pumi Prathima Senaratne^{4,5} Polly Baker^{1,6} Mark Cranley,⁴
Shreshth Dharm-Datta,⁴ Henrietta Ellis,⁴ Duncan Goodall,^{4,7} Michael Gough,⁴
Sarah Lewis,⁴ Jonathan Norman,² Theodora Papadopoulou,^{4,8} David Roscoe,^{2,4}
Daniel Sherwood,⁴ Philippa Turner,^{4,9} Tammy Walker,⁴ Alan Mistlin,⁴ Rhodri Phillip,⁴
Alastair M Nicol,^{4,10} Alexander N Bennett,^{1,11} Sardar Bahadur⁴

ABSTRACT

The highly infectious and pathogenic novel coronavirus (CoV), severe acute respiratory syndrome (SARS)-CoV-2, has emerged causing a global pandemic. Although COVID-19 predominantly affects the respiratory system, evidence indicates a multisystem disease which is frequently severe and often results in death. Long-term

respiratory droplets and close personal contact, of which there have been two global epidemics in the last 20 years, SARS in 2003, caused by SARS-CoV-1, and Middle Eastern respiratory syndrome (MERS) in 2012, caused by MERS-CoV. SARS-CoV-2 causes COVID-19, which has a predilection for the lungs, and can result in a severe pneumonia, inducing

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjports-2020-102596>).

For numbered affiliations see end of article.

Guidance ▾

Standards and indicators ▾

Life sciences ▾

British National Formulary (BNF) ▾

British National Formulary for Children (BNFC) ▾

Clinical Knowledge Summaries (CKS) ▾

About ▾

Read about [our approach to COVID-19](#)

Home > NICE Guidance > Conditions and diseases > Infections > COVID-19

We are reviewing these guidelines as new evidence, policy and practice emerges: [give us your feedback](#).

COVID-19 rapid guideline: managing the long-term effects of COVID-19

NICE guideline [NG188] Published: 18 December 2020 Last updated: 11 November 2021

Guidance

Tools and resources

Information for the public

Evidence

History

Overview

[Download guidance \(PDF\)](#)

Recommendations

Update information

Guidance

This guideline covers identifying, assessing and managing the long-term effects of COVID-19, often described as 'long COVID'. It makes recommendations about care in all healthcare settings for adults, children and young people who have new or ongoing symptoms 4 weeks or more after the start of acute COVID-19. It also includes advice on organising services for long COVID.

This guideline has been developed jointly by NICE, the Scottish Intercollegiate Guidelines Network (SIGN) and

Next >



BRIEFING ROOM

Memorandum on Addressing the Long-Term Effects of COVID-19

APRIL 05, 2022 • PRESIDENTIAL ACTIONS

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

SUBJECT: Addressing the Long-Term Effects of COVID-19

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Policy. My Administration has made combating the coronavirus disease 2019 (COVID-19) pandemic, and guiding the Nation through the worst public health crisis in more than a century, our top priority. When I came into office, COVID-19 was wreaking havoc on our country — closing our businesses, keeping our kids out of school, and forcing us into isolation.

Today, America has the tools to protect against COVID-19 and to dramatically decrease its risks. We move towards a future in which COVID-19 does not disrupt our daily lives and is something we prevent, protect against, and treat.



T

Evaluation

1. Comprehensive History and Physical
2. Comparison of pre and post COVID functioning
3. Review of COVID disease and complications (venous thromboembolism, presence and degree of kidney injury, supplemental oxygen requirements [including the need for noninvasive or invasive ventilation], cardiac complications, delirium)
4. Review subjective reports of cognition, mental health
5. Past medical issues, nutrition, activity level

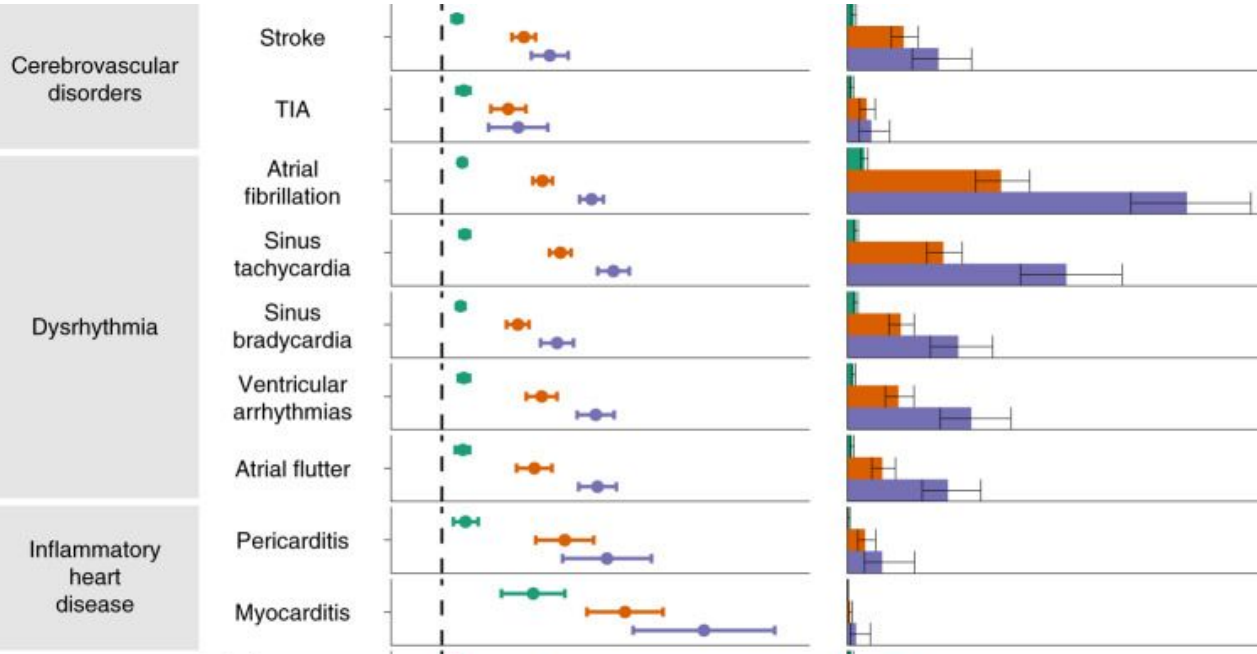
Labs

- CBC, CMP (kidney, liver, albumin)-all with persistent complaints above 4 weeks
- Plus/Minus
 - CRP/ESR- persistent fevers, chills, or bone pain
 - Brain natriuretic peptide (BNP) and troponin in patients whose course was complicated by heart failure or myocarditis
 - D-dimer if new dyspnea or any patient in whom there is a concern for thromboembolic disease.
 - Thyroid studies in those with unexplained fatigue or weakness.
 - Creatinine kinase in patients with weakness or muscle tenderness.
 - SARS-COV-2 Antibodies if testing was not done

Persistent Pulmonary-Cardiac Symptoms

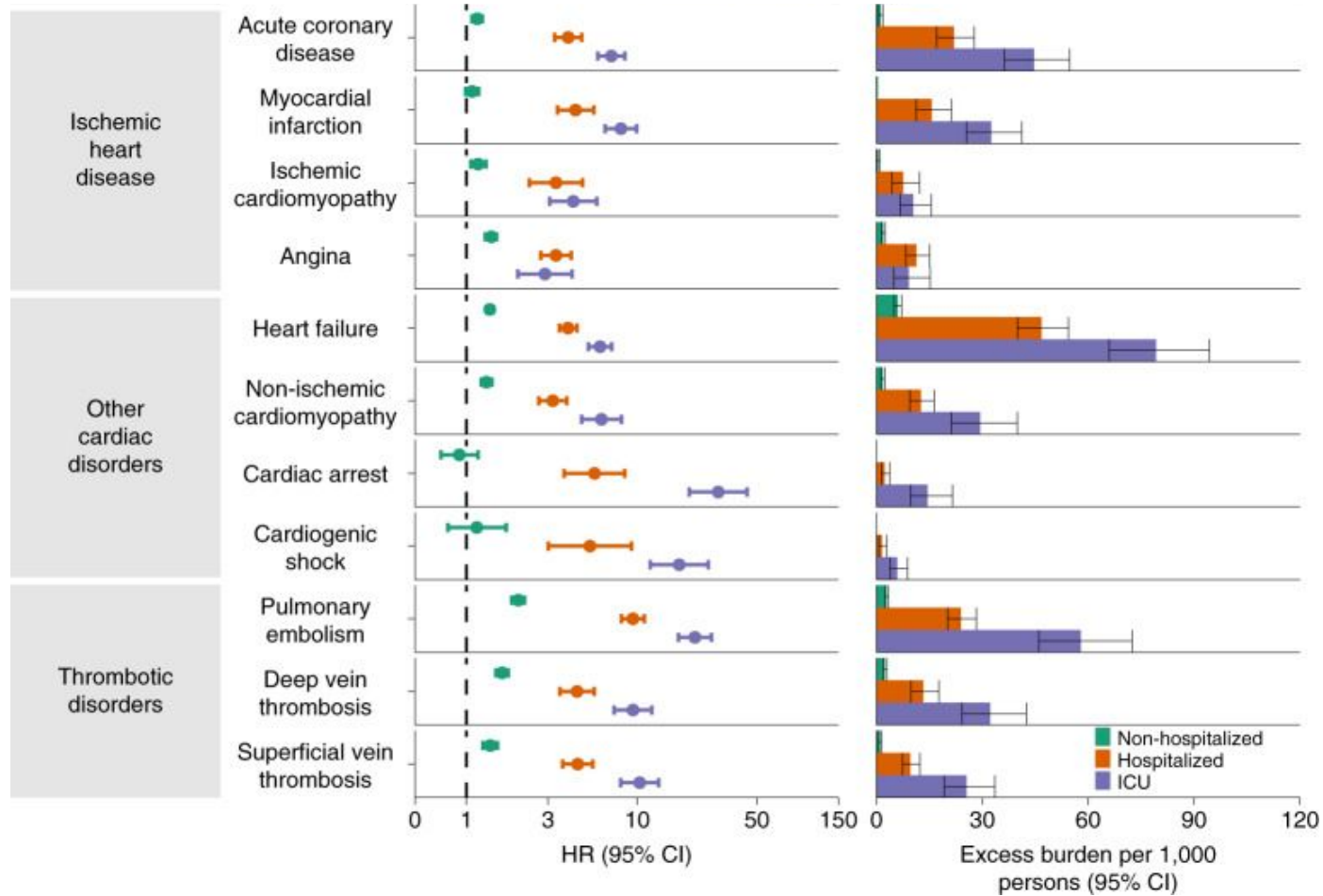
- Review for symptoms of orthopnea, chest pain (exertional, positional), peripheral edema, palpitations, dizziness, orthostasis, and pre-syncope or syncope.
- Exam check for pulm fibrosis, effusion, consolidation, arrhythmia
- Postural blood pressure (up to 10 minutes after standing) and pulse rate
- EKG, may need Holter if fatigue, palpitations
- ECHO if history of myocarditis
- Return to sports/activity monitored closely

1 year post COVID -VA Study



23 excess CV events per 1000 patients with COVID-19

Adjusted hazard ratio 1.55



Persistent Pulmonary Symptoms

- Accumulating data shows lung damage (ie, ground glass opacities, consolidation, interlobular septal thickening) to resolve in two to four weeks,
- IF severe disease- may require 12 weeks or longer with some studies suggesting changes up to a year
- Perform **chest x-ray** at 12 weeks following discharge to ensure complete radiographic resolution
- IF persistent or worsening abnormalities at 12 weeks on X-ray, Chest CT and pulmonology referrals
- PFT's if hospitalized or new symptoms, every 6-12 weeks

6-month Pulmonary Follow-up

1700 patients previously hospitalized with COVID-19 in Wuhan, China

Patient subset with severe pulmonary involvement (ie, requiring high flow nasal cannula oxygen, noninvasive, or mechanical ventilation),

- 56 percent had persistently abnormal diffusion capacity at six months

Management of Persistent Dyspnea

Maximize treatment for underlying cause of dyspnea,

Often multifactorial

- resolving pneumonia
- organizing pneumonia
- deconditioning
- neuromuscular weakness
- exacerbation of underlying lung disease
- tracheal stenosis from intubation
- heart failure

IF organizing pneumonia in post ARDS- DATA shows 2 weeks of corticosteroids are helpful

Orthostasis/Dysautonomia

Evaluate for unexplained sinus tachycardia, dizziness on standing (>30 beats per minutes after 5-10 minutes)

- Compression stockings
- Abdominal binder
- Hydration
- Salt intake
- Physical therapy
- Behavioral modifications



Persistent Neurological Symptoms

Unexplained muscle weakness or sensory complaints-

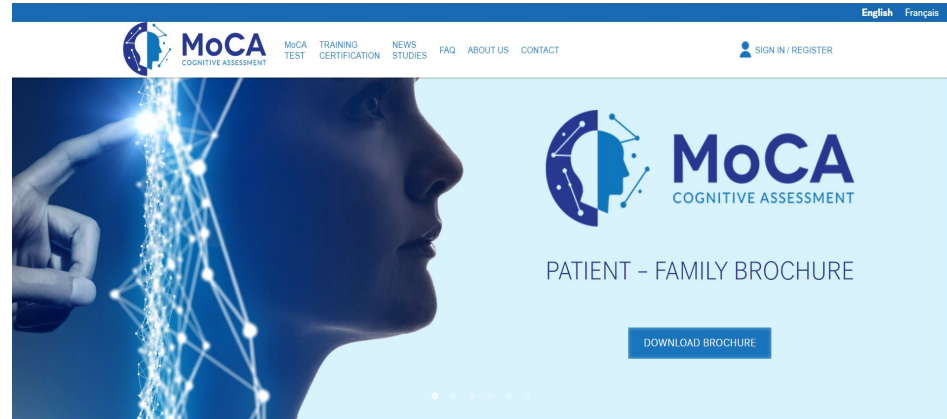
- evaluation with EMG/NCS

Brain Fog- Cognitive testing

Short Portable Mental Status Questionnaire (SPMSQ)

Abbreviated Mental Test Score (AMTS)

Montreal Cognitive Assessment (MOCA)



Better patient care

Persistent Fatigue

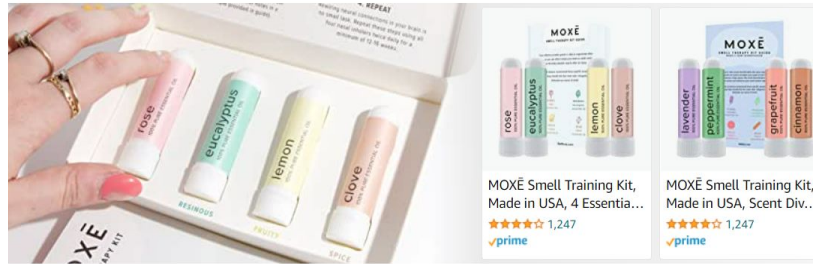
PASC fatigue assessment recommendations

Number	Statement
1	Patients should be assessed for fatigue patterns throughout their normal day to guide activity recommendations.
1a	Patients should be assessed for their responses to initiating and escalating activity on their fatigue.
1b	Patients should be evaluated for changes in daily functioning and activity levels.
1c	Patients' physical functioning and endurance should be assessed to inform activity and therapy recommendations. (Examples of tests that can be chosen based on an individual's activity tolerance: 30 s sit to stand ^[1] ; 2-min step (seated or standing) ^[2] ; 6-min walk test ^[3] ; 10 m walk test ^[4]).
2	Clinicians should assess for changes in activities of daily living, independent activities of daily living, school, work, and avocational (ie, hobbies).
3	A full patient history with review of pre-existing conditions should be conducted.
4	Patients should be evaluated for conditions that may exacerbate fatigue symptoms and warrant further testing and potential subspecialty referral. Particular areas include: <ul style="list-style-type: none">▪ Sleep▪ Mood, including anxiety, depression, and PTSD. NOTE: Patients often report dissatisfaction with their care because of their persistent symptoms being attributed to psychological factors. It is important to note that mood disorders may be secondary to persistent medical issues or one of many factors leading to fatigue.▪ Cardiopulmonary▪ Autoimmune▪ Endocrine
5	A medication review should be conducted to investigate medications that may be contributing to fatigue. Of note, antihistamine, anticholinergic, and antidepressant/anxiolytic medications can contribute to fatigue in patients with PASC.
6	The following basic laboratory workup should be considered in new patients or those without laboratory workup in the 3 months before visit including complete blood count with differential, chemistries including renal and hepatic function tests, thyroid-stimulating hormone, c-reactive protein or erythrocyte sedimentation rate, and creatinine kinase. Other laboratory tests may be considered based on the results of these tests or if there is specific concern for comorbid conditions.

Smell and Taste- Usually resolving in less than 3 months

Olfactory training kits

Self-guided online programs



Sponsored

RESULTS



A Role for Antivirals?

Michael J. Peluso, Khamal Anglin, Matthew S. Durstenfeld et al. Effect of oral nirmatrelvir on Long COVID symptoms: a case series, 03 May 2022, PREPRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-1617822/v1>]

CAUTION: A Case series of 3 patients

- Given later in the course it helped with long covid symptoms
- Given earlier it didn't affect long covid symptoms
- All patients fully vaxxed and boosted

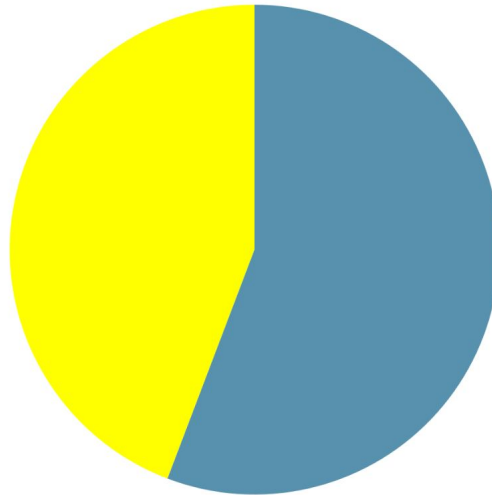
CAUTION: Paxlovid has significant drug drug interactions



Questions?

- candice.smith@tannerclinic.com

Doctor's Feelings about COVID



● Doctors who are Tired of COVID ● Doctors who are Tired of COVID, but in Yellow