

# Post Viral Syndrome/Long COVID Recovery

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# The Functional Medicine Approach to Long COVID



# Session Outline: Long COVID in the Post-Pandemic Era

- Overview & current landscape
- Pathophysiology, mechanisms, 5 drivers
- Key lifestyle interventions & post viral recovery protocol
- Group visit models
- Patient registry and outcomes data
- Patient case presentations
- Resources and Fullscript integration



# Current Landscape

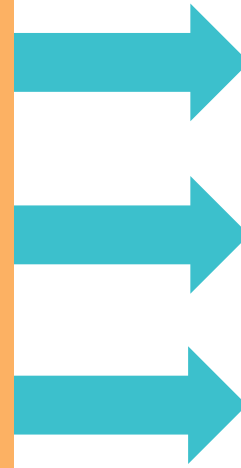
- Confusing terminology: PASC, long COVID, long haul
- 200+ symptoms: delayed, remitting, relapsing
- Long lag times before diagnosis
- No proven treatments, no standards of care = no guidelines and no trained workforce



# LONG COVID PREVALENCE <sup>1</sup>

- Greater than 80% of Americans have had acute COVID
- Most Long COVID cases occur in people with mild acute illness
- 1/3 of people with Long COVID have no identified pre-existing conditions
- Reinfection contributes additional risk of Long COVID

- 15-30% people have persistent symptoms @ 1 month
- 6-10% people have persistent symptoms @ 3 months
- 1-2% people have persistent symptoms @ 12 months



- Long COVID Incidence Estimate
- ~ 30 million people with Post-COVID @ 1 month
  - ~ 10 million people with Post-COVID @ 3 months
  - ~ 2 -4 million people with Post-COVID @ 12 months



# Estimated Total Cost of Long COVID = \$3.7 trillion

Table 1: The Economic Cost of Long COVID

Impact	Value (\$ billion)
Reduced quality of life	\$2,195
Reduced earnings	\$997
Increased medical spending	\$528
Total cost	\$3,719

[https://scholar.harvard.edu/files/cutler/files/long\\_covid\\_update\\_7-22.pdf](https://scholar.harvard.edu/files/cutler/files/long_covid_update_7-22.pdf)



# RECOVER

Researching COVID to Enhance Recovery



National Institutes of Health  
*Researching COVID to Enhance Recovery*

- Funded by Congress (Dec 2020): \$1.15 billion to study promising therapies
- To-date, largely descriptive epidemiology, no therapeutic interventions
- Clinical trials just underway



# Focus Areas of RECOVER's Clinical Trials



## **Autonomic Dysfunction**

Dizziness, fast heart rate, shortness of breath, upset stomach, or other changes in body functions that happen automatically



## **Cognitive Dysfunction**

Brain fog, trouble thinking clearly, memory changes, slowed attention, and other symptoms related to brain function



## **Viral Persistence**

When the virus that causes COVID-19 stays in the body and causes damage to organs or the immune system to not function properly



## **Sleep Disturbances**

Changes in sleep patterns or ability to sleep



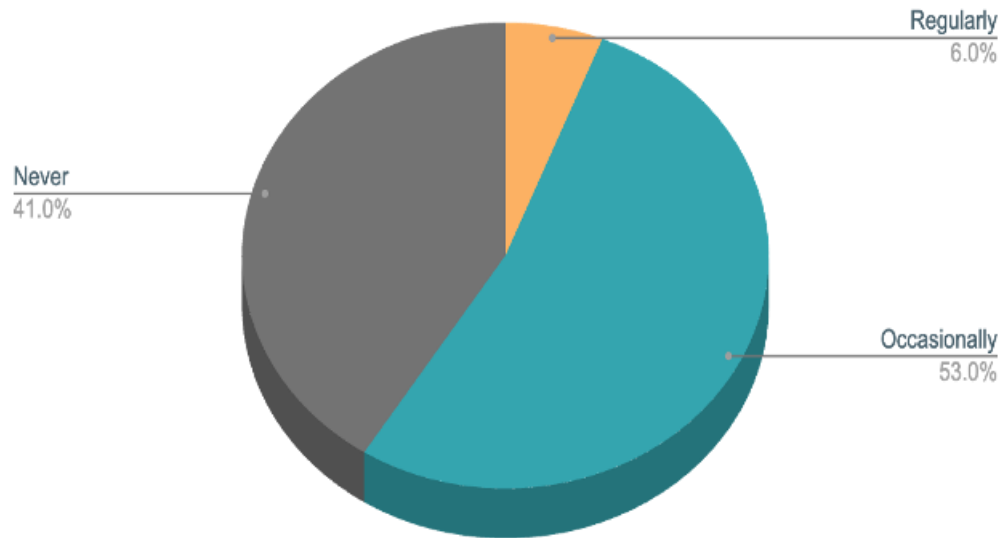
## **Exercise Intolerance and Fatigue**

Exhaustion or low energy that interferes with daily activities

# Medscape Physician Survey (2023)

## Key Findings

Reported LC Treatment Success that Benefited Patients, n=432



Long COVID does not appear to be self-resolving, in the sense of spontaneous recovery or recovery in the absence of a cure or a treatment that has been validated. It further raises the importance of finding treatment because this is not going to go away.

Ziyad Al-Aly

Clinical Epidemiologist

Washington University, St Louis

STAT Health Tech, 9/20/2023 [https://www.statnews.com/2023/09/20/do-long-covid-odds-increase-with-second-infection/?utm\\_campaign=breaking\\_news&utm\\_medium=email&\\_hsmi=275130536&\\_hsenc=p2ANqtz-\\_Fz5sQzp45OzS1UyaREko82SfD8HXId2tVTahbKLPYeT\\_IzbsU0EZCjEYEIU-qBJptPUPhyCM\\_6OqMlbAfcKQeCUgpWQ&utm\\_content=275130536&utm\\_source=hs\\_email](https://www.statnews.com/2023/09/20/do-long-covid-odds-increase-with-second-infection/?utm_campaign=breaking_news&utm_medium=email&_hsmi=275130536&_hsenc=p2ANqtz-_Fz5sQzp45OzS1UyaREko82SfD8HXId2tVTahbKLPYeT_IzbsU0EZCjEYEIU-qBJptPUPhyCM_6OqMlbAfcKQeCUgpWQ&utm_content=275130536&utm_source=hs_email)



# Program/Protocol Development Process

## 2022

- Expert working group established
- Developed framework based on 5 drivers
- Social listening study completed (>1 million conversations)
- Selected validated outcomes instruments & developed REDCap patient registry
- Developed 90-day program and protocol
- Enrolled first patients & groups in program and registry

## 2023

- Developed and presented education/training workshops (>5000 providers)
- Refined protocol
- Integrated protocol with Fullscript
- Analyzed and presented outcomes data

## Current

- Characterization of patient registry (comorbidities, top symptoms, duration of symptoms)
- More group visit programs across the country using a variety of models
- Enroll additional patients to grow data set
- Interrogate registry to better understand responders and non-responders

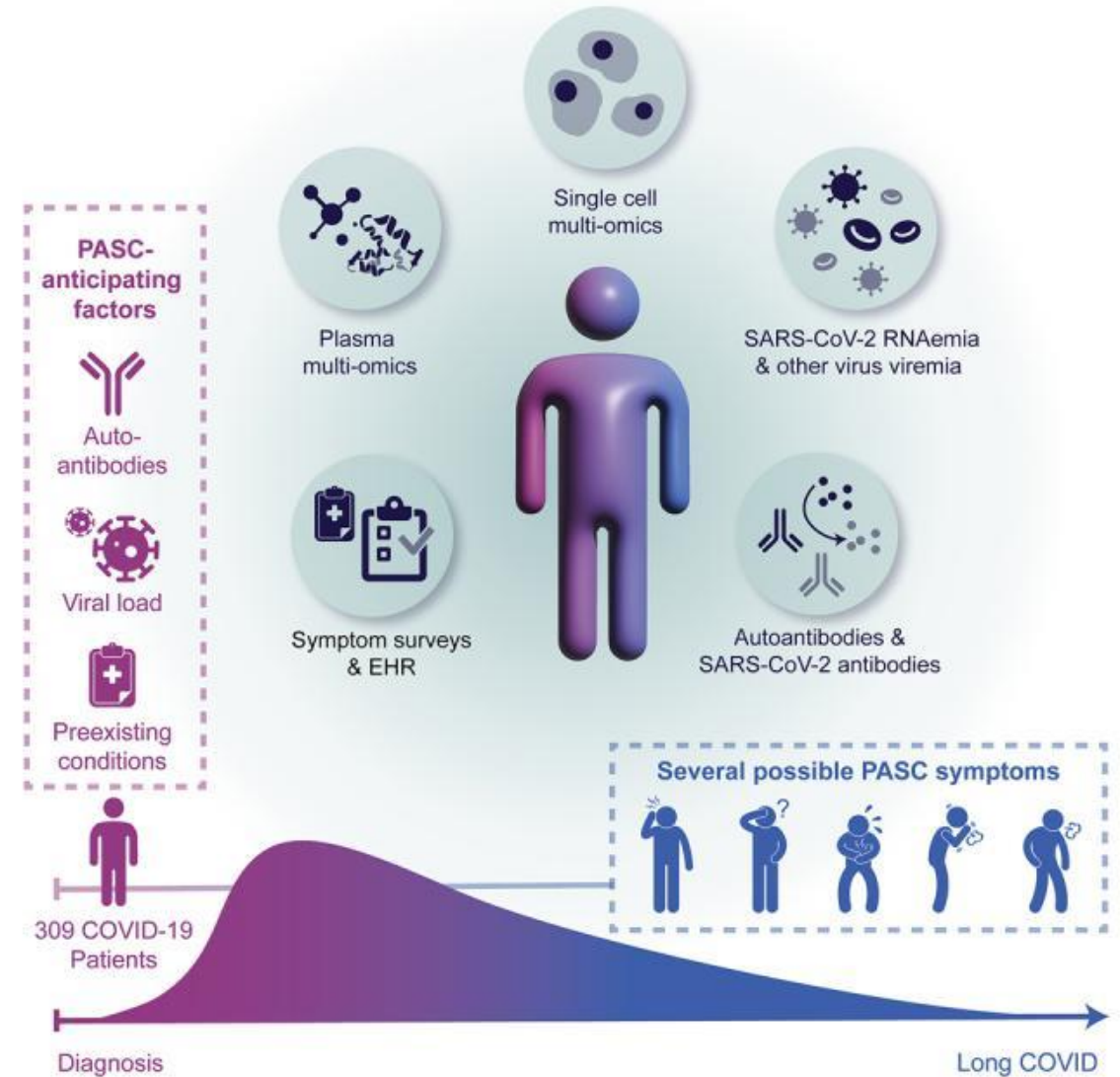


# LONG COVID IN THE POST-PANDEMIC ERA

ASSESSING PROGRESSION AND PERSONALIZING  
TREATMENT USING A ROOT-CAUSE APPROACH

# Multiple early factors anticipate post-acute COVID-19 sequelae

Su, Y, Yuan, D, et. al. (2022). Multiple early factors anticipate post-acute COVID-19 sequelae. Cell, 185(5). <https://doi.org/10.1016/j.cell.2022.01.014>



# Long COVID or post-COVID-19 syndrome: putative pathophysiology, risk factors, and treatments

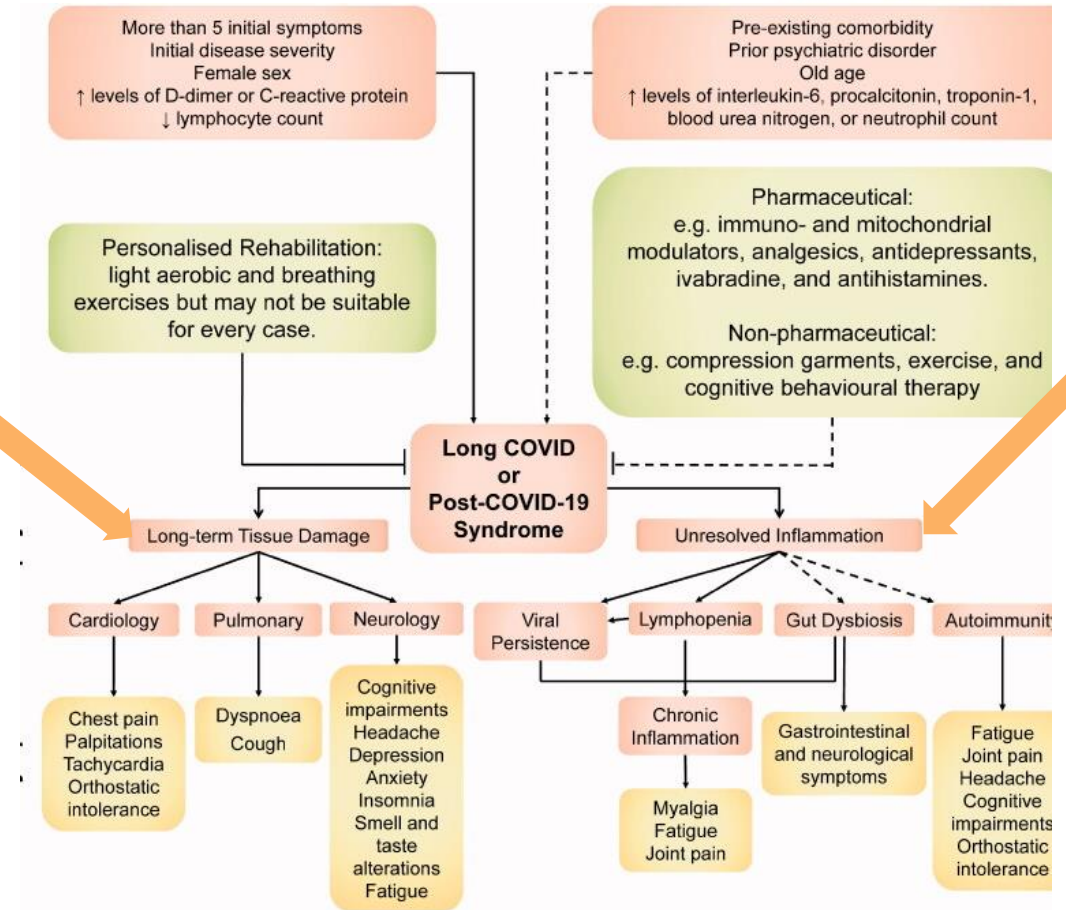
Yong, SS (2021). Long COVID or post-COVID-19 syndrome: putative pathophysiology, risk factors, and treatments.

Infectious Diseases, 53(10), 737–754.

An overview of the symptoms, putative pathophysiology, associated risk factors, and potential treatments involved in long COVID.

<https://doi.org/10.1080/23744235.2021.1924397>

Note: Dashed lines represent areas where evidence is relatively lacking compared to non-dashed lines. (Color online only).

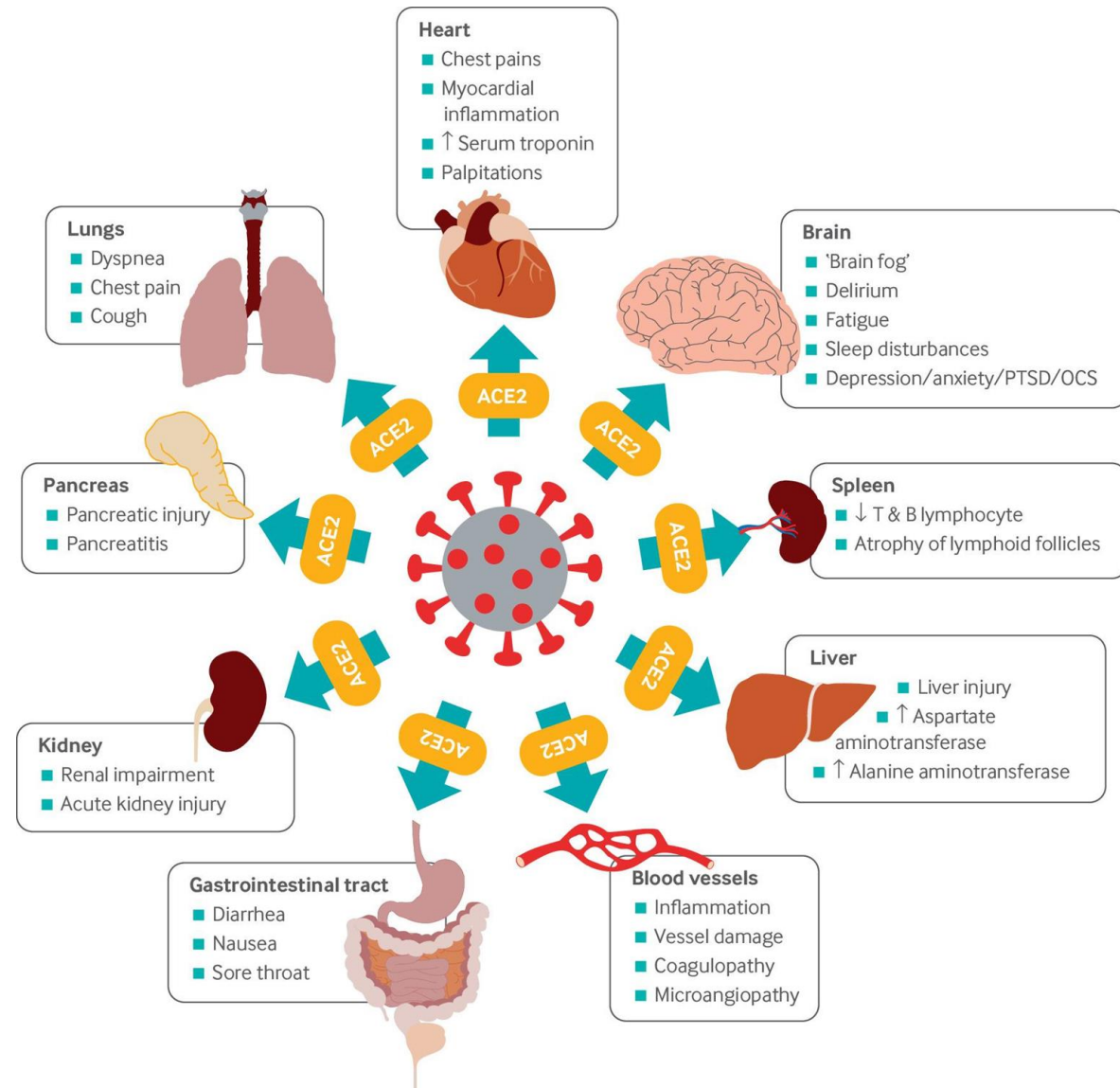


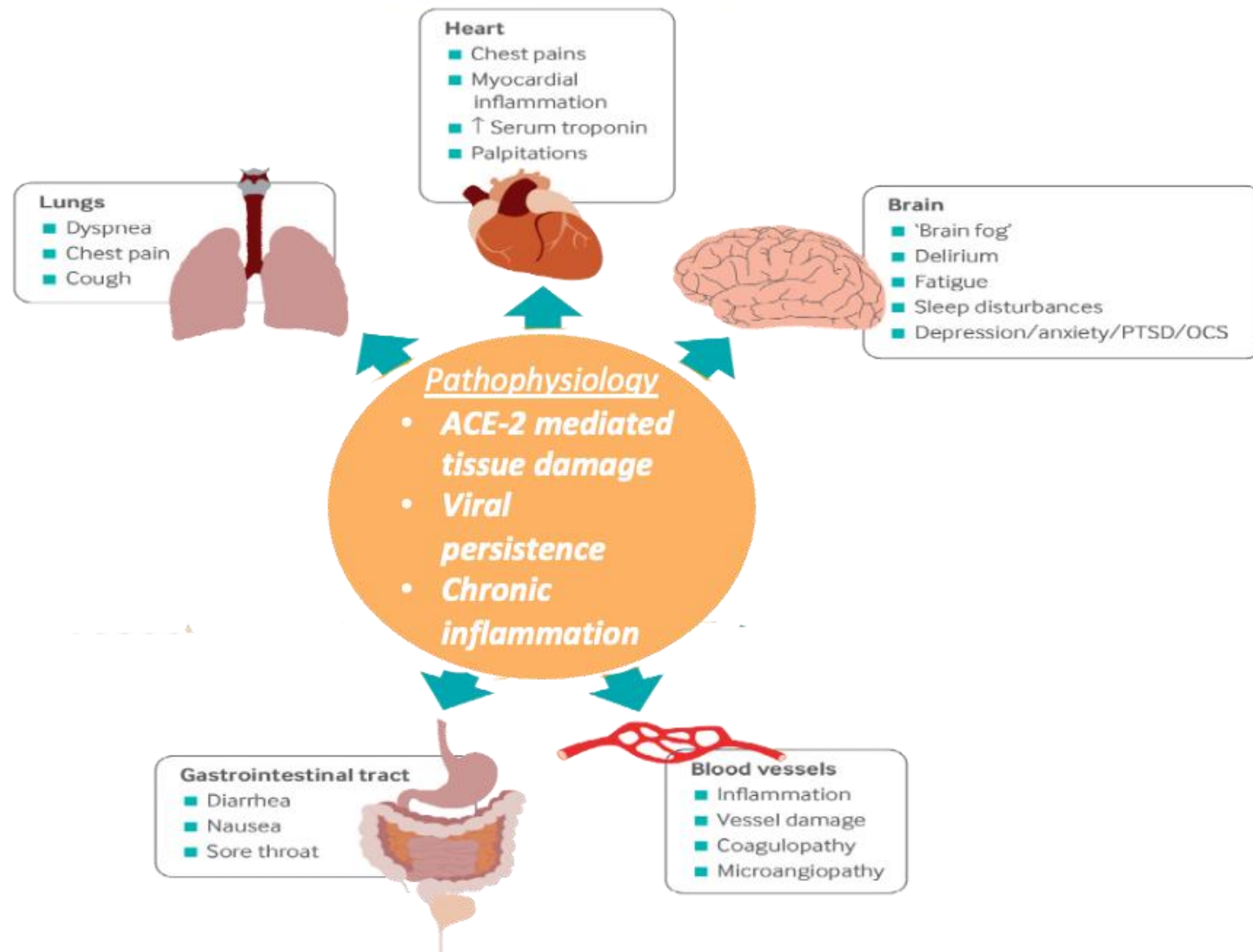


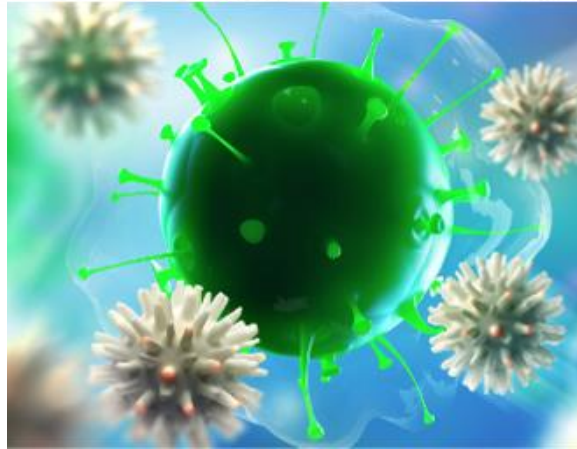
# Long Covid: mechanisms, risk factors, and management

Crook, H, Raza, S, Nowell, J, Young, MK, Edison, P (2021). Long covid—mechanisms, risk factors, and management. BMJ, n1648. <https://doi.org/10.1136/bmj.n1648>

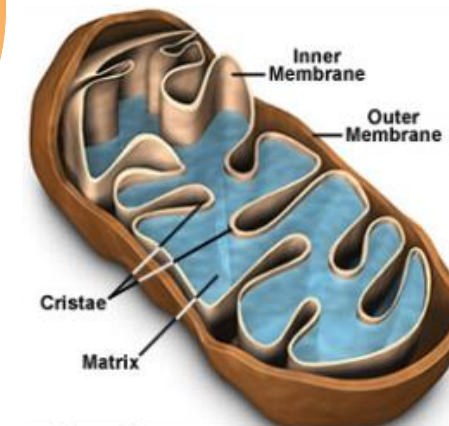
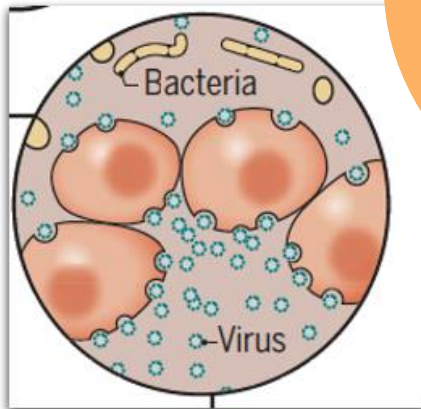
Multi-organ complications of covid-19 and long covid. The SARS-CoV-2 virus gains entry into the cells of multiple organs via the ACE2 receptor. Once these cells have been invaded, the virus can cause a multitude of damage ultimately leading to numerous persistent symptoms.







*ACE-2 mediated damage*  
*Viral persistence*  
*Chronic inflammation*  
*Gut/Microbiome dysbiosis*  
*Mitochondrial dysfunction*

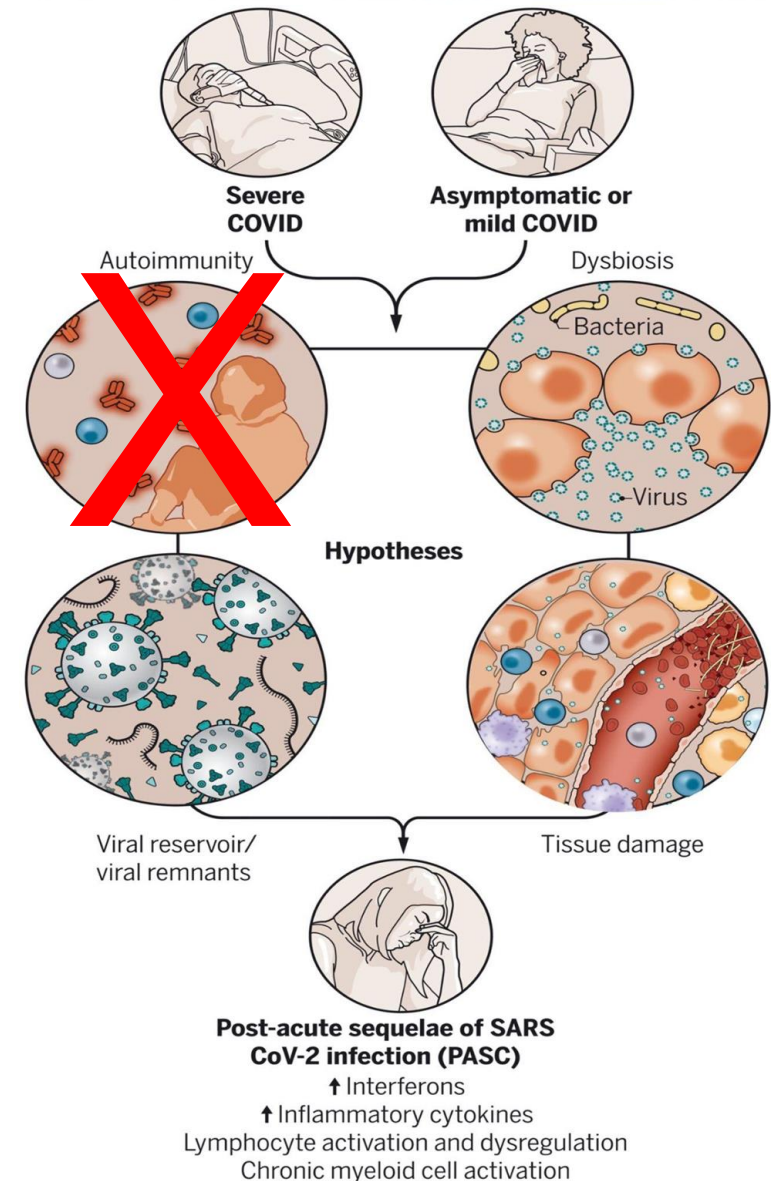


# Distinguishing features of Long COVID identified through immune profiling

Klein, JB, Wood, JR, Iwasaki, A, et al. (2022). Distinguishing features of Long COVID identified through immune profiling. medRxiv (Cold Spring Harbor Laboratory). <https://doi.org/10.1101/2022.08.09.22278592>

A fraction of COVID-19 patients with either severe or mild COVID-19 develop a variety of new, recurring, or ongoing symptoms and clinical findings 4 or more weeks after infection. Analyses of immune responses in people with PASC reveal key inflammatory cytokines and cellular activation phenotypes that are significantly elevated over nonPASC convalescent controls. Further studies are needed to identify the drivers of PASC pathophysiology.

Illustration: V. Altounian/Science





**ACE-2  
mediated  
tissue damage**

**Viral  
Persistence**

**Chronic  
Inflammation**

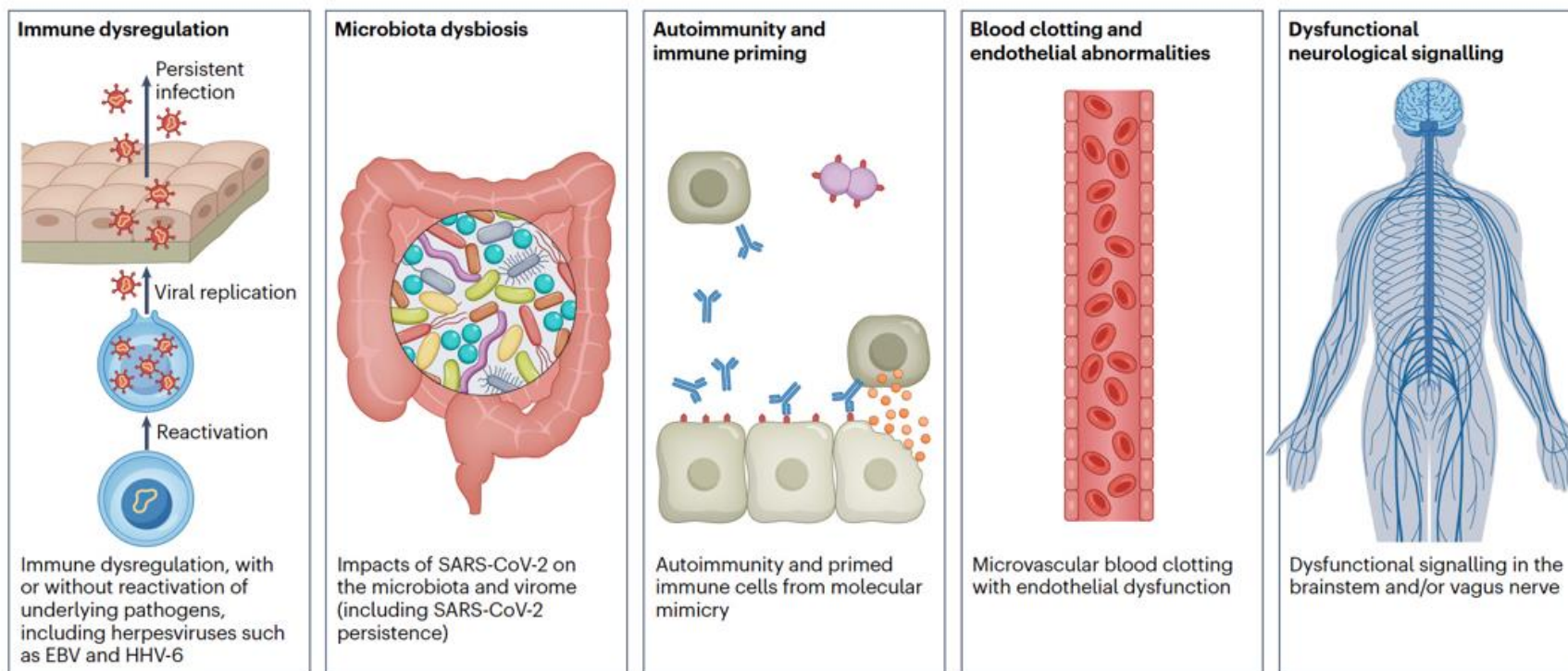
**Gut/Microbiom  
e dysbiosis**

**Mitochondrial  
dysfunction**

# Long COVID: major findings, mechanisms and recommendations

Davis, HE, McCorkle  
133–146 (2021)

Rev Microbiol 21,



**Fig. 3 | Hypothesized mechanisms of long COVID pathogenesis.** There are several hypothesized mechanisms for long COVID pathogenesis, including immune dysregulation, microbiota disruption, autoimmunity, clotting

and endothelial abnormality, and dysfunctional neurological signalling. EBV, Epstein–Barr virus; HHV-6, human herpesvirus 6; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.



# Long-lasting effects

- “Pulmonary vascular microthrombosis and macrothrombosis have been observed in 20–30% of patients with COVID-19, which is higher than in other critically ill patient populations (1–10%).”
- “In addition, the severity of endothelial injury and widespread thrombosis with microangiopathy seen on lung autopsy is greater than that seen in ARDS from influenza.”

Review Article | [Published: 22 March 2021](#)

## Post-acute COVID-19 syndrome

[Ani Nalbandian](#), [Kartik Sehgal](#) , ... [Elaine Y. Wan](#)  [+ Show authors](#)

[Nature Medicine](#) 27, 601–615 (2021) | [Cite this article](#)

675k Accesses | 919 Citations | 4179 Altmetric | [Metrics](#)

### Abstract

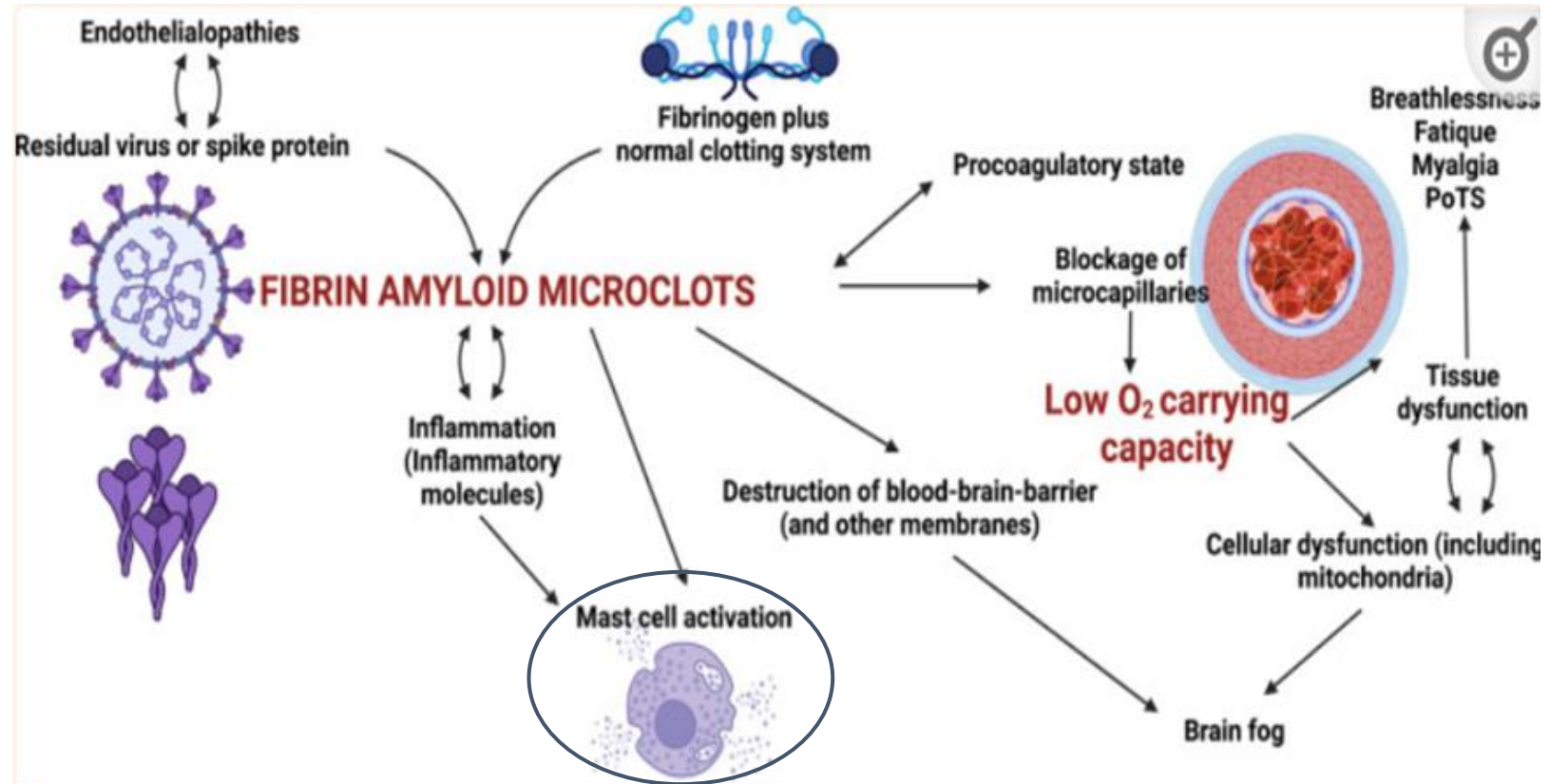
Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the pathogen responsible for the coronavirus disease 2019 (COVID-19) pandemic, which has resulted in global healthcare crises and strained health resources. As the population of patients recovering from COVID-19 grows, it is paramount to establish an understanding of the healthcare issues surrounding them. COVID-19 is now recognized as a multi-organ disease with a broad

Nalbandian, A, Sehgal, K, Gupta, A, . . . Wan, E. (2021). Post-acute COVID-19 syndrome. *Nature Medicine*, 27(4), 601–615.  
<https://doi.org/10.1038/s41591-021-01283-z>

# Long-lasting effects

These microclots are:

- Pro-inflammatory
- Entrap molecules, including those that would break them down
- Can block capillaries, resulting in hypoxia
- May be triggered by persistent viral load and/or spike protein remnants



Kell, DB, Laubscher, GJ, & Pretorius, E. (2022). A central role for amyloid fibrin microclots in long COVID/PASC: origins and therapeutic implications. *Biochemical Journal*, 479(4), 537–559. <https://doi.org/10.1042/bcj20220016>

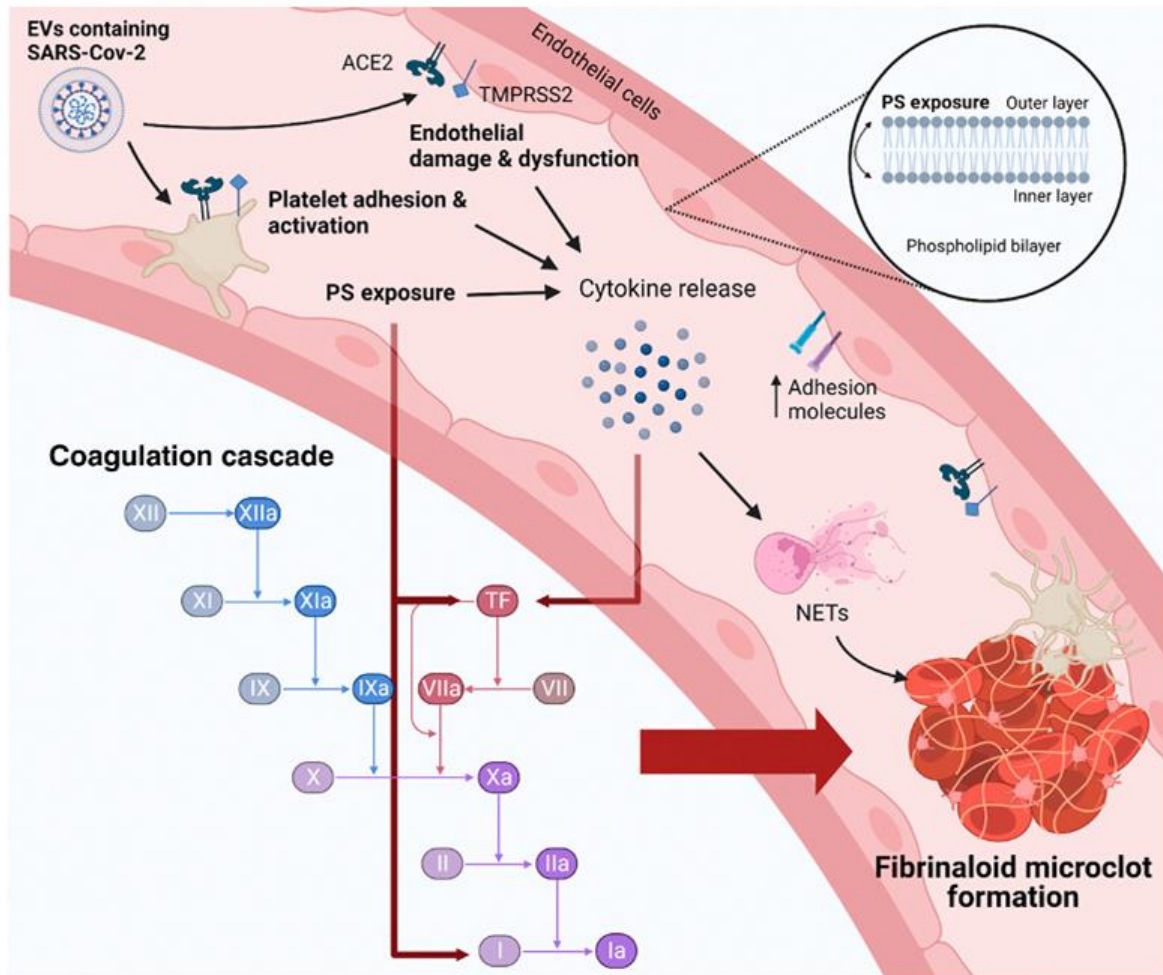
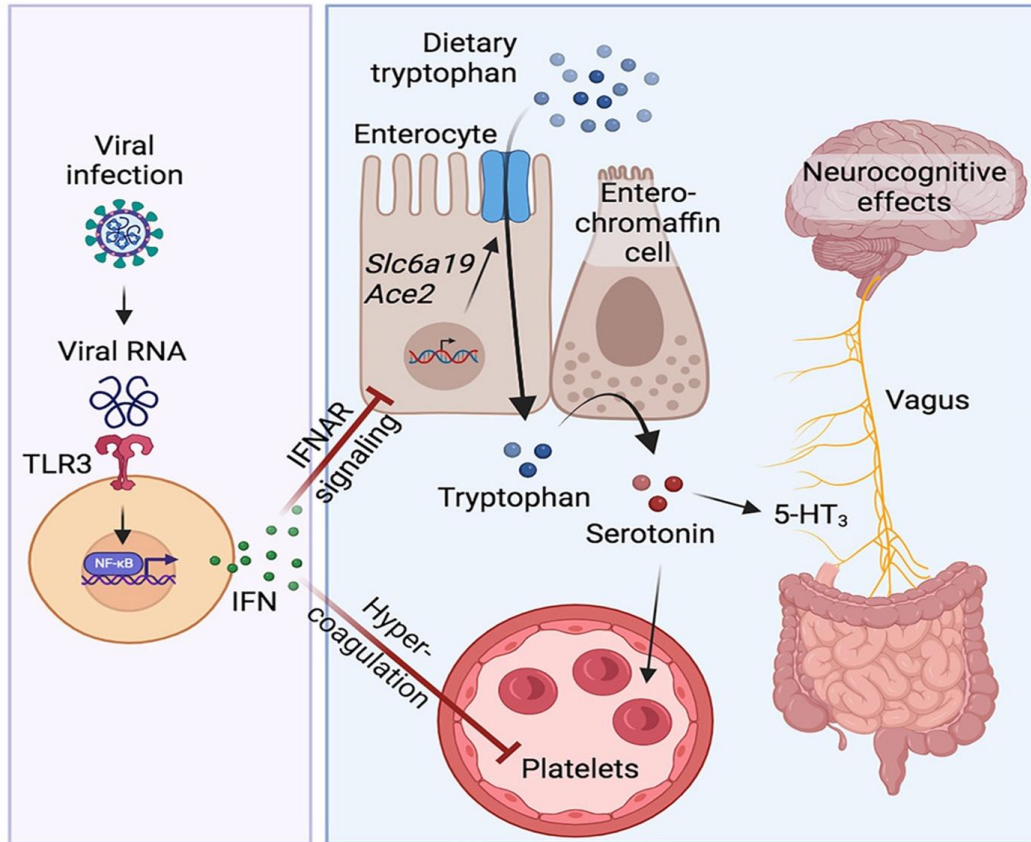


Figure 7. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) may bind to endothelial cells via the angiotensin converting enzyme 2 (ACE2)/transmembrane protease serine 2 (TMPRSS2) receptors to promote endothelial damage and dysfunction, thereby promoting the activation of the coagulation cascade and formation of fibrinoid microclots. In long COVID, SARS-CoV-2 may hide in extracellular vesicles

These mechanisms culminate in the long term persistence of the disorder characterized by a thrombotic endothelitis, endothelial inflammation, hyperactivated platelets, and fibrinoid microclots. – representing a unifying pathway for the various symptoms of LongCOVID.

Turner, S, Khan, MA, Putrino, D, Woodcock, A, Kell, DB, & Preterius, E. (2023). Long COVID: pathophysiological factors and abnormalities of coagulation. Trends in Endocrinology and Metabolism, 34(6), 321–344. <https://doi.org/10.1016/j.tem.2023.03.002>

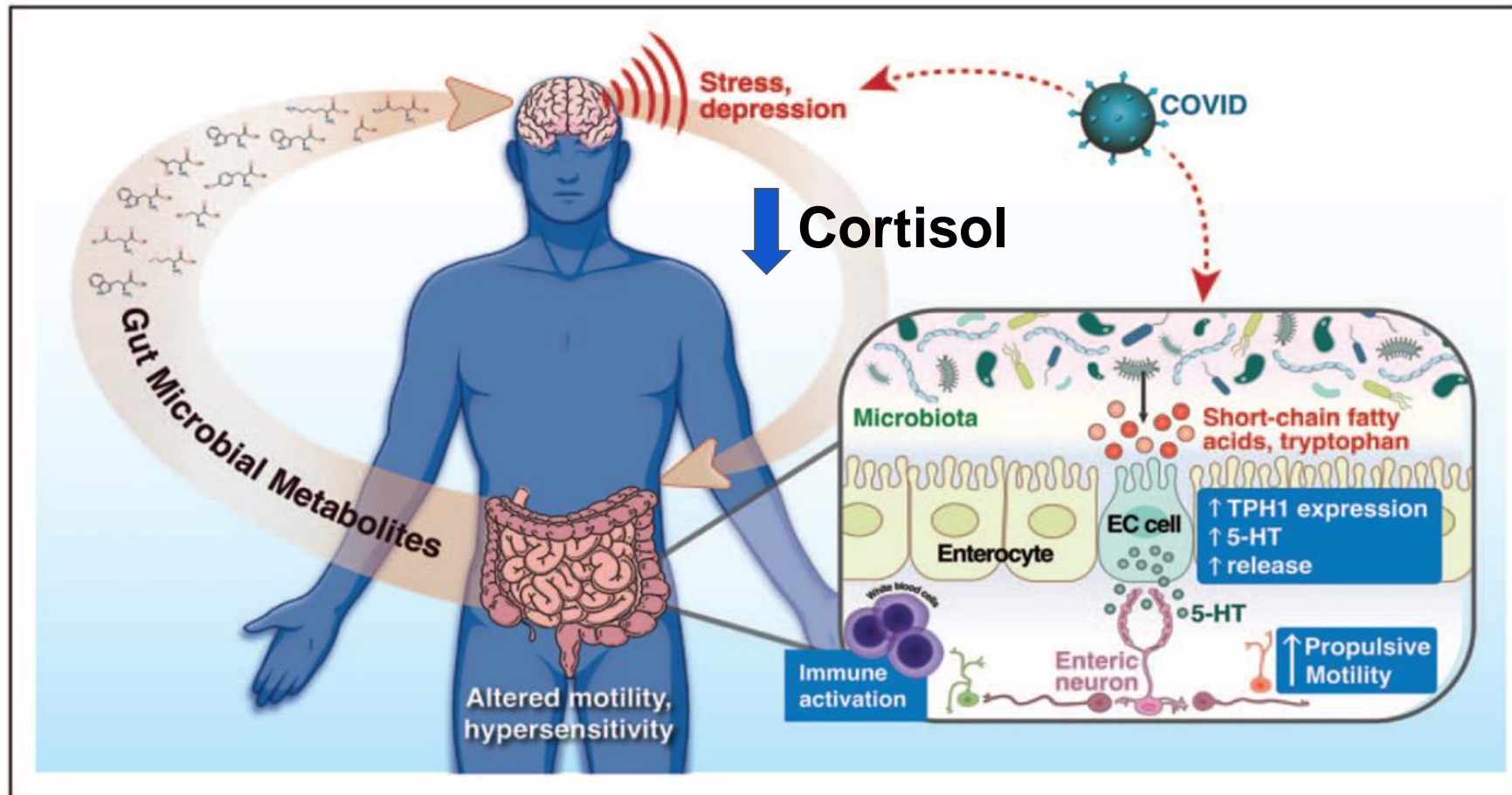
# Serotonin reduction in post-acute sequelae of viral



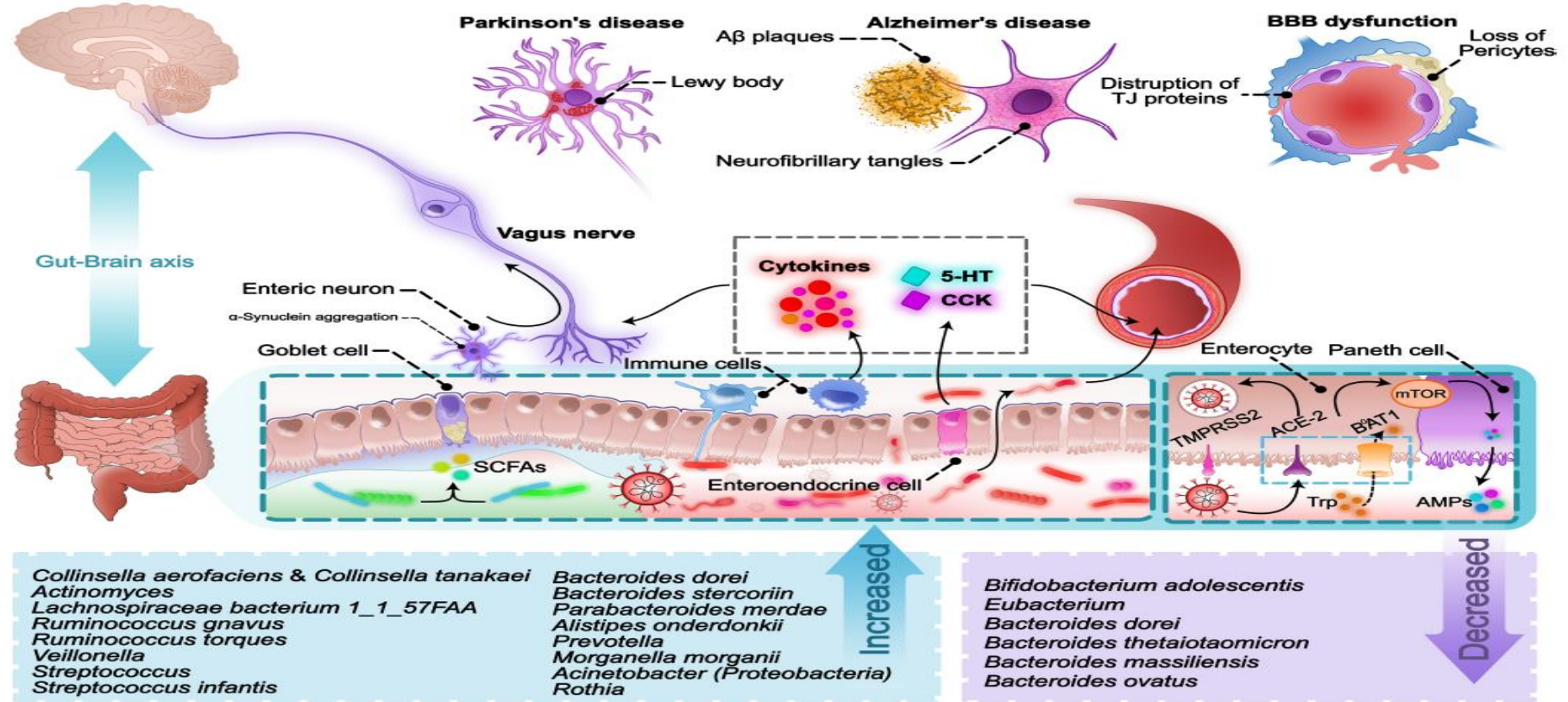
## Highlights

- Long COVID is associated with reduced circulating serotonin levels
- Serotonin depletion is driven by viral RNA-induced type I interferons (IFNs)
- IFNs reduce serotonin through diminished tryptophan uptake and hypercoagulability
- Peripheral serotonin deficiency impairs cognition via reduced vagal signaling

Wong, AC, et al (2023). Serotonin reduction in post-acute sequelae of viral infection. Cell. <https://doi.org/10.1016/j.cell.2023.09.013>



Freedberg, DE, & Chang, L. (2022). Gastrointestinal symptoms in COVID-19: the long and the short of it. *Current Opinion in Gastroenterology*, 38(6), 555–561. <https://doi.org/10.1097/mog.0000000000000876>



Vakili K, et al. The contribution of gut-brain axis to development of neurological symptoms in COVID-19 recovered patients: A hypothesis and review of literature. Front Cell Infect Microbiol. 2022 Dec 22;12:983089. doi: 10.3389/fcimb.2022.983089. PMID: 36619768; PMCID: PMC9815719.

# PROGRAM AND PROTOCOL OVERVIEW





# Long COVID Protocol

## ENROLLMENT

- Health History
- Timeline & Progression of Symptoms
- Previous Testing (if available)
- Evaluation of Function (PROMIS-29\*)
- Recovery Goals

## PHASE 1: 90-Day Program

- Lifestyle Components
- Specialty & Foundational Supplements

## LIFESTYLE:

- Food & Nutrition
- Sleep
- Movement & Exercise
- Stress Modification
- Social Connection
- Nutritional Supplementation



# Long COVID Patient Journey

## **Follow-Up: 30, 60, 90-day patient registry surveys**

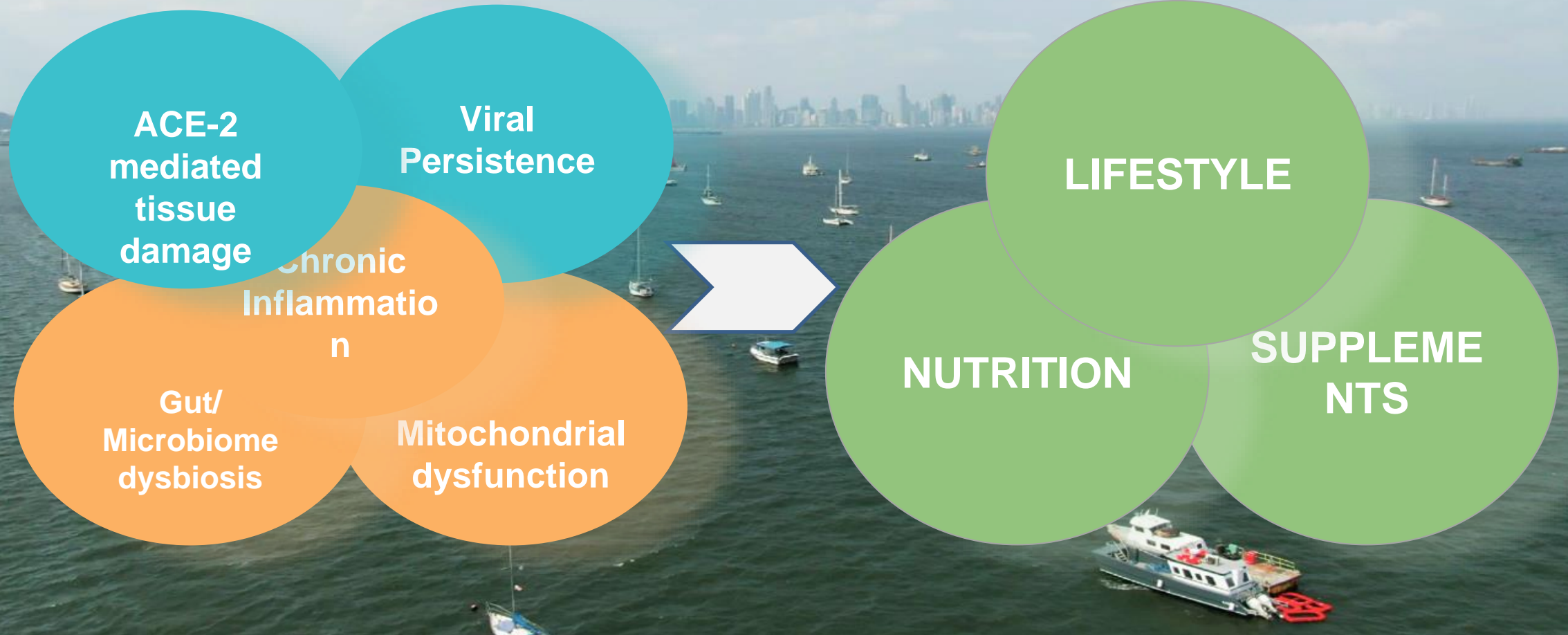
- Updated timeline and progression of symptoms at 30-day intervals
- Adherence to food plan, nutritional supplements, and lifestyle recommendations
- PROMIS-29\*
- Post COVID Function Scale (PCFS)

# KEY LIFESTYLE INTERVENTIONS OVERVIEW

- Food, Nutrition + Supplements
- Restorative Sleep
- Movement & Exercise
- Stress Modification
- Social Connection



# A Rising Tide Lifts all Boats



# KEY LIFESTYLE INTERVENTIONS OVERVIEW



# KEY LIFESTYLE INTERVENTIONS OVERVIEW

- Food, Nutrition + Supplements
- Restorative Sleep
- Movement & Exercise
- Stress Modification
- Social Connection



# WHY LIFESTYLE?

- In a prospective cohort study of 2000 women. Adherence to a healthy lifestyle prior to COVID-19 infection was inversely associated with risk of Post-COVID Conditions (PCC).
- Compared with those who did not have any healthy lifestyle factors, those with 5 or 6 had half the risk of PCC.
- Adequate sleep and healthy weight had the greatest impact on symptoms.



Wang S, Li Y, Wang S, Li Y, Yue Y, et al. Adherence to Healthy Lifestyle Prior to Infection and S, Li Y, Yue Y, et al. Adherence to Healthy Lifestyle Prior to Infection and Risk of Post–COVID-19 Condition. JAMA Intern Med. 2023;183(3):232–241.

# FOOD & NUTRITION

- Including plant-based foods, colorful and nutrient dense, with high quality protein and fats.
- Eliminating processed foods and drinks.



# FOOD & NUTRITION

- Plant-based nutrition is associated with less hospitalization and death from acute covid.
- And greater recovery from acute and post covid.



Kim H, Rebholz CM, Hegde S, LaFiura C, Raghavan M, Lloyd JF, et al. Plant-based diets, pescatarian diets and COVID-19 severity: a population-based case–control study in six countries. *BMJ Nutrition, Prevention & Health*. 2021 May 18;  
Storz MA. Lifestyle Adjustments in Long-COVID Management: Potential Benefits of Plant-Based Diets. *Curr Nutr Rep*. 2021 Dec;10(4):352-363. doi: 10.1007/s13668-021-00369-x. Epub 2021 Sep 10



# FOOD & NUTRITION

## TIPS for Coaching on Eating for Post Viral Recovery

- Personalize to individual GI symptoms, intolerances, energy and budget
- Use a health coach or nutritionist
- Advise on time restricted eating
- Rx low glycemic diet
- Optimize fermented foods and prebiotics
- Reduce histamines if symptoms correlate
- Suggest spices for added benefit & taste



# SLEEP

“COVID-19 and sleep disorders can induce BBB leakage via neuroinflammation, which might contribute to the ‘coronasomnia’ phenomenon. The new studies suggest that the control of sleep hygiene and quality should be incorporated into the rehabilitation of COVID-19 patients.”

Coliro MJ, Asraf K, Tzischinsky O, Hadar-Shoval D, Tannous-Haddad L, Wolfson AR. Sleep quality and COVID-19-related stress in relation to mental health symptoms among Israeli and US adults. *Sleep Health*. 2021;7(2):127–33

Gupta R, Grover S, Basu A, Krishnan V, Tripathi A, Subramanyam A, et al. Changes in sleep pattern and sleep quality during COVID-19 lockdown. *Indian J Psychiatr*. 2020;62(4):370–378

Jahrami HA, Alhaj OA, Humood AM, et al. Sleep disturbances during the COVID-19 pandemic: A systematic review, meta-analysis, and meta-regression. *Sleep Med Rev*. 2022;62:101591. doi:10.1016/j.smrv.2022.101591

Alzueta E, , et al An international study of post-COVID sleep health. *Sleep Health*. 2022 Dec;8(6):684-690. doi: 10.1016/j.sleh.2022.06.011. Epub 2022 Sep 23. PMID: 36163137; PMCID: PMC9501615.





# SLEEP: Improving Sleep Hygiene

Up to 40% of people with LC have sleep disruption which can cause a feed forward cycle in brain fog, inflammation, pain and mental health disturbances.



Find personalized experiments to achieve restorative sleep

Alzueta E, et al. An international study of post-COVID sleep health. *Sleep Health*. 2022 Dec;8(6):684-690. doi: 10.1016/j.sleh.2022.06.011. Epub 2022 Sep 23

Semyachkina-Glushkovskaya O, Mamedova A, Vinnik V, Klimova M, Saranceva E, Ageev V, Yu T, Zhu D, Penzel T, Kurths J. Brain Mechanisms of COVID-19-Sleep Disorders. *Int J Mol Sci*. 2021 Jun 28;22(13):6917. doi: 10.3390/ijms22136917. PMID: 34203143;

Pena-Orbea, C, et al. (2023) Sleep Disturbance severity and correlation in post-acute dequelaes of COVID-19 (PASC) *Journal of General Internal Medicine*

# SLEEP

- Both quality and quantity matter
- Improving sleep hygiene >
- Supplements that support sleep
- Practicing ultradian rhythm break or URB >



# MOVEMENT & EXERCISE >>

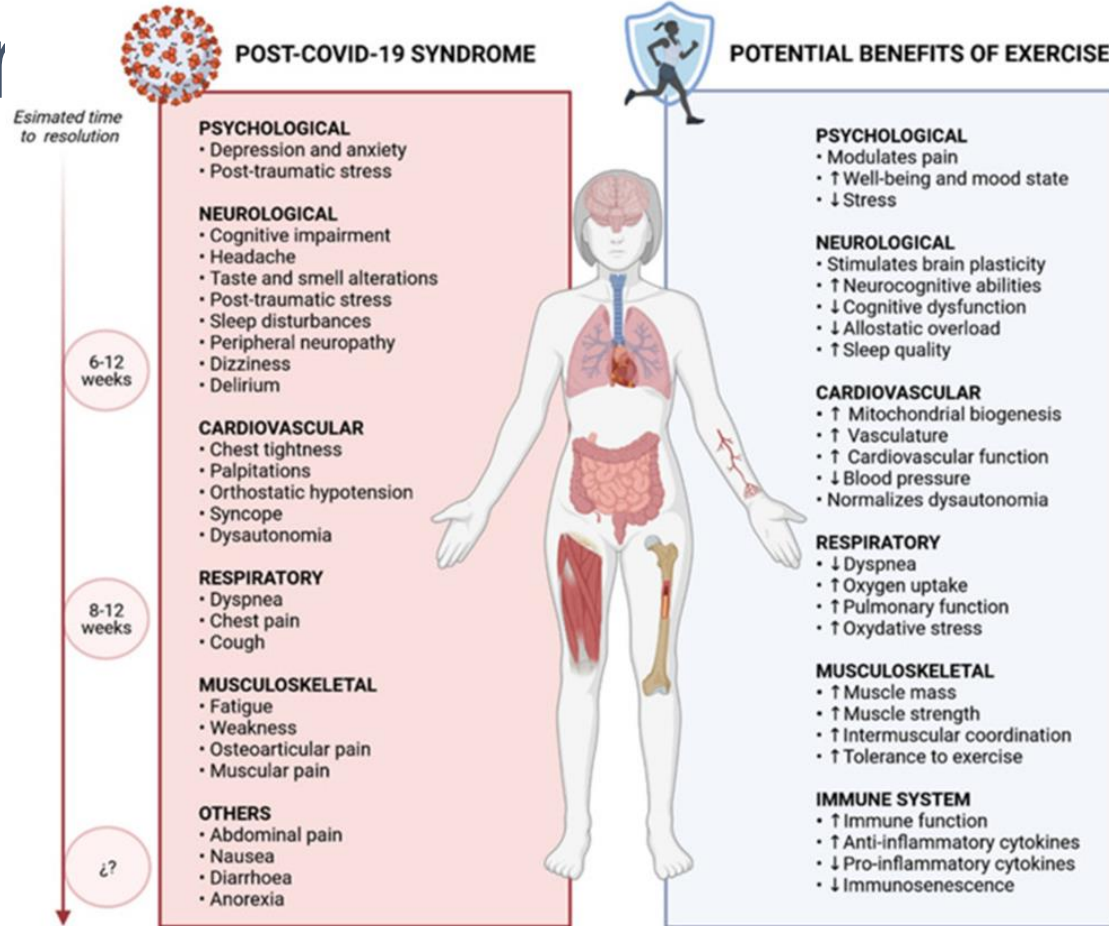
- Moderate, regular activity is essential to functioning of immune system, circulation, and tissue oxygenation
- In the multivariate analysis, physical activity during the pandemic was associated with a reduced likelihood of long COVID (prevalence ratio [PR]: 0.83; 95% confidence interval [CI]: 0.69–0.99) and a reduced duration of long COVID symptoms

Feter N, et al. Physical activity and long COVID: findings from the Prospective Study About Mental and Physical Health in Adults cohort. Public Health. 2023 Jul;220:148-154. doi: 10.1016/j.puhe.2023.05.011. Epub 2023 Jun 13. PMID: 37320945; PMCID: PMC10263464.



# MOVEMENT as Post COVID

Ti



Jimeno-Almazán A, Pallarés JG, Buendía-Romero Á, Martínez-Cava A, Franco-López F, Sánchez-Alcaraz Martínez BJ, Bernal-Morel E, Courel-Ibáñez J. Post-COVID-19 Syndrome and the Potential Benefits of Exercise. *Int J Environ Res Public Health*. 2021 May 17;18(10):5329. doi: 10.3390/ijerph18105329. PMID: 34067776; PMCID: PMC8156194.



# TIPS TO GET MOVING

These experiments may help keep your body's stress response in check and help bring more physical activity into your day:

- Personalize it
- PACE it!.
- Start small
- Plan it out.
- Step outside.
- Utilize daily activities.
- Take it slow.
- HIIT It.
- Find support.



# STRESS MODIFICATION

>>

Techniques to modify the impact of stress on augmenting inflammation and decreasing immune function





# STRESS MODIFICATION

- Acute COVID is associated with elevated evening cortisol levels.
- Long COVID is associated with low cortisol levels and low activation of the HPA axis.
- Stress modification and adrenal restoration are treatment for post - viral conditions



Lamontagne S.J., Pizzagalli D.A., Olmstead M.C. Does inflammation link stress to poor COVID-19 outcome? Stress Health. 2021;37(3):401–414.

Sandrini L., Ieraci A., Amadio P., Zara M., Barbieri S.S. Impact of acute and chronic stress on thrombosis in healthy individuals and cardiovascular disease patients. Int. J. Mol. Sci. 2020;2

Yavropoulou MP, Tsokos GC, Chrousos GP, Sfikakis PP. Protracted stress-induced hypocortisolemia may account for the clinical and immune manifestations of Long COVID. Clin Immunol. 2022 Dec;245:109133.



# STRESS MASTERY TECHNIQUES

>>

Like stress triggers, what helps someone navigate stressful situations varies. Some common experiments include:



- Relaxation techniques
- Meditation
- Finding support from others
- Being physically active (this can add stress to the body but may help mental and emotional stress).
- Spending time in nature
- Diversion tactics
- Gratitude practices
- Laughter, joy, and play
- Engaging in arts, music, and crafts



# STRESS: MIND and MENTAL HEALTH

Worsened by stress, mental health and performance impacts post-viral recovery:



- Brain fog is a common symptom this program addresses .
- Mental health conditions are often new or worse post COVID and appropriate referrals and support are imperative to recovery.
- Mindset matters in recovery

Taquet M, et al. Neurological and psychiatric risk trajectories after SARS-CoV-2 infection: an analysis of 2-year retrospective cohort studies including 1 284 437 patients. *Lancet Psychiatry*. 2022;9:815–827. doi: 10.1016/S2215-0366(22)00260-7.

Schou TM, Joca S, Wegener G, Bay-Richter C. Psychiatric and neuropsychiatric sequelae of COVID-19 - A systematic review. *Brain Behav Immun*. 2021 Oct;97:328-348. doi: 10.1016/j.bbi.2021.07.018. Epub 2021 Jul 30.

R. Zion a, Kengthsagn Louis a, Rina Horii a b, Kari Leibowitz a, Lauren C. Heathcote c d, Alia J. Crum. Making sense of a pandemic: Mindsets influence emotions, behaviors, health, and wellbeing during the COVID-19 pandemic. *Social Science & Medicine*. Volume 301, May 2022, 114889

# SOCIAL CONNECTION

>> People impacted by long COVID reflect how isolated they continue to feel isolated as others move on.

Connecting participants to community, and especially to support of people experiencing similar losses is essential to recovery.





# POST VIRAL RECOVERY:

## Applying the protocol in clinical practice



# SUPPLEMENT TARGETING

- ACE-2 mediated damage  
(tissue damage)
- Viral persistence
- Chronic inflammation
- Mitochondrial dysfunction
- Gut / Microbiome dysbiosis

After simplifying the Post COVID Recovery Framework, we found ourselves needing a curated suite of nutritional product solutions to target the five main drivers of Long COVID.

## ACE-2 Mediated (Tissue) Damage

### Rhamnan Sulfate

#### Protects and repairs the Endothelial Glycocalyx (EGX)

- Derived from *Monostroma nitidum* – a green algae
- A sulfated polysaccharide, which is a soluble dietary fiber
- Supports healthy glycocalyx by supporting:
  - Healthy blood sugar levels
  - Healthy LDL lipid levels
  - Healthy blood pressure
  - Balanced coagulation response

#### Endothelial Glycocalyx Key Features:

Multi-functional dynamic structure that is essential for:

- Selective vascular permeability
- Preventing blood components from sticking to the vessel wall
- Immuno-modulation & inflammation
- Regulating thrombosis
- Mechano-Transduction (Shear Stress) and vascular tone via eNOS
- Harboring Superoxide Dismutase (extracellular SOD)
- Cytokine signaling

Kohli et al. Thrombosis and Inflammation—A Dynamic Interplay and the Role of Glycosaminoglycans and Activated Protein C. *Frontiers in Cardiovascular Medicine*. 2022;9. doi:[www.frontiersin.org/articles/10.3389/fcvm.2022.866751](https://doi.org/10.3389/fcvm.2022.866751)

Saltiel D. The effects of Rhamnan Sulfate from *Monostroma nitidum*: A vascular-focused literature review. *Alt Therapies*. 2023 May;29(4):24-26. PMID: 37164033



## Viral Persistence

### Gromwell Root Acts to inhibit 3-CL Protease

- Lithospermum erythrorhizon, also known as Red-Stone Root
  - *Zicao* [Chinese]
  - *Murasaki* [Japanese]
- Used as an herbal anti-viral in Chinese medicine
- In silica studies demonstrate high affinity in binding to the 3-CL Protease

### 3-Chymotrypsin-Like (3-CL) Protease Inhibitor Key Features

- Coronaviruses use their signature “spikes” to fuse themselves to a cell’s outer membrane via the ACE2-receptor to gain entry inside.
- Once inserted in the cell, a 3CL protease then cuts the polypeptides that promote viral replication.
  - By tightly binding to this protease enzyme, its ability to cleave is blocked.
  - This shuts down the entire virus-making apparatus, leaving it unable to replicate.

He J et al. Potential of coronavirus 3C-like protease inhibitors for the development of new anti-SARS-CoV-2 drugs: Insights from structures of protease and inhibitors. *Int J Antimicrob Agents*. 2020 Aug;56(2):106055. doi: 10.1016/j.ijantimicag.2020.106055.

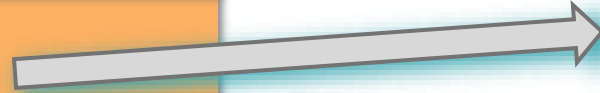
Lee DYW, Li QY, Liu J, Efferth T. Traditional Chinese herbal medicine at the forefront battle against COVID-19: Clinical experience and scientific basis. *Phytomedicine*. 2021 Jan;80:153337. doi: 10.1016/j.phymed.2020.153337.



## Chronic Inflammation

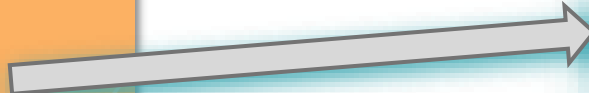
### Scutellaria baicalensis “Chinese Skullcap”

Herbal anti-inflammatory combination product  
with Curcumin, Boswellia, Cat’s Claw,  
Bromelain, Devil’s Claw



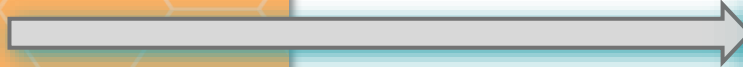
### Omega-3 Fatty Acids

EPA + DHA combination @ 2gm/ day



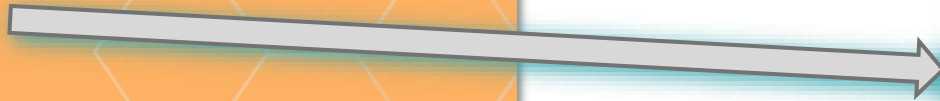
### Vitamin D3 + K2

Vitamin D3 dosing based on serum levels



### Quercetin

### Anti-Oxidants



### Anti-inflammatory actions:

- Decreases activation of the NLRP3 Inflammasome.
- Crosses the blood brain barrier to address brain inflammation
- Prevents organ injury by modulation of host innate immune response

### Omega-3 Fatty Acids

- Promotes anti-inflammatory prostaglandin pathways

### Vitamin D

- Plays an important role in the modulation of the inflammation system by regulating the production of inflammatory cytokines

### Quercetin:

- Immunomodulatory and may improve T-Reg function
- Demonstrated anti-viral activity against both RNA and DNA viruses

Shi S et al. Oral Chinese Herbal Medicine on Immune Responses During Coronavirus Disease 2019: A Systematic Review and Meta-Analysis. Front Med (Lausanne). 2022 Jan 21;8:685734. doi: 10.3389/fmed.2021.685734.

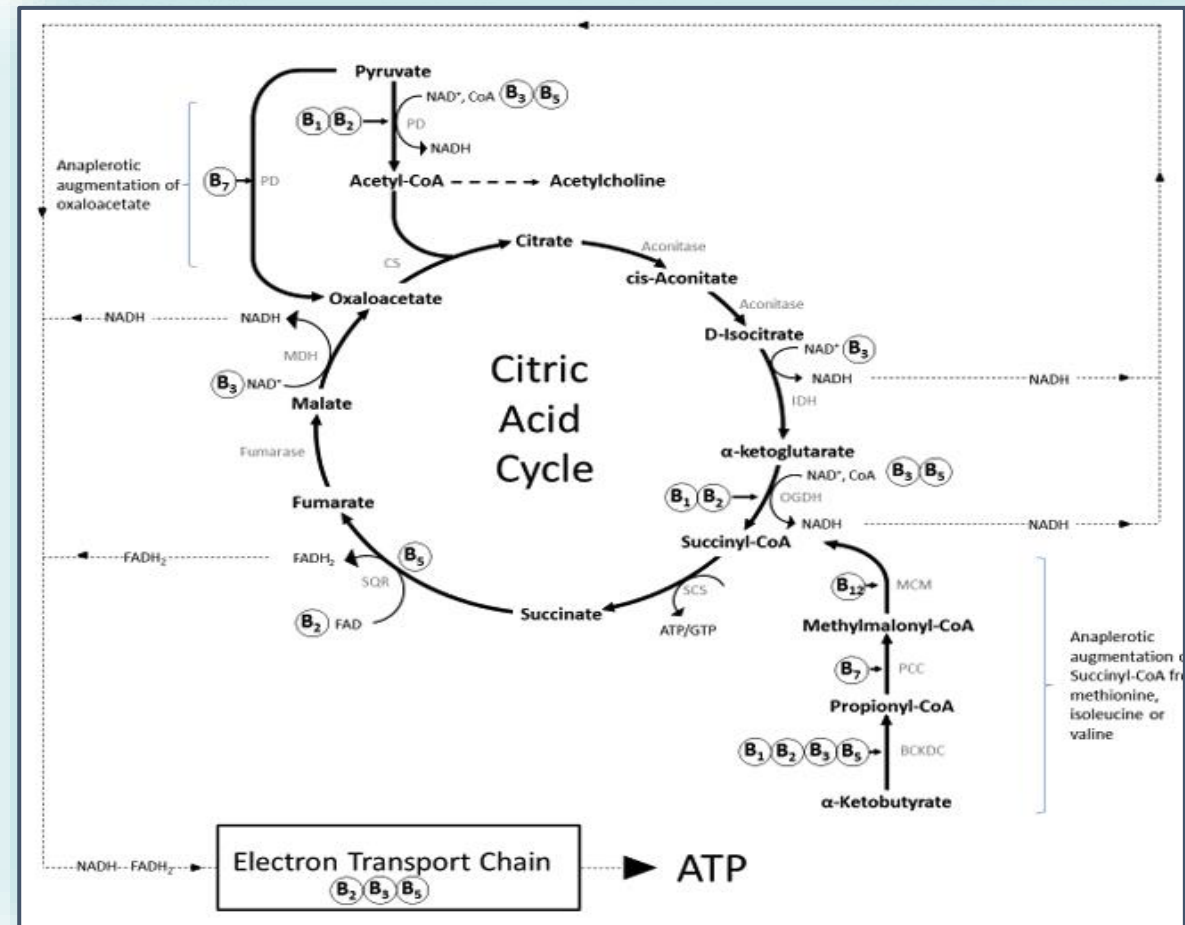
## Mitochondrial Dysfunction

**B-Vitamin & Mineral Complex**  
Vitamin and Mineral Co-factors for Kreb's  
Cycle and Electron Transport Chain (ETC)

**Anti-Oxidant Support**  
Plant-based + ALA + Tocopherols

**Co-Q10**  
Co-Factor in Electron Transport Chain

**Magnesium [chelate]**  
Essential nutrient for mitochondrial function



Singh, KK et al.. Decoding SARS-CoV-2 hijacking of host mitochondria in COVID-19 pathogenesis. American Journal of Physiology-cell Physiology. 2020. 319(2), C258–C267. <https://doi.org/10.1152/ajpcell.00224.2020>

Kennedy DO. B Vitamins and the Brain: Mechanisms, Dose and Efficacy--A Review. Nutrients. 2016;8(2):68. doi: 10.3390/nu8020068. PMID: 26828517.

## Mitochondrial Dysfunction

### B-Vitamin & Mineral Complex

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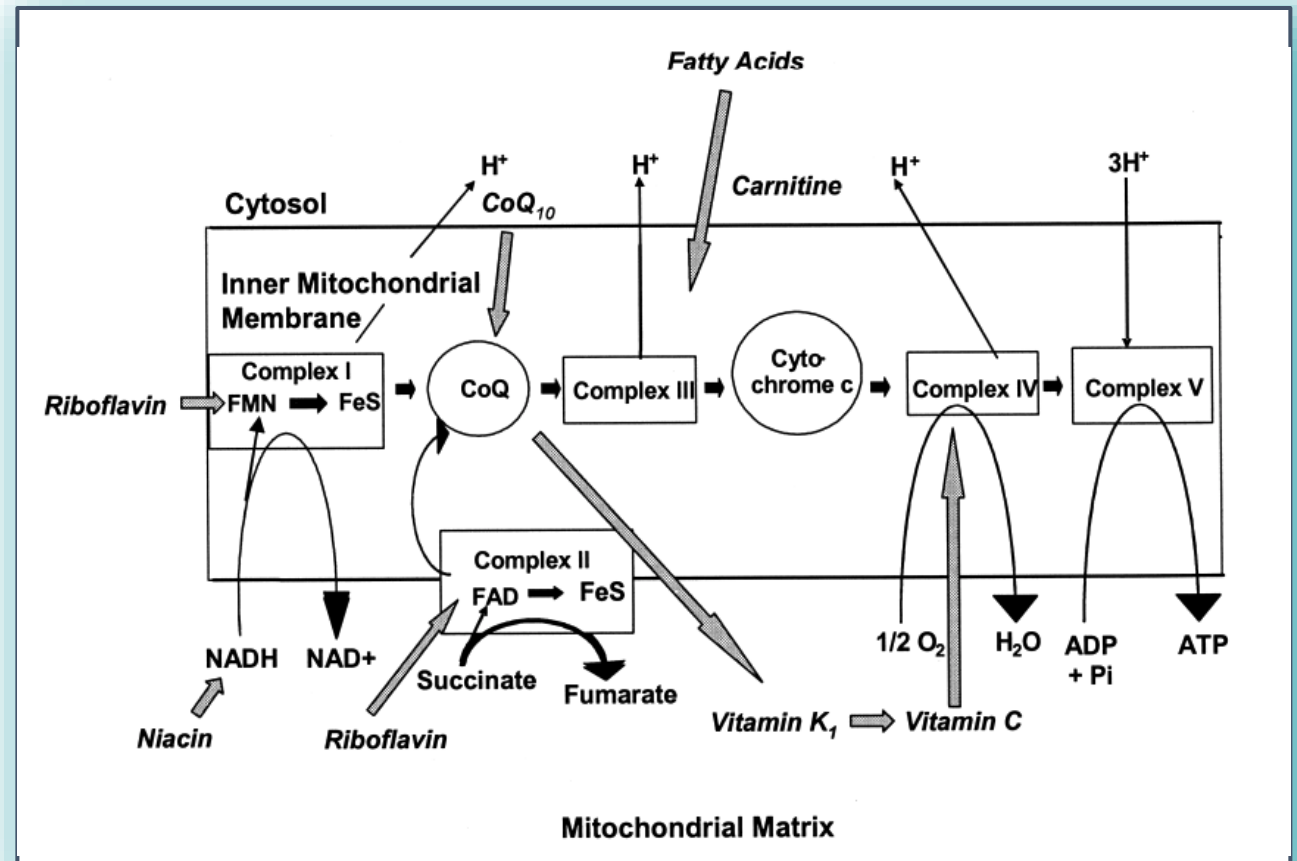
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Kennedy DO. B Vitamins and the Brain: Mechanisms, Dose and Efficacy--A Review. Nutrients. 2016;8(2):68. doi: 10.3390/nu8020068. PMID: 26828517.



## Gut/ Microbiome Dysbiosis

**PROBIOTIC**  
Spore-Based Organism  
(SBO)

Modifying the community 'milieu'

**PREBIOTIC**  
Spore-Based Organism  
(SBO)

Promoting growth of the person's  
beneficial commensal microbiome

## Spore-Based Probiotic

- Probiotic blend of 5 *Bacillus* spores that have been shown to maintain healthy gut barrier and immune function
- Aims to RECONDITION the gut instead of reseeding with probiotic strains that cannot survive digestion or colonize the gut.

## PreBiotic

- Contains non-digestible oligosaccharides that can increase microbial diversity and selectively feed beneficial bacteria like *Akkermansia muciniphila*, *Faecalibacterium prausnitzii*, and *Bifidobacteria*

Zhang D et al. Gut microbiota dysbiosis correlates with Long COVID-19 at one-year after discharge. J Korean Med Sci. 2023 Apr 17;38(15):e120. doi: 10.3346/jkms.2023.38.e120. PMID: 37069814

Zhang L et al. Gut microbiota-derived synbiotic formula (SIM01) as a novel adjuvant therapy for COVID-19: An open-label pilot study. J Gastroenterol Hepatol. 2022 May;37(5):823-831. doi: 10.1111/jgh.15796.PMID: 35170078



# Group Medical Visits

# PVRP Group Medical Visit Components



Scaled  
education on  
the benefits of  
and resources  
for specific  
Lifestyle factors  
for recovery  
after COVID



Group instruction  
and exploration on  
plant based or  
forward anti-  
inflammatory diet  
tailored to each  
person's needs



Group teaching  
on the specialty  
and foundational  
supplements for  
post Viral recovery



Time for  
support,  
connection,  
questions, and  
group practices  
for each part of  
the program



# Group Visit Models

## Insurance-Based

- Bill 99213 or 99214 based on DX codes for LC and symptoms
- Template the note,
- Get 1:1 HPI through questionnaires and chat entries
- Personalize the plan

## Packaged Group Sessions

- Pay per GV session or package
- Use health coach, nutritionist
- Documentation for pertinent info
- Option to video Information on LC sessions and use the group for support and personalization

# PVRP Group Medical Visits/ Groups:

Leverage time for connection

- Everyone has gifts to contribute
- Pair/share for closer connections

Dig deep into teaching on drivers of LC

- Create a Powerpoint or HO to share

Personalize the lifestyle and supplements

- Provide handouts to review later

Share Practices together

- And offer resources for between practice



# Group Medical Visit or Group Topics

- Post COVID story
- Food & Nutrition
- Sleep optimization
- Movement & Exercise
- Breathing
- Autonomic Balance
- Mood/ Mental Health
- Stress Modification
- Brain Health/ Brain fog
- Microbiome
- Mitochondria





# Group Visit Programs: Feedback

- Learning from other's questions is valuable and helps engagement
  - "Please say that again... type it in the chat... send it in a msg"
- Receiving recognition for one's idea/sharing both by peers and a trusted medical professional is empowering
  - Participants bring articles, LC clinic suggestions, support gr. info
- Teaching on the LC drivers is invaluable, and helps reduce uncertainty
  - Participants bring this info to their primaries and families and work on finding their own ways to make shifts
- Taking the supplements **together** reduces symptoms and gives hope,
  - Experiencing themselves and witnessing peers improve stepwise increases their resilience and resolve to engage in their healing



# What We're Learning: More is Needed

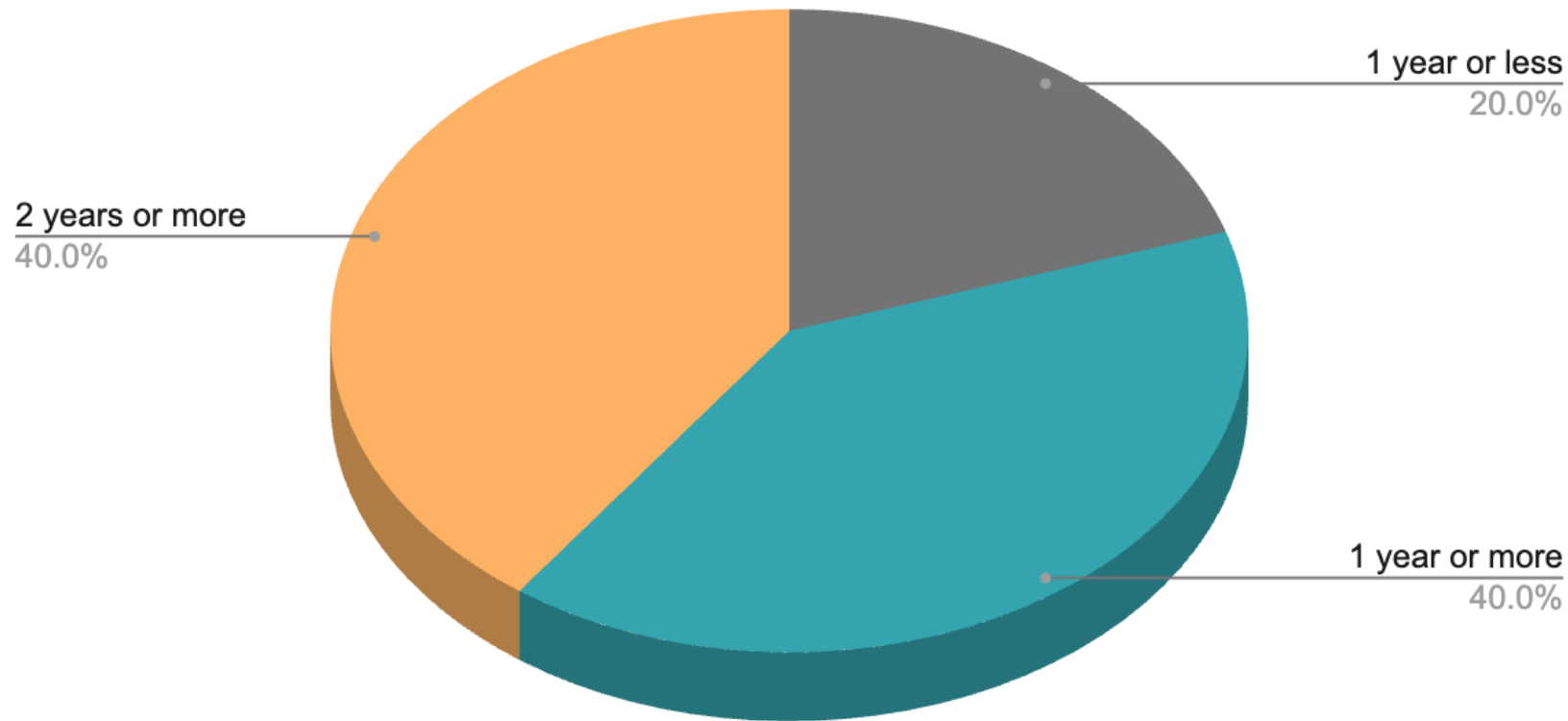
- Personalized Functional Medicine one-on-one approach to address general health and comorbidities
- Refer patients to primary care providers and specialists
- Draw on health coaches, integrative practitioners, PT/OT/RT, psychiatry/psychology
- Refer to social workers
- Provide community resources to address social determinants of health



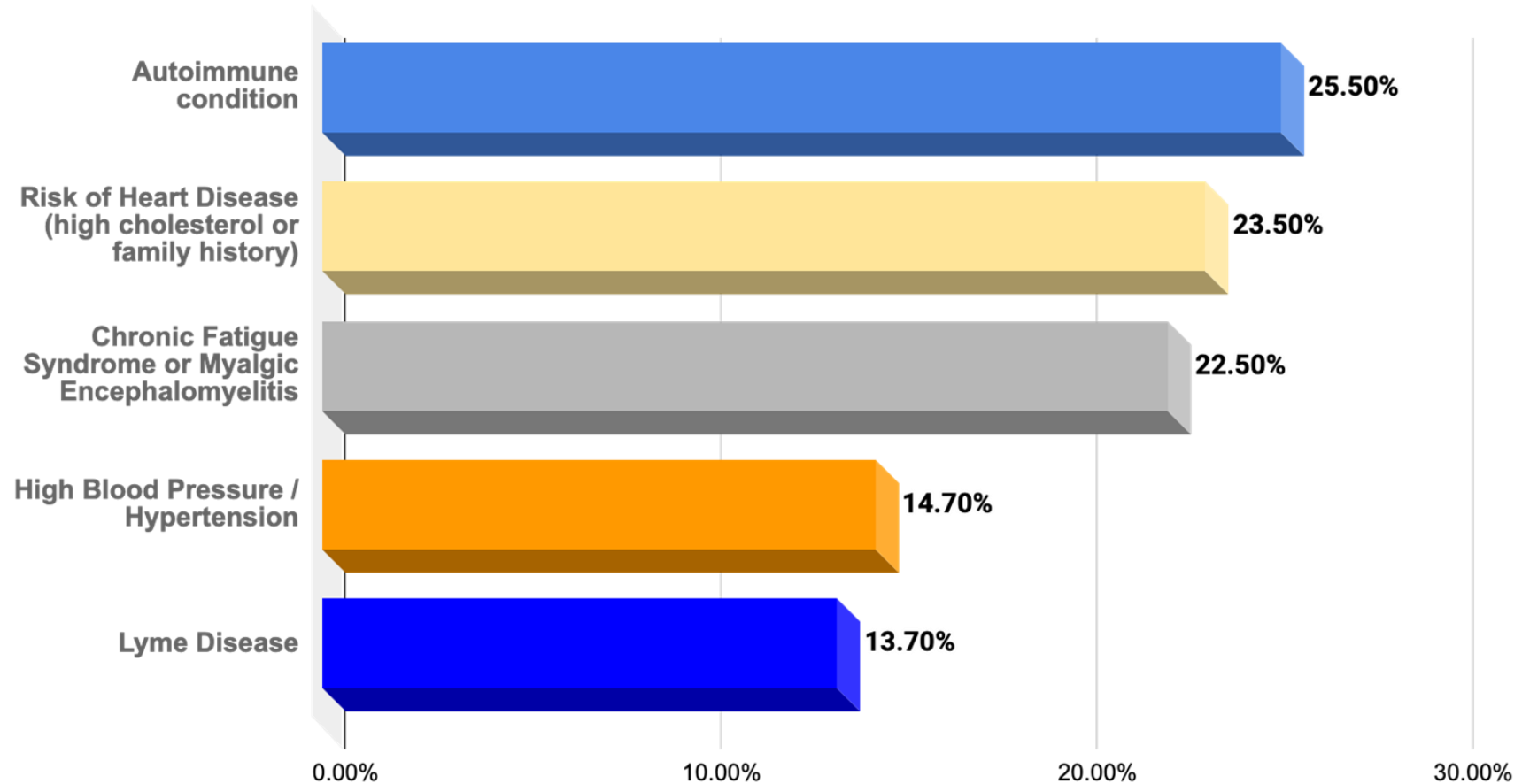
# Characterizing our Patient Population: REDCap Registry NUNM



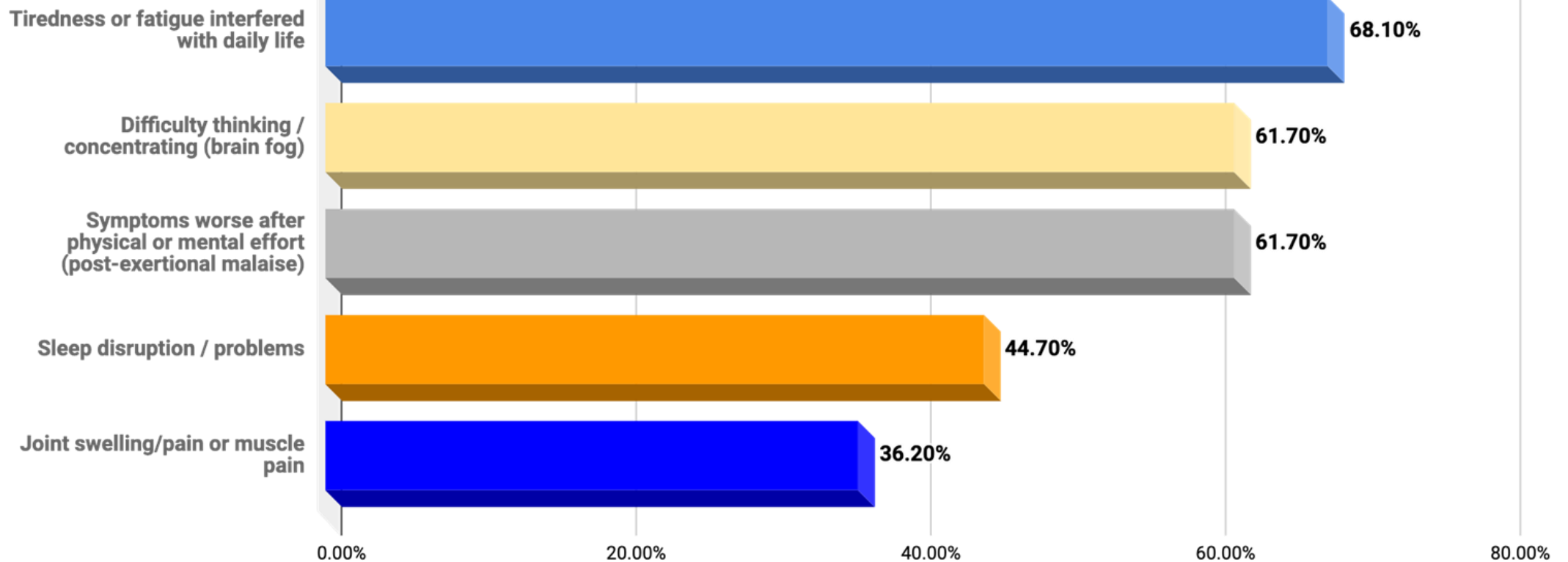
# Time horizon from first COVID infection symptoms to entry in Long COVID patient registry (n=93)



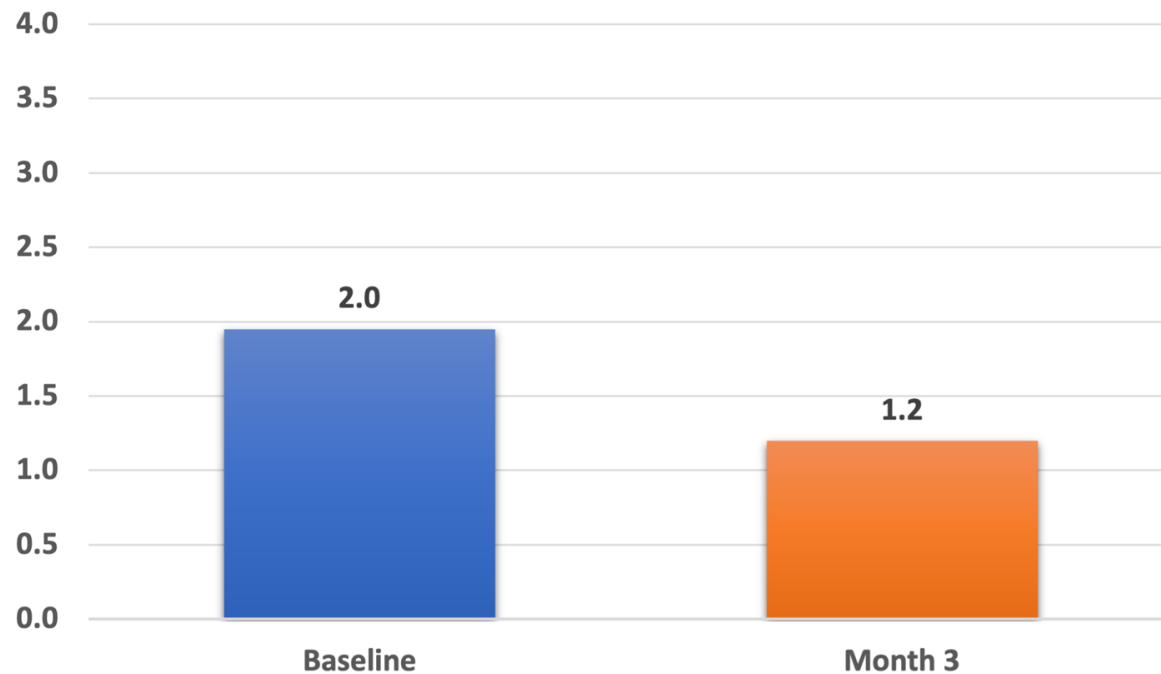
# Top 5 most frequently reported comorbidities (n=102)



# Top 5 most frequently reported Long COVID symptoms (n=47)



# Change in Post-COVID-19 Functional Status Scale (n=40)

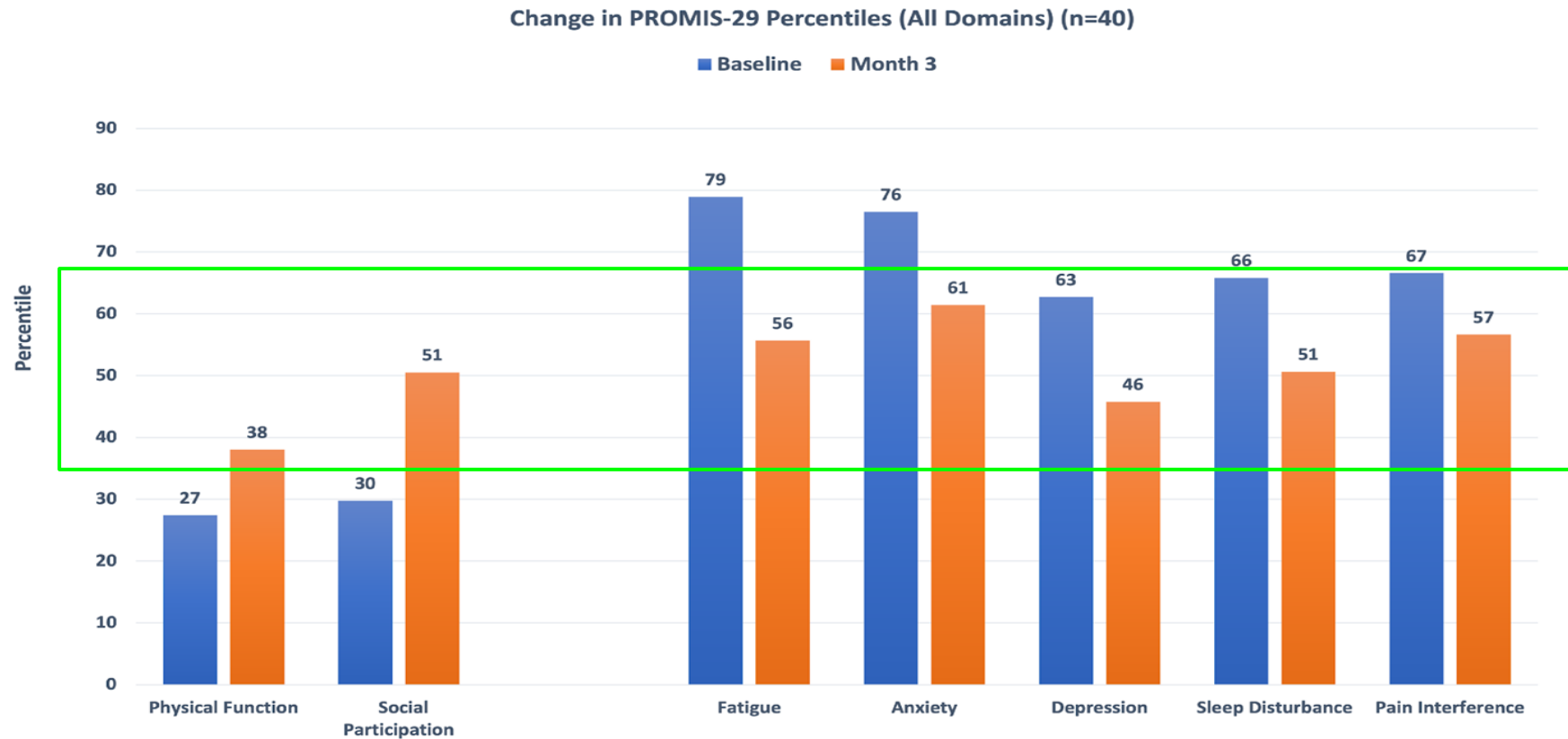


## Potential interpretation:

On a scale of 0 to 4, with 4 being the lowest function, patients' Post-COVID functional status improved from 2.0 to 1.2, on average. This represents a 38.5% improvement in function.

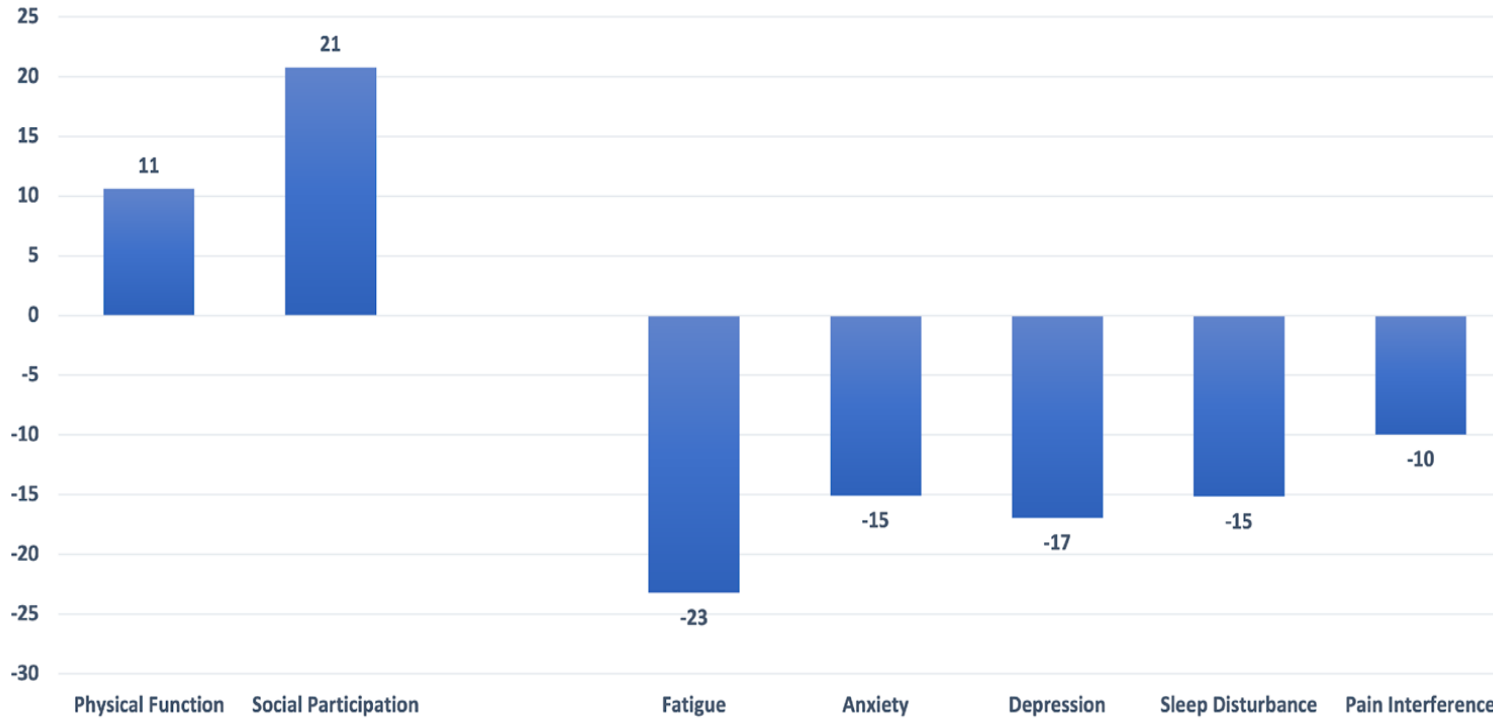
# PROMIS Change in Percentiles (All Domains)

(n=40)



# PROMIS Absolute Change in Percentiles (All Domains)

Absolute Change in PROMIS-29 Percentiles (All Domains) (n=40)



## Potential interpretation:

This figure shows the magnitude of the absolute change in percentile for each of the 8 domains of the PROMIS-29. You can see that the greatest improvements were seen in social participation, fatigue, anxiety and depression.



## Early Patient Quotes

*“My blood oxygen used to go down to 82% while doing PT at the hospital little effort. Now I stay over 90% O2 sat with a lot more movement in 2 weeks on the supplements.”*

*“The group visits tools give me power – I have agency when I have scary and dangerous symptoms, they no longer overwhelm me.”*

*“My body shape is changing, and I’m convinced it (the*

- “My migraines are gone now, just small daily headaches remain, they are less.”
- “My chest pain was really bothering me, I almost went to the ER again but they never find anything. I took an Arterosil and my pain reduced enough to stay home. Now that I’m on it 2 weeks I don’t have those pains anymore.” (Patient cried with gratitude when sharing this).
- “My pain with exertion is less, and I can move more without being set back.”
- “I have much more mental clarity.”
- “I have much better energy and much better mood.”
- “My muscle fatigue is much less since starting the program.”
- “I am done with the Tollovid. It helped my energy. On the Arterosil now for a month I continue to have a lot less pooling and swelling in my legs, and my POTS symptoms are less.”
- “I know more than my regular doctors about my condition. I wish more knew about mitochondria, vagal tone, cortisol and adrenal health, Ace-2 receptors and how it all affects long COVID symptoms.”
- “I no longer feel alone in what I am dealing with. Hearing everyone else’s stories heals me. Hearing everyone’s tools and ways of coping gives me hope and options.” (6 people emphasize this).



# CASE STUDY: KW



Patrick Hanaway, MD



# KW: Demographics



- 56 yo male, entrepreneur
- Height = 6' 4"
- Weight = 225#
- BMI = 27.4

PMHx: No health issues

Recent knee replacement, s/p athletic injury

“Weekend warrior”

COVID March 2021

Vaccine x2 (Pfizer) June/ July, 2021

COVID December 2021

Presented April 2023



# KW: Diagnoses

## Long COVID x 15 months



What are your main health concerns?

- Fatigue – debilitating, episodic —”Comes in waves.”
- Brain Fog,
- Inability to focus,
- Headaches,
- Diarrhea,
- Sleep disruption.



# KW: Treatments

Week 1 – Begin Lifestyle Modification

Week 2 – Begin Protocol

- Tollovid x 30 days (3 caps QID)
- 'ITIS' 2 caps TID x 90d
- Arterosil 2 caps BID x 30d, then 1 cap BID x 60d
- Mitocore (B-Vitamin + AntiOx) 2 caps BID x 90d
- Vitamin D 5000IU qD x 90d
- EPA/ DHA 1000mg 2 caps qD x 90d

Whole30 Food Plan  
Increasing Exercise Plan





## Benchmarking Our Success

Post COVID Function Scale (3-point scale adopted by the NIH RECOVER Initiative and translated into 25 languages)

- <0.5 point decline = insignificant
- 0.5 - 1.0 point decline = clinically significant
- >1.0 point decline = excellent

## Patient Outcome – KW

4 months after first patient enrollment

### Post COVID Function Scale

- Significant change 1  $\Rightarrow$  0

### PROMIS-29: 7 domains of function plus a global pain measure

- Physical Function: no change 75th percentile throughout.
  - \*\*Social Participation: increased from 22nd percentile to 51st percentile
  - \*\* Fatigue: decreased from 75th to 45th percentile
  - \*\* Anxiety: decreased from 78th to 56th percentile
  - \*\* Depression: decreased from 46th to 18th percentile
  - Sleep Interference: decreased from 67th to 57th percentile
  - Pain Interference: no change th percentile throughout.
- 
- \*\*= Clinically significant



## Benchmarking Our Success

Post COVID Function Scale (3-point scale adopted by the NIH RECOVER Initiative and translated into 25 languages)

- <0.5 point decline = insignificant
- 0.5 - 1.0 point decline = clinically significant
- >1.0 point decline = excellent

## Patient Outcome – KW

4 months after first patient enrollment

“While I still occasionally deal with brain fog from LongHaul COVID, the symptoms and the severity have diminished significantly. I am able to do my work and live my life!”

### **FOLLOW-UP:**

Focus on the gut microbiome!

- Post-biotic
- Serum Bovine Immunoglobulin
- L-Glutamine
- Pomegranate powder

Continue mitochondrial support



## Benchmarking Our Success

Post COVID Function Scale (3-point scale adopted by the NIH RECOVER Initiative and translated into 25 languages)

- <0.5 point decline = insignificant
- 0.5 - 1.0 point decline = clinically significant
- >1.0 point decline = excellent

## Patient Outcome – KW

6 months after first patient enrollment

“Addition of 5-HTP, a significant improvement in loose stools, and my increased exercise have given me confidence to live my life fully. ”

### FOLLOW-UP:

Continue to support the gut microbiome!

Continue mitochondrial support

Continue 5-HTP @ 100mg 3 times/ day



# RESOURCES

[www.ovationlab.com/Resources](http://www.ovationlab.com/Resources)

[ovationlab.com/resources](https://ovationlab.com/resources)



[ovationlab.com/resources](https://ovationlab.com/resources)

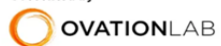


# POST VIRAL RECOVERY PROGRAM

Resources for Providers and Patients



Presented by



Research and Program Development Sponsor



## UPCOMING EVENTS



Wednesday, September 27th  
7 pm ET/4 pm PT

## WORKSHOP REPLAYS

POST VIRAL RECOVERY  
IN THE COVID ERA  
WORKSHOP NO. 1



POST VIRAL RECOVERY  
A 90-DAY PROGRAM  
AND PROTOCOL  
WORKSHOP NO. 2




POST VIRAL RECOVERY  
LIFESTYLE INTERVENTIONS,  
CASE STUDIES & LEARNINGS  
WORKSHOP NO. 3




## PRACTITIONER RESOURCES AND TOOLS

### FULLSCRIPT RESOURCES

- [Protocol Application with Fullscript](#) 
- If you do not have an active Fullscript account, please use [this link](#) to create your no-cost account.
- If you would like to prescribe the **specialty products only**, please use [this link](#).
- If you would like to prescribe the **full protocol** or make modifications to it, please use [this link](#).
- [Dispensary & individual patient discounts](#)

### NUTRITIONAL SUPPLEMENT SELECTIONS

- [Supplement Selection](#) 
- [Fullscript Patient Protocol](#)

### SAMPLE SURVEY INSTRUMENTS

- [LongCOVID Patient Intake Form](#)
  - [WHO Post COVID-19 CRE](#)
- [Timeline and Progression of Symptoms Table](#)
- [PROMIS29](#)
- [Post COVID Function Scale](#)
  - [The Post-COVID-19 Functional Status scale](#)

**PATIENT CASES** - Coming

## PATIENT RESOURCES AND TOOLS

### WHOLE30 PROGRAM RESOURCES

- [Program Rules](#) 📺
- [Plant-Based Whole30 Prep Pack](#)
- [Grocery Guide](#)
- [Shopping List](#)
- [Meal Planning](#)
- [Plant-Based Recipes](#)

### LIFESTYLE INTERVENTION RESOURCES

- [How to Improve Sleep Hygiene](#)
- [Circadian Rhythms](#)
- [Stress Management](#)
- [Physical Activity and Stress](#)
- [Exercise Tolerance Assessment for Exercise Fitness & HR Recovery Instructions \(from Share Care\).](#)

- [WHO Support for Rehabilitation](#)
- [The Levine Protocol For Exercising With POTS - Better By The Beat](#)
- [Instructions for POTS Exercise Program—Children's Hospital of Philadelphia the Structure of the Training Calendars](#)
- [Coronavirus Recovery: Breathing Exercises | Johns Hopkins Medicine](#)
- [Bouncing Back From COVID-19](#)
- [5 At-Home Exercises for COVID-19 Recovery | Patient Care](#)



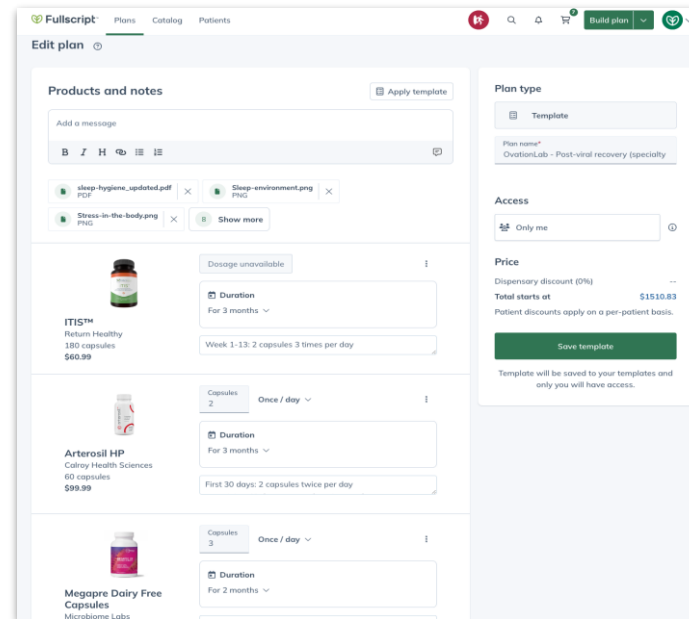
# PVRRP Protocol

# Protocol application



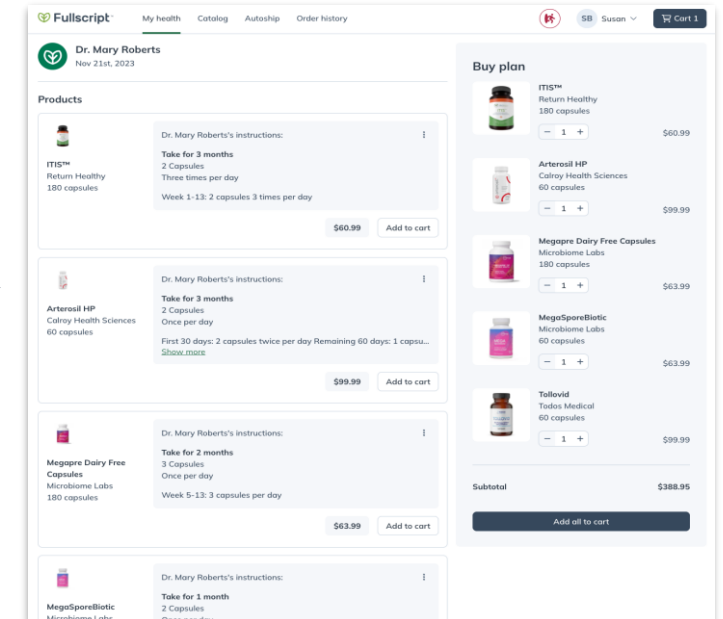
**Evidence-based  
Specialty Protocol**

*\*Suggested products*



**Link to Practitioner  
Template**

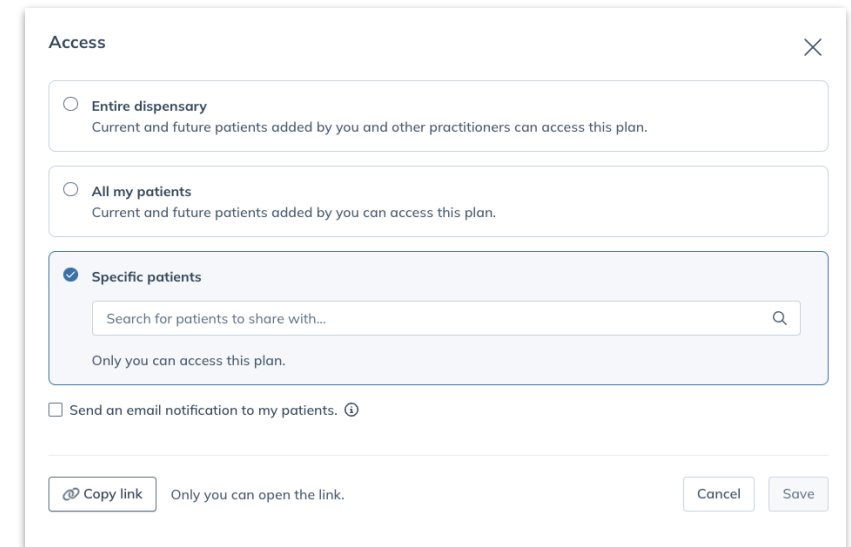
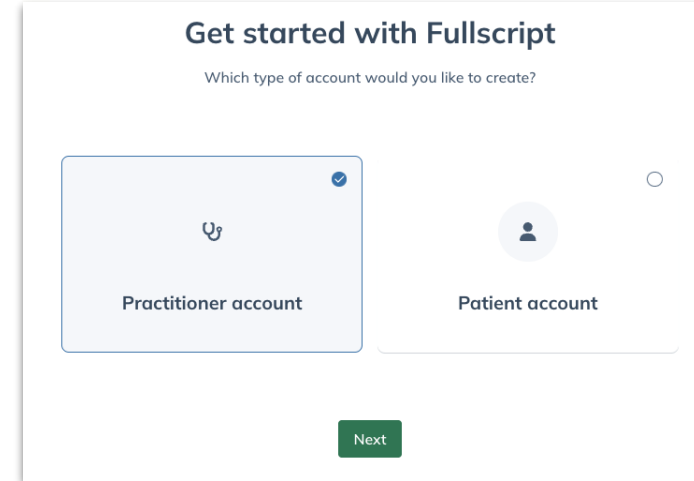
*Edit as needed  
Send to 1 or Many*



**View of  
Patient Plan &  
Resources**

# Next steps

1. Create a Fullscript account (no cost)  
If you do not have a Fullscript account, please use [this link](#) to create your no-cost account.
1. Apply the specialty-only protocol template  
If you would like to prescribe the specialty products only, please use [this link](#).
1. Apply the entire protocol template  
If you would like to prescribe the full protocol, use [this link](#).
1. Share the protocol templates (“multi-patient plan”)  
Easily copy the unique template link to share it with multiple patients, such as through a clinic email newsletter, or on social media.



# Additional resources

Influencer protocol —  
**Post-viral Recovery Protocol**

July 12, 2023

[Upload protocol](#)

Protocols > OvationLab > Post-viral Recovery Protocol

OvationLab and Fullscript have partnered to create positive change in the world of healthcare—making personalized, integrative medicine more accessible and effective than ever before. This protocol is one of the many ways in which OvationLab and Fullscript are helping practitioners in prescribing evidence-based, high-quality integrative care.

Approximately 10 to 20% of individuals experience mid- to long-term effects after recovering from a viral infection. Examples of common effects include fatigue, shortness of breath, persistent cough, cognitive dysfunction (e.g., brain fog, confusion, forgetfulness), headache, muscle aches, and more. These effects can range from mild to severe and may interfere with one's ability to engage in daily life.

[View a downloadable version of this protocol.](#)

**ITIS™**  
Week 1-13: 2 capsules 3 times per day

**Arterosil HP**  
First 30 days: 2 capsules twice per day  
Remaining 60 days: 1 capsule twice per day

**Megapre Dairy Free Capsules**  
Week 5-13: 3 capsules per day

Scan to view  
the protocol



Fullscript | OVATIONLAB | andhealth

## Post-viral Recovery Protocol

OvationLab and Fullscript have partnered to create positive change in the world of healthcare—making personalized, integrative medicine more accessible and effective than ever before. This protocol is one of the many ways in which OvationLab and Fullscript are helping practitioners in prescribing evidence-based, high-quality integrative care.

### Key supplement ingredients included in the protocol

**Arterial support**  
A combination of ingredients such as Monastroma nitidum and fruit and vegetable powder may help promote normal circulation and arterial function.\*

**Inflammatory balance**  
Ingredients for healthy inflammatory balance such as curcumin, ginger, and Boswellia serrata may help support immune function by supporting the adaptive immune response.\*

**Immune support**  
Optimizing immune function can strengthen preventative defense mechanisms.\*

**Probiotic and prebiotic combination**  
Research suggests that probiotics and prebiotics may help restore gut microbiome health.\*

### Suggested products

**Arterosil**  
• First 30 days: 2 capsules, 2 times daily  
• Days 60-90: 1 capsule, 2 times daily

**MegaSporeBiotic**  
• First 7 days: 1 capsule daily  
• Until bottle completion (approx. 5 weeks): 2 capsules daily

**ITIS**  
• Week 1-13: 2 capsules, 3 times daily

**Tollovid**  
• First 30 days: 3 capsules, 4 times daily  
• Next 7 days: 2 capsules, 4 times daily  
• Following 30 days: 1 capsule, 2 times daily

**MegaPre**  
• Week 6-13: 3 capsules, 1 time daily, following completion of MegaSporeBiotic

[Scan to view the protocol](#)

\*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

Or ask for a handout  
at Booth # 6007

Fullscript | OVATIONLAB | andhealth

## Suggested directions for use

	Tollovid	MegaSporeBiotic	MegaPre	ITIS	Arterosil
<b>Week 1</b>	3 capsules, 4 times per day	1 capsule, 1 time per day		2 capsules, 3 times per day	2 capsules, 2 times per day
<b>Week 2</b>	3 capsules, 4 times per day	1 capsule, 2 times per day		2 capsules, 3 times per day	2 capsules, 2 times per day
<b>Week 3</b>	3 capsules, 4 times per day	1 capsule, 2 times per day		2 capsules, 3 times per day	2 capsules, 2 times per day
<b>Week 4</b>	3 capsules, 4 times per day	1 capsule, 2 times per day		2 capsules, 3 times per day	2 capsules, 2 times per day
<b>Week 5</b>	2 capsules, 4 times per day		3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 6</b>	1 capsule, 2 times per day		3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 7</b>	1 capsule, 2 times per day		3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 8</b>	1 capsule, 2 times per day		3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 9</b>	1 capsule, 2 times per day		3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 10</b>			3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 11</b>			3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 12</b>			3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day
<b>Week 13</b>			3 capsules, 1 time per day	2 capsules, 3 times per day	1 capsule, 2 times per day

[Scan the QR code to view the list of references](#)



Or access at  
[fullscript.com/protocols](https://fullscript.com/protocols)



# Q&A Session



# THANK YOU





# References

1. Su et al. [ISB]. Multiple early factors anticipate post-acute COVID-19 sequelae. *Cell*. 2022. Mar 3;185(5):881-895.e20. doi: 10.1016/j.cell.2022.01.014.
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3. Crook et al [UK]. LongCOVID – Mechanisms, risk factors, and management. *BMJ*. 2021 Jul 26;374:n1648. doi: 10.1136/bmj.n1648.
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6. Merad M, Blish CA, Sallusto F, Iwasaki A. [Yale]. The Immunology and ImmunoPathology of COVID-19. *Science*. 2022. 375:1122-1127. doi: 10.1126/science.abm8108



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9. Coiro MJ, Asraf K, Tzischinsky O, Hadar-Shoval D, Tannous-Haddad L, Wolfson AR. Sleep quality and COVID-19-related stress in relation to mental health symptoms among Israeli and US adults. *Sleep Health*. 2021;7(2):127–33
10. Gupta R, Grover S, Basu A, Krishnan V, Tripathi A, Subramanyam A, et al. Changes in sleep pattern and sleep quality during COVID-19 lockdown. *Indian J Psychiatr*. 2020;62(4):370–378
11. <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/care-post-covid.html>
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**Saturday 2:00pm – 3:30pm**

## **Post Viral Syndrome/Long COVID Recovery**

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Post Viral Syndrome/Long COVID Recovery