

# CURRENT AWARENESS BULLETIN

## LONG COVID

### APRIL 2026

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The banner features a blue background with a white play button icon on the left, a white lightbulb icon above an open book icon, and the NHS Somerset logo in the top right. A central dark blue box contains the text 'Episode 4 out now!' and a description of the episode. A QR code is located on the right side.

## Library "Lights"

Episode 4 out now!

In this episode, we sit down with members of the Public Library team to unpack what health literacy really looks like in practice, why it matters, and how our growing partnership is helping people access trustworthy health information.

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## EPIDEMIOLOGY OF LONG COVID

**Larissa I. Silva, Carlos M. Gonzalez-Zambrano, Vanessa C. M. P. Ferreira, Fernando C. Corrêa, Luciane A. Dias-Melicio (24 April 2026) [MicroRNAs in Acute COVID-19 and Long COVID: Dysregulation, Pathogenic Roles, and Clinical Implications](#) *Journal of Immunology Research***

### **Research**

MicroRNAs (miRNAs) are key post-transcriptional regulators of gene expression with central roles in immune responses, inflammation, and viral pathogenesis. Increasing evidence indicates that severe acute respiratory syndrome coronavirus (SARS-CoV-2) infection induces marked dysregulation of host and viral miRNAs (v-miRNAs), contributing to disease severity during acute COVID-19 and to the persistent manifestations observed in long COVID (LC). This narrative review critically synthesizes current evidence on miRNA dysregulation across the acute and post-acute phases of COVID-19, highlighting their pathogenic roles, clinical relevance, and existing knowledge gaps. During acute infection, altered miRNA profiles—including those associated with immune activation, endothelial dysfunction, and immunothrombosis—reflect both host responses and viral strategies of immune modulation, including miRNAs carried by extracellular vesicles (EVs) and SARS-CoV-2–derived v-miRNAs. In LC, emerging data suggest that persistent miRNA alterations are associated with unresolved inflammation, pulmonary dysfunction, neurological symptoms, and vascular injury, although available studies remain limited and heterogeneous. Overall, miRNAs represent promising biomarkers and potential therapeutic targets in COVID-19; however, robust longitudinal and mechanistic studies are urgently needed to clarify their causal roles and translational utility in post-acute disease.

**Halina B. Stanley and Moustafa Bensafi (23 April 2026) [The characteristics of chemosensory losses in the symptomatology of long-COVID](#) *European Archives of Oto-Rhino-Laryngology***

**Purpose** Millions of cases of long-COVID have been identified worldwide since the beginning of the pandemic few years ago, with many affected individuals severely debilitated. Understanding the symptoms of long-COVID, explaining how they are related to each other, and how the clinical course of the disease can be predicted based on these symptoms remains a significant challenge in the community. The aim of the present study is to address this challenge with a view to understanding the relative importance of loss of smell and taste, a common sensory deficit associated with the disease, in long COVID symptomatology. **Conclusion** Chemosensory losses are not systematically associated with the development of long COVID. Chronic olfactory losses may have a different disease mechanism to acute losses. Symptom profiles six weeks after diagnosis (particularly cognitive symptoms) can provide useful indications of how the disease will progress.

**Juliana M. Nieuwland, Angelica Scaramuzza, Marianna Bugiani, Wilma D. J. van de Berg, Jinte Middeldorp (22 April 2026) [Human brain matters: Navigating the neuropathology of COVID-19](#) *Brain Pathology***

Infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused millions of deaths worldwide. Although the incidence of severe acute cases has declined, the prevalence of long COVID, also known as post-acute sequelae of COVID-19 (PASC), is rising. The pathological mechanisms underlying severe COVID-19, along with the relationship to neurological disorders and potential risk for neurodegeneration, remain poorly understood. The aim of this narrative review is to summarize neuropathological features described in postmortem human COVID-19 brains ( $n = 352$ ). Furthermore, analysis of biofluids and neuroimaging from PASC patients underline long-term changes in the proteome and CNS response following the infection. Elderly patients and/or patients with underlying neurological diseases were more susceptible and had worsened symptoms. Potential disease mechanisms underlying neurological symptoms observed in severe COVID-19 are vascular and fluid-brain barrier abnormalities, chronic neuroinflammation, persistent axonal damage and protein aggregation. In PASC patients, an altered biofluid proteome with increased neuronal proteins and pro-inflammatory cytokines was observed. The pathological burden in affected brain regions may contribute to manifestations such as anosmia, memory deficits, and cerebellar ataxia.

**Mohammad Mobarak H. Chowdhury, Akouavi Julite Irmine Quenum, Christine Rioux-Perreault, Jean-Francois Lucier, Subburaj Ilangumaran, Alain Piche, Hugues Allard-Chamard and Sheila**

**Ramanathan (17 April 2026) [Distinct plasma proteome signature at 3 months post-COVID-19 infection irrespective of post-COVID condition](#) *Scientific Reports***

Persistent symptoms following SARS-CoV-2 infection are the hallmark of post-COVID condition (PCC), also referred to as long COVID. However, the underlying molecular mechanisms remain poorly understood. In this study, we employed data-independent acquisition mass spectrometry (DIA-MS)-based plasma proteomics to identify molecular alterations associated with PCC. DIA-MS proteomic analysis revealed a clear distinction between the plasma proteome of uninfected individuals and those previously infected with SARS-CoV-2, irrespective of PCC status. PCC samples demonstrated downregulation of the antioxidant protein peroxiredoxin 6 (PRDX6) and upregulation of oxidative stress-associated proteins, particularly vanin-1 (VNN1) and paraoxonase-3 (PON3). Additionally, individuals with PCC exhibited significantly elevated levels of six proteins—PCSK9, CST3, C1Q, CPB2, KNG1, and GAPDH—associated with glycolysis, complement and coagulation cascades, and inflammatory pathways. Validation by ELISA does not necessarily reflect the proteomics data suggesting the requirement for alternate methods of validation. Nonetheless, oxidative stress, as measured by 8-hydroxy-2'-deoxyguanosine (8-OHdG), further showed that PCC samples had significantly higher levels of DNA damage, compared with convalescent individuals. Antioxidant markers, including reduced and oxidized glutathione (GSH and GSSG), were significantly lower in PCC samples than in uninfected controls. Collectively, these findings indicate that plasma proteomic alterations persist for at least 3 months following SARS-CoV-2 infection, with additional disruptions in oxidative stress and inflammatory pathways characterizing individuals with PCC.

**Marta Liva Sprunge, Kristīne Vaivode, Rihards Saksis, Ninēla Miriama Vainšēlbauma, Laura Ansons, Monta Brīvība, Helvijs Niedra and Vita Rovite (11 April 2026) [Immune dysregulation in prolonged Long-COVID: lymphocytes emerge as key mediators of persistent inflammation, exhaustion and cytotoxicity](#) *Journal of Translational Medicine* 24 Article no. 527**

**Background** Long-COVID affects at least 10% of COVID-19 survivors, displaying debilitating symptoms across multiple organ systems. Despite the widespread prevalence, Long-COVID aetiology remains poorly understood, but emerging evidence points to immune dysregulation as a potential mechanism involved in its development or persistence. **Conclusions** Collectively, these findings provide insight into the immune processes underlying the progression of COVID-19 into a chronic Long-COVID state. The observed changes in immune cell subsets at the acute phase of the infection may be predictive of Long-COVID progression and could be useful in understanding disease aetiology while the observed long-term effects are crucial to developing therapeutic and diagnostic tools.

**Supriya Mahajan, Saurabh Mahajan and Nidhi Kaushik (10 April 2026) [Integrative Insights into the Immunopathogenesis and Organ-Specific Immunological Mechanisms of Long COVID: A Narrative Review](#) *Viruses* 18 (4) Article no. 458**

Long COVID (LC), also referred to as post-acute sequelae of SARS-CoV-2 infection, is characterized by persistent symptoms originating 3 months following acute COVID-19, lasting for at least two months and frequently affecting individuals who initially experienced mild to moderate disease. The clinical spectrum is heterogeneous, involving respiratory, cardiovascular, neurological, renal, gastrointestinal, and endocrine systems, thereby posing substantial diagnostic and therapeutic challenges. Despite extensive investigation, the precise immunopathogenic mechanisms underlying LC remain incompletely defined. Accumulating evidence suggests that LC is driven by a multifactorial interplay of persistent viral antigen reservoirs, chronic immune activation, dysregulated innate and adaptive immune responses, autoimmunity, endothelial dysfunction, microvascular injury, and aberrant tissue repair. These systemic immune perturbations manifest variably across different organs, contributing to the diverse clinical phenotypes observed. However, mechanistic clarity is hindered by heterogeneity in study designs, limited longitudinal data, and the absence of standardized immunological profiling. This narrative review provides integrative insights into the immunopathogenesis of LC, synthesizing current evidence on systemic immune dysregulation and organ-specific immunological mechanisms. A conceptual framework is proposed to facilitate a structured understanding of this complex syndrome and to guide future research toward targeted immunomodulatory strategies.

**Panagiotis Mavroudis, Georgia Ragia, Nikos Pantazis, Eirini Dermizaki, ..., Alexandra Stamati and Myria Pallikarou (08 April 2026) [Association of ADIPOQ rs1501299 with long-COVID syndrome: a single-center cross-sectional study](#) *Infectious Diseases Article no. 2654244***

**Background** Long-COVID syndrome is a public health issue, affecting millions of individuals worldwide. However, the pathophysiological mechanisms underlying the syndrome's sequelae are still under investigation. Adiponectin has been implicated with acute SARS-CoV2 infection, while its role in Long-COVID remains obscure. The aim of this study is to investigate the potential association of adiponectin and SNPs of adiponectin pathway with Long-COVID. **Conclusion** ADIPOQ rs1501299 could potentially serve as a genetic marker, contributing to risk stratification of developing Long-COVID syndrome.

**Debasis Sahu, Logan R. Van Nynatten, David Tweddell, Mark Daley and Douglas D. Fraser (07 April 2026) [Computational proteomics to enhance personalized treatment of COVID-19 and Long COVID](#) *Clinical Proteomics***

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has led to significant global health burden, including both acute infections and persistent post-acute sequelae, also known as Long COVID (LC) in survivors. While clinical management has reduced case-fatality rates, a substantial proportion of patients develop LC, a heterogeneous syndrome with long-term symptoms. This complex continuum requires therapeutic strategies for both the acute and chronic phases. Plasma proteomics has emerged as a powerful tool in precision medicine, offering insights into systemic molecular changes and disease trajectories. Using targeted and untargeted proteomic analyses, researchers can identify disease-relevant pathways, perform cellular deconvolution to assess tissue-specific contributions, and pinpoint therapeutic targets for both acute infection and persistent symptoms. Combined with bioinformatics and machine learning, these proteomic insights support biomarker discovery and drug repurposing strategies.

**Tiffany Atkins, Paul Glasziou, Samantha Chakraborty, Tari Turner, Gabriel Rada and Oyungerele Byambasuren (02 April 2026) [Living evidence syntheses for long COVID therapeutics: combining rigorous protocols to build efficiency while maintaining rigour](#) *Systematic Reviews***

**Background** Given the rapidly changing evidence, the creation and maintenance of a living systematic review database of therapeutics for long COVID is an ideal and necessary approach considering the rapidly changing evidence that continues to be identified. This paper describes methods and results of a collaboration between three teams who produced a living literature review on long COVID therapeutics—Australian Living Evidence Collaboration (ALEC), Bond University, and Epistemonikos COVID-19 L.OVE (Living Overview of Evidence) database. **Conclusions** Despite initial differences, a comprehensive search strategy based on the collaboration of the three teams was developed. Ongoing monthly updates were initiated and are now planned for well into the future to make continual and rapid updates to the library of evidence surrounding therapeutics for long COVID. Where global public health is concerned, it is valuable to review and refine processes in the early stages, so that they can be reliable. We recommend open collaboration to achieve the goal of creating accessible, efficient, and reliable evidence syntheses.

## PATHOPHYSIOLOGY Cardiology & Pulmonary

**Aleksandar Tomaskovic, Vincent Weber, David T. Ochmann, Barlo Hillen, Elmo W. I. Neuberger, Alexandra Brahmer, Ella Lachtermann, Klaus Lieb and Perikles Simon (27 April 2026) [Cardiopulmonary Exercise Testing Reveals Functional Limitations and Work Disability in Severe Post-COVID-19 and ME/CFS Patients](#) *Sports Medicine 12 Article no. 50***

**Objectives** We aimed to objectively assess physical work ability using cardiopulmonary exercise testing (CPET) in a cohort of long-standing and severely affected PCC patients. We hypothesized: (1) patients with ME/CFS exhibit lower peak oxygen uptake ( $VO_{2peak}$  [mL/min/kg]) and peak power output

(PPO [W/kg]) than those without; (2) most patients demonstrate objective work disability, closely aligned with subjective perception of disability; (3) oxygen pulse ( $O_2$  pulse [mL/bpm]) is reduced in ME/CFS, independent of comorbidity. **Conclusions** Severely affected PCC patients exhibit objective work disability, particularly those with ME/CFS.  $VO_{2peak}$  and PPO are associated with subjective disability and occupational status. Therefore, early integration of CPET into clinical and occupational evaluations can inform individualized therapy planning and return-to-work decisions.

**Callum Thomas, Ruth E. Ashton, Rebecca Owen, Ethan McNeil-Angopa, Jack Carr, Thomas Bewick and Mark A. Faghy (23 April 2026) [Impaired peripheral oxygen delivery during submaximal exercise in adults with long COVID](#) *Physiological Reports***

Long COVID (LC) is a multisystem condition that is linked to distinct pathologies including viral persistence, immunological dysfunction, endothelial damage, and mitochondrial dysfunction. To date, limited research has assessed peripheral tissue hypoxia to better understand LC symptom exacerbation. Forty-six people with LC and 10 controls (CON) completed two submaximal cardiopulmonary exercise tests (CPETs), separated by 24-h. Near-infrared spectroscopy (NIRS)-derived signals from the left gastrocnemius muscle were continuously monitored before, during, and after 2-day incremental CPET. CPET outcomes demonstrated impaired physical function on day 2 compared with day 1 for the LC cohort at rest and VT1. LC tissue saturation index (TSI%) remained elevated above rest for a shorter duration of exercise compared to CON on day 1 (2nd minute vs. 5th minute). On day 2, this response worsened for LC (Rest vs. 1st exercise minute:  $63 \pm 5\%$  vs.  $65 \pm 5\%$ ;  $p < 0.05$ ); meanwhile, CON exhibited sustained TSI% elevation throughout exercise above rest (Rest vs. 12th exercise minute:  $62 \pm 5\%$  vs.  $67 \pm 4\%$ ;  $p < 0.05$ ). LC TSI% remained elevated above rest for a shorter duration of exercise compared to CON, worsening for LC on day 2. LC showed rapid normalization of TSI%, suggesting impaired muscle oxygenation and recovery during repeated exercise.

**Rajveer Sagoo, Navraj S. Sagoo, Katherine Nguyen and Mohanakrishnan Sathyamoorthy (April 19, 2026) [Sex-Based Differences in Cardiovascular Diagnoses, Mortality, and Resource Utilization in Long COVID Hospitalizations: A National Inpatient Sample Analysis](#) *American Journal of Cardiology***

Long COVID refers to persistent sequelae following SARS-CoV-2 infection, and sex-specific cardiovascular outcomes among hospitalized patients remain incompletely characterized. We queried the 2022 National Inpatient Sample (NIS) to identify adult hospitalizations with a diagnosis of long COVID (ICD-10 U09.9), excluding patients younger than 18 years or with missing outcome data. Analyses incorporated NIS discharge weights to generate national estimates. Multivariable (survey-weighted) logistic regression was used to estimate adjusted odds ratios (aORs) for cardiovascular diagnoses and in-hospital mortality. Among 87,415 weighted hospitalizations for long COVID, 49.4% were male and 50.6% were female. Males had more complicated hypertension, coagulopathy, and alcohol use disorder, whereas females had higher rates of obesity, depression, and hypothyroidism (all  $p < 0.05$ ). Males had a higher in-hospital mortality rate (5.9% vs. 4.7%,  $p < 0.001$ ). In adjusted analyses, females had lower odds of in-hospital mortality (aOR: 0.874 [95% CI, 0.819–0.932]), cardiac arrhythmias (aOR: 0.652 [0.629–0.677]), venous thromboembolism (aOR: 0.846 [0.807–0.887]), and myocardial infarction (aOR: 0.767 [0.720–0.817]). Adjusted odds of ischemic cerebrovascular accident were not significantly different (aOR: 0.955 [0.795–1.146]). Females had higher odds of transient ischemic attack (aOR: 1.441 [1.067–1.945]). Median length of stay (5 vs. 4 days) and total hospital charges (\$50,447 vs. \$43,839) were lower in females (all  $p < 0.001$ ). In conclusion, in this nationally representative analysis of long COVID hospitalizations, sex-based differences were observed in cardiovascular diagnoses, mortality, and healthcare utilization, and these findings support sex-sensitive risk stratification and hypothesis generation for post-COVID care.

**Saad Alhumaid, Zainah Sabr, Sara Mohammad Alshehri, Hassan A. Alhashem, Qasim Alnajjad, Dalal Saadoun Alsaadoun, ..., Zainab Al Alawi and Qasem M. Alalwan (15 April 2026) [Asthma control and exacerbation risk following SARS-CoV-2 infection in the post-acute COVID-19 phase: a systematic review](#) *Allergy, Asthma and Clinical Immunology***

**Objectives** To systematically evaluate asthma control and exacerbation risk following SARS-CoV-2 infection in the post-acute COVID-19 phase among pediatric and adult populations. **Conclusion** Post-acute asthma outcomes following SARS-CoV-2 infection are heterogeneous and appear to vary according to acute COVID-19 severity, follow-up duration, and study design. While transient worsening of asthma control may occur, particularly after more severe infection, the available evidence does not consistently demonstrate sustained deterioration in asthma control. These findings suggest that post-COVID asthma management may benefit from consideration of infection severity, while highlighting the need for high-quality longitudinal research to better define long-term outcomes.

**Janne Marques Silveira, Ana Paula Midori Nakaishi, Marcos Gontijo da Silva, Daniele Oliveira dos Santos and Ada Clarice Gastaldi (10 April 2026) [Effects of Exercise-Based Pulmonary Rehabilitation in Patients with Long COVID: A Systematic Review and Meta-Analysis](#) *Advances in Respiratory Medicine* 94 (2) Article no. 25**

**Background/Objective:** A substantial proportion of infected individuals develop persistent symptoms after the acute phase of COVID-19, regardless of initial disease severity. Long COVID (LC) remains a public health challenge characterized by impaired functional exercise capacity (FEC) and quality of life (QoL). We systematically synthesized evidence on the effects of in-person outpatient pulmonary rehabilitation (OPR) with individualized and supervised exercise in adults with LC. **Conclusions:** Supervised PR improves FEC, QoL, and dyspnea in individuals with LC. In patients with fatigue/PEM, systematic assessment and continuous symptom monitoring are essential. High-quality controlled studies are needed to strengthen evidence and clinical guide.

**Maria Juszczuk, Sara Nawaz, Ali Mahdi, Christian Lewinter, Fabrizio Ricci, Marcus Stahlberg and Artue Fedorowski (3 April 2026) [Post-COVID Postural Orthostatic Tachycardia Syndrome and Inappropriate Sinus Tachycardia: Prevalence, Overlap, and Clinical Characteristics](#) *JACC: Advances* 5 (5)**

As the world recovered from the COVID-19 pandemic, new and complex patient cases emerged, revealing longstanding and previously unpredictable cardiac manifestations. In this context, cases of postural orthostatic tachycardia syndrome (POTS) and inappropriate sinus tachycardia (IST) have been extensively reported. Although separate diagnostic definitions have been established, the clinical delineation between the disorders remains imprecise.<sup>1</sup> This study aimed to characterize and compare clinical and hemodynamic profiles of POTS and IST in long COVID patients.

**Noemi Marchini de Souza Couto, João Vitor Martins Bernal, Tábata de Paula Facioli, Daniel dos Santos and Hugo Celso Dutra de Souza (02 April 2026) [The Severity of COVID-19 Is Associated with Greater Impairment of Cardiac Autonomic Modulation—Physical Training as a Countermeasure](#) *Journal of Functional Morphology and Kinesiology* 11 (2) Article no. 149**

**Background:** COVID-19 has been associated with persistent impairments in autonomic modulation of heart rate variability (HRV). However, whether disease severity during the acute phase influences the magnitude of these impairments remains insufficiently explored. In turn, aerobic physical training (APT) has been proposed as a countermeasure to autonomic dysfunction of HRV in different conditions, although its effects in individuals with COVID-19 are not yet well established. To address these gaps, this study investigated the consequences of COVID-19 on autonomic modulation of HRV according to disease severity and evaluated the effects of APT on this parameter. **Conclusions:** Individuals who had COVID-19 and developed moderate to severe cases showed greater impairments in the autonomic modulation of HRV, characterized by increased sympathetic autonomic modulation and reduced vagal modulation. In turn, APT as a countermeasure appears to increase vagal autonomic modulation and reduce sympathetic autonomic modulation of HRV, regardless of the previous severity of COVID-19.

**Ana Maria Mihai, Monica Marc, Florina Lucaciu and Alexandra Sima (01 April 2026) [Incident Heart Failure Risk Following COVID-19 Recovery: A Systematic Review and Meta-Analysis](#) *Journal of Clinical Medicine* 15 (7) Article no. 2665**

**Background/Objectives:** While acute cardiac injury during COVID-19 is well-documented, the long-term risk of new-onset heart failure (HF) in survivors remains a critical clinical concern. This study

aims to quantify the risk of new-onset heart failure during a 25 months prognostic follow-up period following recovery from SARS-CoV-2. **Conclusions:** COVID-19 recovery serves as a significant independent risk factor for chronic heart failure, emphasizing that cardiovascular impact extends far beyond the acute phase. These findings necessitate the implementation of structured cardiovascular monitoring and biomarker screening for at least one year post-infection to address this emerging chronic disease burden.

**Mohammad Samet, Fatemeh Alsadat Aghaei-Meybodi, Sina Hosseini, Abbas Meidany and Azadeh (April 2026) [Lung autopsy findings in 44 COVID-19 deceased patients: pathological and radiological insights](#) *Monaldi Archives for Chest Disease***

This study presents a detailed histopathological analysis of lung tissue from 44 deceased COVID-19 patients, aiming to elucidate the mechanisms driving severe disease. Postmortem biopsies were systematically examined, revealing diffuse alveolar damage in 95.5% of cases, predominantly in the acute/exudative phase. Characteristic features included extensive hyaline membrane formation, alveolar septal thickening, fibrin deposition, and red blood cell extravasation. Notably, advanced fibrosis, indicative of ongoing tissue remodeling, was observed in 86.4% of cases, highlighting the chronic pathological impact of the disease. Patient demographics showed a predominance of older males with comorbidities such as hypertension and diabetes, aligning with known high-risk profiles. The methodology involved meticulous autopsy procedures and standardized histopathological assessments to ensure the reliability of findings. This study provides key insight into histological changes in the lungs of COVID-19 patients, helping to clarify the disease's progression. It provides valuable insights that may contribute to a better understanding of long COVID and the potential long-term pulmonary complications in these patients. These findings may ultimately support improved management approaches and therapeutic strategies for COVID-19 care.

**Louisa Ruhl, Isabell Pink, Evgeny Chichelnitskiy, Nora Drick, Andrea Sauer, Lennart Boblitz, Kerstin Beushausen, Jana Keil, Anna-Lena Ullrich, ..., Julius Schmidt and Marius M. Hoepfer (29 March 2026) [Post-Acute Sequelae Patients with Severe COVID-19 History Show a Prolonged Inflammatory, Vascular Injury Pattern](#) *European Journal of Immunology* 56 (4) **Article no. e70169****

SARS-CoV-2 infection can lead to persistent symptoms (i.e., long/post-COVID), especially in unvaccinated individuals. Little is known about the sustained impact of acute severe COVID-19 on immune signatures and long/post-COVID symptoms, often associated with cardiovascular events and pulmonary impairment. The longitudinal cohort (LC) was obtained from  $N = 46$  patients with previous severe COVID-19 and prior to SARS-CoV-2 vaccination, collected over 5 visits up to 12 months after discharge ( $n = 139$ ). Long/post-COVID status was assessed by lung function and fatigue scores. Blood was analysed regarding immune cell profiles, SARS-CoV-2 antibodies, and autoantigens. LC patients were compared with 39 acute severe COVID-19 ICU patients and 28 unexposed pre-pandemic donors (UE) and correlated with clinical parameters. LC patients exhibited long-term decreased CD4<sup>+</sup>/CD8<sup>+</sup> T cell ratio, differentiation from naïve to TEMRA, CD57<sup>+</sup>CCR7<sup>-</sup> memory, and HLA-DR<sup>+</sup>CD38<sup>+</sup> activated CD4<sup>+</sup> and CD8<sup>+</sup> T cells. LC plasma profiles displayed elevated levels of markers for chronic inflammation and endothelial injury. Chronic inflammatory chemokines and cardiovascular markers remained high. These markers and autoantibodies against centromere structures negatively correlated with lung function. At 1-year post-discharge, LC patients with a COVID-19 ICU history displayed sustained significant changes in their immune profile at cellular and inflammatory levels, revealing signatures of persistent inflammation and endothelial injury.

**CFS/ME/MS/CF**

**Shuangyan Li, Hui Zhao, Min Zhang, Tingting Yuan, Xiaomeng Li, Zhengyin Shen, Chengfeng Qin, Yanming Li and Mingming Pan (27 April 2026) [Long-term health outcomes in elderly COPD patients with long COVID: a 2-year prospective cohort study](#) *Respiratory Research***  
**Background** Elderly chronic obstructive pulmonary disease (COPD) patients often face long-term adverse health issues post-COVID-19, but longitudinal and comprehensive assessments are limited. The study aimed to assess 2-year trajectories of both self-reported symptoms and lung function in

elderly COPD patients after SARS-CoV-2 infection and to explore potential molecular mechanisms underlying long COVID progression through serum proteomic analysis. **Conclusion** Elderly COPD patients with long COVID showed a persistently greater symptom burden and more frequent adverse outcomes, even up to two years post-infection. These individuals exhibited worse pulmonary ventilation function, particularly at the first and second follow-up visits, along with slightly lower diffusion capacity throughout all three follow-up visits. Disordered coagulation, platelet activation, and complement system may be the underlying molecular mechanisms and therapeutic targets.

**Silke Lauren Sommen, Sunniva Segtnan, Joel Selvakumar, Lise Beier Havdal, Tonje Stiansen-Sonerud, Johannes Gjerstad, Siri Mjaaland, Unni Cecilie Nygaard, Vegard Bruun Bratholm Wyller, Ratnadeep Mukherjee and Lise Lund Berven (22 April 2026) [Long COVID: Deep single-cell immunophenotyping and machine learning reveal a general signature for fatigue](#) *Journal of Transactional Medicine***

**Background** The post COVID-19 condition, commonly referred to as “Long COVID” (LC), is a constellation of long-lasting and debilitating symptoms following acute SARS-CoV-2 infection, which closely resembles other post-infective fatigue states. The underlying immunological disturbances of LC are poorly understood. Multiple explanatory mechanisms, such as persisting SARS-CoV-2 reservoirs, reactivation of latent viruses, endothelial dysfunction, auto-antibodies, tissue damage, and immune abnormalities, have been proposed but remain incompletely characterized, particularly in younger populations. **Conclusion** Our results point to a shared underlying pathophysiology in LC and other forms of fatigue. The absence of unique LC-related immune changes supports the notion that LC represents a specific example of post-infective fatigue syndrome triggered by SARS-CoV-2 in susceptible individuals. Innate and adaptive immune dysregulation, particularly higher levels of hyperresponsive terminal NK cells, is most striking and could serve as a general fatigue marker rather than an LC-specific biomarker. These findings highlight the need for further studies to correlate immune perturbations with symptom clusters and inform diagnostic and treatment strategies for fatigue states.

**J.M. Sardell, S. Das, M. Pearson, D. Kolobkov, A.R. Malinowski, L.M. Fullwood, M. Sanna, ..., M.A. Strivens and S. Gardner (21 April 2026) [Identification of novel reproducible combinatorial genetic risk factors for myalgic encephalomyelitis in the DecodeME patient cohort and commonalities with long COVID](#) *Journal of Translational Medicine***

**Background** Myalgic encephalomyelitis (also known as ME/CFS or simply ME) has severely impacted the lives of tens of millions of people globally, but the disease currently has no accurate diagnostic tools or effective treatments. Identifying the biological causes of ME has proven challenging due to its wide range of symptoms and affected organs, and the lack of reproducible genetic associations across ME populations. This has prolonged misunderstanding, lack of awareness, and denial of the disease, further harming patients. **Conclusion** These findings provide further evidence that ME is a complex multisystemic condition where the risk of developing the disease has a very clear genetic and biological basis. They give a substantially deeper level of insight into the genetic risk factors and mechanisms involved in ME. The discovery of so many multiply reproducible genetic associations implies that ME is highly polygenic, which has important consequences for its future study and the delivery of clinical care to patients. The striking overlap in genes and mechanisms between long COVID and ME suggests the potential for development of novel or repurposed drug therapies that could be used to successfully treat either condition. However, although they share significant genetic commonalities, long COVID and ME appear to be best considered as partially overlapping but different diseases.

**Leinard A. Jason and Ben Z. Katz (15 April 2026) [Comparing ME/CFS following mononucleosis with Long COVID](#) *Chronic Illness***

**Objectives** Long COVID following SARS-CoV-2 and Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) following infectious mononucleosis (IM) are examples of post-infectious chronic illnesses. Behavioral and pathophysiological underpinnings of both ME/CFS following IM and Long COVID are not well understood. **Discussion** These findings may allow investigators a better understanding of these post-viral illness pathophysiology.

**Marta Liva Springe, Kristīne Vaivode, Rihards Saksis, Ninēļa Miriama Vainšēlbauma, Laura Ansons, Monta Brīvība, Helvijs Niedra and Vita Rovite (11 April 2026) [Immune dysregulation in prolonged Long-COVID: lymphocytes emerge as key mediators of persistent inflammation, exhaustion and cytotoxicity](#) *Journal of Translational Medicine* 24 Article no. 527**

**Background** Long-COVID affects at least 10% of COVID-19 survivors, displaying debilitating symptoms across multiple organ systems. Despite the widespread prevalence, Long-COVID aetiology remains poorly understood, but emerging evidence points to immune dysregulation as a potential mechanism involved in its development or persistence. **Conclusions** Collectively, these findings provide insight into the immune processes underlying the progression of COVID-19 into a chronic Long-COVID state. The observed changes in immune cell subsets at the acute phase of the infection may be predictive of Long-COVID progression and could be useful in understanding disease aetiology while the observed long-term effects are crucial to developing therapeutic and diagnostic tools.

**Mythily Srinivasan and Paule Valery Joseph (08 April 2026) [A hypothesis connecting dysgeusia due to defects in ATP-P2X3 signaling and fatigue in myalgic encephalomyelitis/chronic fatigue syndrome: lessons learned from long-COVID](#) *Frontiers in Medicine* 13**

Myalgic encephalomyelitis (ME)/chronic fatigue syndrome (CFS) is a neuroimmune disease characterized by debilitating post-exertional malaise (PEM), brain-fog/cognitive problems, and dysregulation of the autonomic nervous system. Currently, there are no objective biomarkers for ME/CFS despite decades of research. Here, we compile evidence from literature that supports taste dysfunction, particularly alterations of taste perception mediated by Type II taste receptor cells, may be a critical underrecognized feature of ME/CFS. The impetus is drawn from the emerging evidence of clinicopathological similarities between long-COVID and ME/CFS. We discuss in parallel the mechanisms of cellular metabolism, inflammation, vascular dysfunction, and autonomic dysregulation in ME/CFS and long-COVID pathophysiology. We postulate that mechanistically, dysregulation of ATP signaling through P2X2/P2X3 purinergic receptors underlies both gustatory impairment and core ME/CFS symptoms. Adopting information from the NIH-RECOVER shared resources, we present evidence that suggests chemosensory dysfunction as a potential indicator of progression/severity of PEM. We discuss standardized taste testing as a non-invasive screening tool complementary to molecular biomarkers for ME/CFS. Notwithstanding, we acknowledge the limitations, confounding and contributing factors such as medications and deficiencies that may exacerbate or independently cause taste-related symptoms in ME/CFS. In conclusion, we present a compelling case for the multifactorial role of taste dysfunction in ME/CFS and suggest specific research priorities for investigating the relationship between chemosensory function and post-viral chronic illness.

**Julia Barr, Lowri Marsden, Theshan Dassanayake, Norah Almutairi, Vikki McKeever, Tarek Gaber, Rachel Tarrant, Belinda Godfrey, Sharon Witton and Manoj Sivan (25 March 2026) [Testing a Personalised Dysautonomia Management Protocol in Patients with Orthostatic Intolerance and a Diagnosis of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome or Long COVID](#) *Journal of Clinical Medicine* 15 (7) Article no. 2510**

**Background/Objectives:** Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) and Long COVID (LC) are complex multisystem conditions with significant functional disability. Many patients experience symptoms of orthostatic intolerance, which can be captured in some cases as Orthostatic Hypotension (OH) or Postural orthostatic Tachycardia Syndrome (PoTS) on objective testing. Conservative treatments are recommended for first-line symptom management, but there is a lack of efficacy evidence. This study aims to assess the feasibility of an 8-week clinically supervised, personalised Dysautonomia Management Protocol (DMP) in a cohort of ME/CFS and LC patients with subjective and objective evidence of orthostatic intolerance (dysautonomia). **Conclusions:** The results suggest that targeted conservative interventions could influence autonomic function and symptom reduction. However, the magnitude of change was limited, and statistical significance might not necessarily relate to a clinically significant improvement in symptoms.

### Children/Paediatrics

Carly B. Steifman, Bryan Alvarez-Carcamo, Smriti Verma, Ronan McCarthy, Lauren B. Guthrie, ..., Daniel Irimia and Lael M. Yonker (22 April 2026) [Endovascular profiles linked to neutrophil activation in children and young adults with long COVID](#) *Pediatric Research*

**Background** Endovascular symptoms are among the most debilitating long COVID symptoms; however, underlying mechanisms are unclear. Children and young adults with long COVID, an understudied population, offer key insight into long COVID pathology. **Conclusions** Children and young adults with long COVID with cardiovascular symptoms display increased microclots, endothelial injury, and neutrophil inflammation, which warrant further evaluation and suggest intravascular NETosis as a key driver of endovascular pathology in long COVID.

### Cognitive/psychological/neurological

Marco Florida, Liliana Elena Weimer, Paolo Bonfanti, Aldo Lo Forte, Viola Cogliandro, Valeria Bottaro, Paola Andreozzi, Silvia Zucco, Guido Vaghegginini and Graziano Onder (21 April 2026) [Cognitive impairment in long-COVID: frequency, trajectories and risk factors in a cohort study from Italy](#) *Neurological Sciences* 47 Article no. 446

**Background** Data on cognitive impairment in patients with Long-COVID remain controversial. **Discussion** Cognitive impairment in Long-COVID appeared common and persisting. Cognitive symptoms, unlike psychological symptoms, were associated with lower cognitive scores and tended to accumulate during follow-up. Advanced age, severity of acute SARS-CoV-2 disease and female sex should be considered as potential risk factors.

Tiana M. Saak, Jeremy P. Tervo, Patricia T. Jacobson, Brandon J. Vilarello, Francesco F. Caruana, Liam W. Gallagher, Joseph B. Gary, David A. Gudis, Jeffrey N. Motter, Terry E. Goldberg, Davangere P. Devanand and Jonathan B. Overdevest (16 April 2026) [Longitudinal evaluation of neurocognitive outcomes in a cohort with persistent post-COVID olfactory dysfunction](#) *Scientific Reports* 16 Article no. 12499

Persistent COVID-19-associated olfactory dysfunction (C19OD), along with other neurologic and cognitive deficits are common features of long COVID. This study aims to evaluate longitudinal trends in neurocognitive performance within a cohort with C19OD. In individuals with perceived C19OD we performed serial psychophysical olfactory and neurocognitive assessments at baseline and follow-up one year later. At baseline evaluation, individuals with C19OD were found to have diminished cognitive functioning compared to normosmic counterparts across several domains, including attention, executive functioning, language, learning and memory, and psychomotor speed. At subsequent one-year follow-up assessment, C19OD participants demonstrated cognitive recovery, with performance comparable to normosmic counterparts. These findings suggest that early associations between C19OD and certain neurocognitive domains may dissipate upon repeated longitudinal evaluation, with partial resolution of cognitive deficits despite persistent C19OD.

Amit Bansal, Sam W. Z. Olechnowicz, Nicholas Kiernan-Walker, Jacob Cumming, Imadh Abdul Azeez, Ramin Mazhari, COVID PROFILE consortium, Rebecca J. Cox, Ivo Mueller, Rory Bowden and Emily M. Eriksson (13 April 2026) [Divergent inflammatory and neurology-related protein levels in long COVID following primary and breakthrough SARS-CoV-2 infections](#) *Communications Medicine*

**Background:** Long COVID is a complex condition where symptoms persist for more than 3 months after SARS-CoV-2 infection and affects an estimated 5-30% of individuals. While persistent inflammation has emerged as an important feature of this condition, it is unclear if immune responses from COVID-19 vaccination or SARS-CoV-2 re-infection exacerbate or mirror the initial inflammatory responses. **Conclusions:** These findings suggest that there is an altered immune response outcome primarily observed in individuals with long COVID upon re-exposure.

**Rachael Matthews, Ali Alam, Ed Bullmore and Benedict D. Michael (13 April 2026)**

**[Understanding the long-term neurological effects of SARS-CoV-2 infection](#) *Nature Reviews***

***Neurology***

Post-COVID-19 condition (PCC), also known as long COVID, is a heterogeneous condition marked by persistent symptoms following acute SARS-CoV-2 infection. As approximately 6% of people who have experienced acute COVID-19 are estimated to develop PCC, the potential population is vast. Many of the key symptoms of PCC reflect involvement of the nervous system, ranging from cognitive impairment ('brain fog'), headaches and fatigue to anxiety and depression. This Review summarizes the spectrum of neurological and psychological symptoms that occur following acute SARS-CoV-2 infection, with a particular focus on the international consensus-based core outcome set for PCC. We also explore the proposed underlying mechanisms, including evidence for immune system dysregulation, microvascular dysfunction and volumetric changes on neuroimaging. In addition, we review ongoing and completed large-scale treatment trials. Growing evidence suggests a bidirectional interaction between symptoms traditionally considered neurobiological in origin, such as cognitive deficits and headache, and those within the purview of psychiatry, such as anxiety and depression. PCC represents an opportunity to better understand the long-term consequences of acute infection and improve management strategies and outcomes, not only for people with the condition but also for those with other post-viral syndromes that affect brain health.

**Ingibjörg Magnúsdóttir, Anders B. Nygaard, Asle Hoffart, Gillian Murphy, Kadri Kõiv, Mary M. Barker, Anikó Lovik, ... , Merete Ellingjord-Dale and Unnur Anna Valdimarsdóttir (11 April 2026)**

**[Acute COVID-19 severity and impaired cognitive function up to 32 months after diagnosis: an observational study](#) *BMC Medicine***

**Background** Cognitive dysfunction ("brain fog") is a commonly reported post-COVID-19 symptom. Leveraging data from five general population cohorts across four European countries (Estonia, Iceland, Norway, and Sweden), we assessed long-term prevalence of impaired subjective cognitive function among individuals diagnosed with COVID-19 by acute illness severity. **Conclusions** The data indicates that a severe COVID-19 acute illness course is associated with impaired cognitive function up to 18–32 months after COVID-19 diagnosis.

**Zennur Sekendiz, Maria Caliendo, Daniella Taboada, ..., Nikhil Palekar, Sara Weisenbach (10 April 2026)**

**[The neuropsychiatric features of Long COVID in older adults and the potential association with neuroinflammation: Preliminary observations in a small cohort](#) *Journal of the Neurological Science* 486 Article no. 125915**

**Background** The underlying mechanism of neuropsychiatric features of Long COVID remains unclear; however, the most compelling hypothesis is the contribution of excessive neuroinflammation induced by a systemic inflammatory response or cytokine storm. We aimed to investigate the neuropsychiatric features of Long COVID in older adults and the potential association with neuroinflammation measured by [<sup>18</sup>F]FEPPA positron emission tomography (PET) targeting translocator protein (TSPO). **Conclusion** Older adults with Long COVID showed greater neuropsychiatric symptoms, such as depression and fatigue, compared to healthy older adults. The [<sup>18</sup>F]FEPPA PET findings suggest that their persistent neuropsychiatric symptoms could potentially be associated with chronic neuroinflammation.

**Mortimer Gierthmuehlen, Kirsten Schmieder, Niklas Thon and Petra Christine Gierthmuehlen (02 April 2026)**

**[Transcutaneous Auricular Vagal Nerve Stimulation Against Fatigue Syndrome in Patients with Long COVID: Results of the Randomized, Placebo-Controlled Clinical Pilot Trial COVIVA](#) *Neurology and Therapy***

**Introduction** Fatigue is the most prevalent symptom in "long COVID", affecting 6–7% of patients after COVID-19 infection. Its pathophysiology remains unclear, with viral persistence, immune dysregulation, and mitochondrial dysfunction among proposed mechanisms. Transcutaneous auricular vagus nerve stimulation (taVNS), a non-invasive neuromodulatory approach, has been suggested as a potential treatment. **Conclusion** taVNS was safe, feasible, and associated with high adherence in long COVID-related fatigue, but showed no superiority over sham stimulation. Larger

multicenter trials with more homogeneous populations and objective biomarkers are required to determine whether taVNS confers therapeutic benefit in this condition.

**Muhammad Abdullah, Anam Naz, Leah R. Reznikov, Javed Anver Qureshi, Ammarah Hasnain, Ayesha Obaid and Amjed Ali (26 March 2026) [Neuropeptide and cytokines expression in long COVID-19 related neuropsychological sequelae: insights into NK1R-mediated neuroinflammation and \*in silico\* therapeutic targeting](#) *Frontiers in Cellular Neuroscience* 20**

**Objectives:** In the present study, neuropsychological sequelae related to long COVID-19 were screened and the expression of related neuropeptides and cytokines was evaluated. Additionally, potential drugs have been evaluated computationally to reduce neuroinflammation in long COVID-19. **Conclusion:** IL-6, IL-10, and SP are found to be deregulated in long COVID-19 leading to neurophysiological sequelae. To overcome neuropsychological sequelae, binding of SP to NK1R can be hindered using aprepitant and N-Acetyl-L tryptophan which has been evaluated computationally and may require further *in vivo* and *in vitro* studies for validation.

#### Other

**Naomi J. Patel, Zoe Swank, Jiaqi Wang, Xiaosong Wang, Lauren A. O'Keeffe, Madison Negron, Liya S. Getachew, Louise L. Hansen, Grace Qian, ..., Alene A. Saavedra and Kevin T. Mueller (27 April 2026) [Differences in SARS-CoV-2 antigen persistence in individuals with systemic autoimmune rheumatic diseases compared to the general population: A RECOVER-Adult Cohort Study](#) *Arthritis and Rheumatology***

**Background** Individuals with systemic autoimmune rheumatic diseases (SARDs) are at risk for worse acute and post-acute COVID-19 outcomes, though whether individuals with SARDs have longer persistence of viral antigens after COVID-19 has not been studied. **Conclusion** Individuals with SARDs were more likely to have SARS-CoV-2 antigen positivity at months 3 and 6 following COVID-19 infection compared with individuals without SARDs, not explained by demographics, variant, vaccination, or treatment.

**Uzair Abbas, Rabeel Nawaz Laghari, Ishfaque Ahmed, Usama Abdul Musawwir, Hina Riaz, ..., Khadija Anwar and Niaz Hussain (15 April 2026) [Acute SARS-CoV-2 viral load and systemic inflammation are associated with neuropsychiatric and musculoskeletal symptoms in long COVID](#) *Plos One***

**Background** Long after recovery from acute-COVID illness, many patients show persistent multi-organ dysfunction consistent with Long COVID. Biochemical profile and measurements of inflammatory markers in these individuals can help to understand the underlying pathophysiology. This study aims to evaluate biochemical markers and their association with symptoms of Long COVID. We, in a retrospective analysis, also examined whether the Long COVID symptom persistence is associated with the SARS-CoV-2 viral load documented during the acute infection. **Conclusion** We identified Long COVID in 59% of the participants, the highest reported percentage in studies in the middle-aged individuals. Compared to controls, we found differential biochemical markers in the Long COVID group indicating a different metabolic status in these individuals. Moreover, the association of raised inflammatory markers at ten months follow up and acute-phase SARS-CoV-2 viral load were also seen to be associated with musculoskeletal and neuropsychiatric symptoms of the Long COVID. These significant clinical and biochemical changes warrant thorough monitoring and follow-ups for extended time.

**Monika Haack, James Chan, Larissa C. Engert, Rammy Dang, Haoyang Wang, Erica N. Borducchi, Krishna Shah, Jinyan Liu, Haoqi Sun, Wolfgang Ganglberger, Elizabeth W. Karlson, Aric A. Prather, Dan H. Barouch and Janet M. Mullington (03 April 2026) [The effect of pre-existing sleep disturbance on T cell responses to SARS-CoV-2 variants, pro-inflammatory and pro-resolving mediators, and glucocorticoid sensitivity in Long COVID](#) *Scientific Reports***

Sleep disturbance is highly common in Long COVID (LC), and is known to worsen infection outcomes and hinder full recovery from infections. We here investigated whether sleep disturbance prior to SARS-CoV-2 infection compromised inflammatory responses in LC. Blood of 74 participants from the

National Institute of Health RECOVER Adult clinical cohort were analyzed at the 6-month time point following the infection. Participants were categorized into groups of Likely, Possible, and No LC based on the Long COVID Research Index. Findings show that Likely LC did not differ from Possible or No LC with respect to interferon-gamma expression in CD4 and CD8 T cells stimulated with omicron spike-peptide variants, the expression of inflammatory mediators by monocytes (IL-6, TNF, COX-2), the ability of glucocorticoids (GC) to suppress inflammatory expression in monocytes, or levels of inflammatory pro-resolving mediators (SPMs). 53% of the Likely LC group reported pre-existing sleep disturbance, compared to 30 and 23% of Possible and No LC groups, respectively. In the Likely LC group, reduced ability of GCs to suppress inflammation was associated pre-existing sleep disturbance, suggesting compromised anti-inflammatory control. Research on the type of sleep disturbance (insomnia, hypersomnia) driving altered GC sensitivity will help to identify LC subtype-specific intervention targets.

**Ditte Gertz Mogensen, Pia Dreyer, Vibeke Backer and Mary Jarden (24 March 2026)** [Living with a hidden disability – a qualitative study of post-COVID-19 olfactory dysfunction](#) *Frontiers on Allergy 7*

**Introduction:** Since the onset of the COVID-19 pandemic, olfactory dysfunction has become increasingly prevalent, manifesting as complete loss of smell, reduced olfactory sensitivity, or distorted perceptions such as parosmia. This qualitative study explored how post-COVID-19 olfactory dysfunction is experienced and how it impacts daily life, well-being, and quality of life.

**Conclusions:** Olfactory dysfunction after COVID-19 is experienced as an invisible yet intrusive condition that impacts daily functioning, eating habits, social relationships and personal identity. The findings highlight the need for greater awareness among healthcare professionals to support patients in developing coping strategies that promote quality of life in the context of long-term sensory loss.

#### PSYCHO-SOCIAL IMPACTS OF LONG COVID (INC. WORK, EDUCATION, QOL)

**Esther Ortega-Martin and Javier Alvarez-Galvez (20 April 2026)** [Understanding quality-of-life patterns in long COVID: How Symptoms and socioeconomic conditions shape patient wellbeing](#) *Plos One*

**Objective** To characterize the heterogeneity of Long COVID (LC) by identifying distinct patient profiles based on symptoms and quality of life (QoL), and to examine the sociodemographic and clinical predictors associated with these profiles. **Conclusions** LC is characterized by distinct clinical and QoL profiles, with strong interactions between multisystem symptom burden and social determinants. Identifying patients at greatest risk of poor QoL can inform stratified interventions and integrated policies that combine medical care, psychosocial support, and workplace reintegration.

**Laston Gonah, Themba G Ginindza and Khumbulani Welcome Hlongwana (17 April 2026)** [Mapping global evidence on compassion fatigue among healthcare workers during COVID-19: insights and implications for future preparedness – a scoping review](#) *Journal of Global Health 16 Article no. 04130*

**Background** Compassion fatigue (CF) is a critical occupational hazard for healthcare workers (HCWs), intensified by the COVID-19 pandemic, with implications for well-being, retention, and quality of care. We aimed to map the global evidence on CF prevalence, risk factors, effects, interventions, and research gaps among HCWs during the COVID-19 pandemic. **Conclusions** Compassion fatigue is a multifactorial, context-dependent hazard disproportionately affecting vulnerable HCWs. Effective mitigation requires longitudinal research, inclusive global representation, and multi-level strategies linking individual resilience with organisational reform and policy action to safeguard HCW well-being in current and future crises.

**Alexandra C. Larsson, Roda Alhasan, Annie Palstam, Lena Rafsten and Hanna C. Persson (17 April 2026)** [Self-reported anxiety, depression, and health-related quality of life during two years following hospitalization for covid-19: a longitudinal study](#) *Scientific Reports 16 Article no. 12692*

Coronavirus disease 2019 (COVID-19) is a respiratory illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Health-related quality of life (HRQoL) has been observed to decline after COVID-19 hospitalization, with anxiety and depression contributing to reduced HRQoL and emphasizing the need for research on long-term outcomes. The aim of the study was to longitudinally explore self-reported symptoms of anxiety, depression, and associated factors of HRQoL during 2 years after hospital-treated COVID-19, and to compare differences based on age, sex, and initial disease severity. Two years after COVID-19, individuals with initial moderate infection reported higher levels of anxiety ( $p = 0.031$ ) and pain/discomfort ( $p = 0.039$ ) than did those with severe infection. Symptoms of anxiety did not change significantly over the study period. Depressive symptoms increased significantly between 3 and 12 months after COVID-19 ( $Z = -2.957$ ,  $p = 0.003$ ). Older age was significantly associated with lower HRQoL ( $B = -0.003$ , 95% CI  $[-0.004, -0.001]$ ,  $p = 0.010$ ). Symptoms of anxiety remained generally within the normal range throughout the two-year follow-up after hospital-treated COVID-19. Symptoms of depression were lower at 3 months after hospitalization but subsequently stabilized at a higher, yet still normal, level. At two years after COVID-19, lower HRQoL was associated with older age, highlighting the importance of addressing age-related vulnerabilities in long-term follow-up care.

**Amy Lawson Moore, Edward J. Jedlicka, James C. Patterson and Christina R. Ledbetter (11 April 2026)** [LearningRx Cognitive Training for Workplace Self-Efficacy in Adults with Post-COVID-19 Brain Fog: A Mixed-Methods Pilot Study](#) *Brain Sciences* 16(4) Article no. 410

**Background/Objectives:** Cognitive dysfunction, or “brain fog”, following COVID-19 viral infection is strongly associated with diminished work capacity which disproportionality affects working-age adults. This study examined an existing method of cognitive rehabilitation training applied to adults struggling with workplace functioning and self-efficacy due to post-COVID-19 brain fog. **Conclusions:** This study adds to the growing body of literature examining the possibility of using cognitive rehabilitation for post-COVID-19 cognitive dysfunction impacting workplace self-efficacy and work functioning.

**Lucy E Gardiner, Daniel Lozano-Rojas, Nikki Smith, ..., Rod S Taylor and Rachael A Evans (09 April 2026)** [Investigating prognostic classifications of pre-existing multiple long-term conditions for health outcomes one-year after COVID-19 hospitalisation: a UK prospective observational study](#) *International Journal of Infectious Diseases* Article no. 108695

**Background** Pre-existing multiple (two or more) long-term conditions (MLTCs) may negatively affect recovery after COVID-19. We investigated how pre-existing MLTCs, including different categorisation and patterns of MLTCs, affect one-year health outcomes after severe COVID-19. **Interpretation** Adults with pre-existing MLTCs were 34% less likely to feel fully recovered at one-year after COVID-19 hospitalisation compared with adults without MLTCs. We describe prognostic classifications of MLTCs with future work needed to understand if they have prognostication in broader post-acute infection sequelae.

**Harrison T. Reeder, Lawrence C. Kleinman, Melissa S. Stockwell, ..., Andrea S. Foulkes and Rachel S. Gross (02 April 2026)** [School Difficulties and Long COVID in Children and Adolescents](#) *Academic Pediatrics*

**Objective** Pediatric Long COVID (LC) is an infection-associated chronic condition following SARS-CoV-2 infection. While research has begun to elucidate clinical phenotypes, functional impacts are not well described. **Conclusions** LC in school-age children and adolescents was negatively associated with functional school-related outcomes, including academic performance, attention, and peer interactions. As LC affects a substantial proportion of U.S. children, these findings highlight the urgent need to develop, provide, and evaluate school-related services for children and adolescents with LC.

## SERVICE DESIGN

**Michelle C. Krzyzanowski, Helen Pan, Iris Glaze, Stephen Hwang, David Williams, Michelle Engle, Justin Waterfield, Cataia Ives, Sara Armson, Wayne Huggins and Carol M. Hamilton (22 April 2026) [The PhenX Toolkit: Long COVID Collection of Standard Protocols Current Protocols](#)**

Because of the urgent need to better understand the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission mechanism and clinical outcomes resulting from infection, health organizations and research institutes developed data collection instruments to assess coronavirus disease 2019 (COVID-19) symptoms, treatments, and associated impacts on behaviors and risks, treatment and outcomes, information available, psychosocial and mental health, and socioeconomic effects across demographic groups. The PhenX team developed the COVID-19 Protocol Library to share data collection instruments, methods, and protocols in use by investigators and to reduce proliferation of similar protocols. The COVID-19 Variable Compare Tool (VCT) integrates all COVID-19 Research Collection protocols and a prioritized subset of instruments from the COVID-19 library. The Long COVID Specialty Collection and the VCT support investigators' needs to combine and analyze data related to COVID-19 prospectively and retrospectively by identifying compatibility with other studies.

**Alvarez-Pedrerol M, Polo-Alonso S, Ramos R , Martí-Lluch R , Pinsach-Abuin M , Décano IR , Elosua R, Subirana I, ..., Camps-Vilaró A and Marrugat J (16 April 2026) [Sex Differences in Long COVID Prevalence Over One year After the Acute Phase, and Related Risk Factors. The GINA-COVID Cohort Study International Journal of Women's Health 18 Article no. 538491](#)**

**Background:** This 1-year cohort study aimed to track long COVID prevalence, identify associated risk factors, and assess its association with hospitalization. **Conclusion:** Findings underscore the importance of sex-specific approaches in managing long COVID and suggest further investigation into hypertension's protective role in females and disease severity's impact in males.

**Anne Pastorello, Cécile Vuillermoz, Laurence Meyer, Camille Davaisse-Paturet, Joël Coste, Nathalie Bajos, ..., Josiane Warszawski and Alexandra Rouquette (14 April 2026) [Evolution with age of the relationship between sex and post-COVID symptoms: a population-based cohort study BMC Medicine](#)**

**Background** It is unclear why women more frequently experience post-COVID symptoms than men. Sex and age-dependent immune dysregulation triggered by SARS-CoV-2 infection might be involved in this association. We assessed whether age modified the association between sex and post-COVID symptoms, and whether this effect modification might be attributable to SARS-CoV-2 infection. **Conclusions** Women are a target population in post-COVID symptoms management, especially among younger adults. Sex and age-dependent mechanisms attributable to SARS-CoV-2 infection may be involved in post-COVID symptoms.

**Yusuff Adebayo Adebisi (10 April 2026) [Prepandemic Risk Factors for Disabling Long COVID: A Prospective Cohort Analysis Journal of Tropical Medicine](#)**

**Introduction** Disabling long COVID, characterised by persistent symptoms that limit daily functioning, has emerged as an important public health concern. However, prospective evidence on predisposing risk factors remains limited. **Conclusion** Prepandemic health, socioeconomic and psychological vulnerabilities were independently associated with disabling long COVID, with distinct sex-specific patterns of risk.

## INTERVENTIONS/RESEARCH

**Dana Dharmakaya Colgan, ..., Lita Buttolph and Heather Zwickey (13 April 2026) [Designing Nutrition Studies for Long COVID and Related Infection-Associated Chronic Illness: Qualitative Insights From a Patient-Reported Evaluation of Ketogenic Metabolic Therapy Journal of Patient Experience 13](#)**

**Background** Long COVID affects over 400 million people worldwide and has no FDA-approved treatments. Patients often rely on self-directed strategies, making their lived experiences an

essential, yet underutilized, source of evidence. Ketogenic metabolic therapy (KMT) has demonstrated mechanisms relevant to Long COVID, including improved mitochondrial energy production, reduced oxidative stress, and modulation of inflammation, but remains underexplored. **Conclusion** Findings suggest nutrition trials for infection-associated chronic illnesses, including Long COVID, should consider incorporating longer intervention periods, multicomponent design, patient-centered outcomes, lived-experience integration, and tailored supports to optimize feasibility and impact.

**Sudeep Peddireddy, Noah VanWingerden, Priya Patel, Gabriel Howard and Jeffrey Berger (13 April 2026) [Stellate Ganglion Block in the Treatment of Long COVID: A Systematic Review](#) *Current Pain and Headache Reports* 30 Article no. 44**

This review evaluates stellate ganglion block as a treatment for long COVID, seeking to evaluate the treatment's efficacy by various symptoms and the limitations of the current literature. **Conclusion** Stellate ganglion block is a promising treatment that appears to generate substantive benefit for many of the symptoms seen in long COVID. However, the current literature has small, uncontrolled studies with heterogenous study designs and follow-up periods. Standardized research with larger sample sizes, control groups, and longer-term follow up is necessary to elucidate the degree of benefit.

**David W Miller, Samuel N Rodgers-Melnick, Nada Tharwat Deraz, Jeffery A Dusek, Tracy L Segall and Amy M Edwards (10 April 2026) [Interdisciplinary Pediatric Long-COVID Care: A Descriptive Study of Interventions and Health-Related Quality of Life](#) *Open Forum Infectious Diseases* 13 (4)**

**Objectives** Data on pediatric long-COVID is limited to descriptive reports of symptom prevalence and incidence, with few studies describing integrative care or including patient-reported quality of life. This study describes demographic, clinical, symptom severity, and intervention characteristics within a pediatric long-COVID clinic involving collaboration between infectious disease and integrative medicine physicians. **Conclusions** Pediatric patients with long-COVID report high symptom burden. This study describes patient characteristics, care delivered and provides a novel description of symptom severity. Future research among more diverse populations is needed to evaluate outcomes of this integrative care.

**Malin Nygren-Bonnier and Anne E. Holland (April 2026) [Physiotherapy management of long COVID in adults](#) *Journal of Physiotherapy* 72 (2) pp. 94-105**

Persistence of symptoms following coronavirus disease 2019 (long COVID) has emerged as a substantial global health challenge, with a cumulative global incidence of over 400 million people.<sup>1</sup> Persistent symptoms occur in a substantial proportion of people following severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, including many who were never hospitalised. Long COVID affects multiple organ systems and commonly presents with fatigue, exertional intolerance, dyspnoea, chronic pain, autonomic dysfunction, cognitive impairments and mental health symptoms. Coexisting conditions such as dysautonomia, postural orthostatic tachycardia syndrome (POTS) and myalgic encephalomyelitis/chronic fatigue syndrome are frequent, contributing to reductions in daily functioning and health-related quality of life. This review summarises current knowledge on the physiotherapy management and rehabilitation of long COVID and highlights key challenges and priorities for future research and clinical practice.

**Letícia Soares, C H Romatowski, Gina Assaf and Chloé de Canson (31 March 2026) [The case for routine patient review in long COVID research](#) *The Lancet: Infectious Diseases* 26 (5) pp. 446-447**

Long COVID is an infection-associated chronic condition that occurs after SARS-CoV-2 infection and can lead to sometimes severe disability. In early 2024, long COVID had already affected 400 million people, with an estimated annual global economic impact of US\$1 trillion. 6 years into the COVID-19 pandemic, research into long COVID has progressed considerably, and evidence implicates several pathomechanisms, including aberrant immunity, persistent pathogens, endothelial dysfunction, and mitochondrial dysfunction. People with long COVID have played a crucial role in the field's

development, establishing long COVID as a disease entity in the scientific literature and publishing numerous articles on epidemiology, public health, pathomechanisms, and trial design—two of which are among the ten most cited in the field. Routine patient review, in sum, would create a systemic incentive to draw on patient expertise at every stage of the research process, and therefore has the potential to improve and accelerate long COVID research and bring us closer to finally approving treatments. Routine patient review could also serve as a model for incentivising patient involvement in research across other infection-associated chronic conditions and beyond.

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