

COVID PATIENT RECOVERY ALLIANCE

The COVID Patient Recovery Alliance is a multi-sector collaboration with the mission to support the energy and innovation of government and private-sector leaders as they care for individuals with long-COVID. The Alliance is developing national solutions that link diverse data sources, improve clinical care pathways, and ensure sustainable federal financial support for the care of these patients. The Alliance is particularly interested in those patients who served their communities and nation when called to duty; whose COVID-19-related costs are extraordinary and burdensome; or who are underserved by existing programs, including racial and ethnic minorities and communities experiencing health disparities.

For more information, please visit our website at COVID19PatientRecovery.org.

PURPOSE OF RESEARCH TRACKER

The research, news, and knowledge of long-COVID is quickly evolving. To stay up-to-date and informed on long-COVID, the Patient Recovery Alliance is performing routine intel scans from a variety of sources – from peer-reviewed publications to various news websites – and on variety of long-COVID-related topics, including health care coverage, workers' compensation, impacted populations, symptoms, and prevalence. The outputs of these intel scans are compiled in this document, which will be periodically updated.

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Date	Article	Publication	Key Takeaways
February 2022			
2/7/2022	Prevalence of Select New Symptoms and Conditions Among Persons Aged Younger Than 20 Years and 20 Years or Older at 31 to 150 Days After Testing Positive or Negative for SARS-CoV-2	JAMA Open Network	Symptoms and conditions reported as possible sequelae of SARS-CoV-2 infection occurred infrequently ($\leq 11\%$ prevalence) in nonventilated persons with medical encounters at 31 to 150 days after SARS-CoV-2 testing. The prevalence of new symptoms and condition diagnoses following a positive test was highest among ventilated persons >20 y/o and was higher among hospitalized persons compared with their non-hospitalized counterparts. Diagnoses common among hospitalized persons <20 years old with a positive test, compared to negative, were shortness of breath, heart rate abnormalities, and type 2 diabetes.
2/8/2022	Scientists Finally Have A Definition For Long Covid. Here's Why It Matters	Huffington Post	A panel of 120 international experts agreed on the definition for long-COVID in children and young people being: "Post-Covid-19 condition occurs in young people with a history of confirmed SARS CoV-2 infection, with at least one persisting physical symptom for a minimum duration of 12 weeks after initial testing that cannot be explained by an alternative diagnosis. The symptoms have an impact on everyday functioning, may continue or develop after Covid-19 infection, and may fluctuate or relapse over time."
2/7/2022	A clinical review of long-COVID with a focus on the respiratory system	Current Opinion in Pulmonary Medicine	Breathlessness, coughing, and chest pain were the most reported respiratory symptoms associated with long-COVID. In hospitalized patients, abnormalities on lung function testing or chest imaging were observed less commonly at 12 months compared to six months since discharge. Respiratory features of long-COVID may reduce over time, yet resolution is not seen in all cases. "Clinical assessment of patients with persisting symptoms after acute COVID-19 requires a comprehensive evaluation to exclude other possible causes for symptoms. With no robust current evidence for interventions to treat long-COVID respiratory symptoms, symptomatic treatment, supported self-management and pulmonary rehabilitation should be considered to help individuals with respiratory symptoms associated with long-COVID." "Future research is needed to understand the natural history of long-COVID, identify factors associated with spontaneous improvement/persistence, investigate mechanisms for persisting symptoms, and test interventions to prevent and treat long-COVID."

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2/8/2022	Long COVID and kids: more research is urgently needed	Nature	“What little is known about long COVID in children and teenagers suggests that it can be just as disabling as it is in adults. However, there are many fewer studies in teens than in adults — and even fewer in children under the age of 11. This latter group is seeing a surge of COVID-19 infections: in many countries, children are not being vaccinated.” “It’s time for younger people to be included in more studies of the condition, including trials of potential treatments.”
2/7/2022	Antihistamines for Postacute Sequelae of SARS-CoV-2 Infection	The Journal of Nurse Practitioners	This case report shares anecdotal findings that long-COVID patients experienced substantial and rapid relief from their symptoms with the help of over-the-counter antihistamines. The cases studied were two middle-aged women who were generally healthy and exercised regularly prior to their illness. Symptoms included fatigue, brain fog, inability to tolerate exercise, and discoloration and pain in fingers and toes. Researchers note that they believe these are the first case reports in the literature to document the potential benefits of antihistamines for long-COVID patients but said that this was brought to their attention through Survivor Corps, where antihistamines were frequently cited by patients as providing relief from their symptoms. Study author Melissa Pinto said, “The next steps for this research into antihistamine treatment are to conduct broad-based trials in order to evaluate efficacy and to develop dosage schedules for clinical practice guidelines.”
2/7/2022	Long-term cardiovascular outcomes of COVID-19	Nature Medicine	This study involved 153,760 people with COVID-19, 5,637,647 contemporary controls and 5,859,411 historical controls—which, altogether, correspond to 12,095,836 person-years of follow-up. Researchers found that COVID-19 participants, regardless of age, sex, ethnicity, and other cardiovascular risk factors (e.g. obesity, diabetes, and hypertension), were at increased risk of suffering from several cardiovascular diseases. Those who survived the first 30 days of COVID-19 (acute phase of COVID-19) exhibited an increased risk of stroke (Hazard Ratio 1.52), atrial fibrillation (HR 1.71), and pericarditis (1.85). The increased risk and excess burden of adverse cardiovascular outcomes extended up to a year. The authors recommended that global health systems should be prepared to handle a vast number of potentially affected people as the study reported a 12-month burden of cardiovascular diseases.

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2/8/2022	Working with long COVID: research evidence to inform support	Chartered Institute of Personnel and Development	<p>“In the Patient-Led Research Collaborative report of 3,765 respondents with long COVID, 45% reported that they were working reduced work schedules and 22% were not working due to their health condition. In a TUC survey of 3,557 workers with long COVID, 57% had returned to work fully with 16% returning to reduced hours.” Additionally, the TUC survey found that: 18% of respondents reported that the number of days taken as absent due to their condition has triggered formal absence management processes or disciplinaries; 4% reported that they had taken additional unpaid leave to avoid taking further sick leave; and 4% described being threatened with disciplinary proceedings, of which 1% translated into disciplinary action. CIPD and SimplyHealth surveyed of 804 organizations, representing more than 4.3 million employees, and found that: 46% have employees who have experienced long-COVID in the last 12 months, 26% of employers now include long-COVID among their main causes of long-term sickness absence; 20% of employers said they didn’t know whether any employees have experienced ongoing symptoms from COVID-19 in the last year, suggesting the problem could be underestimated as a workplace issue; and 26% of organizations are providing training/guidance for line managers on how to support people to stay at work when managing health conditions, and 19% provide guidance for employees.</p>
2/7/2022	Physical and mental health 3 months after SARS-CoV-2 infection (long COVID) among adolescents in England (CLoCk): a national matched cohort study	The Lancet Child and Adolescent Health	<p>A national cohort study of 6804 adolescents in the U.K. aged 11-17 years – of which 3065 had tested positive for COVID-19 and 3739 who tested negative – found that, at PCR testing, 35.4% who tested positive and 8.3% who tested negative were symptomatic. 30.5% from the test-positive group and 6.2% from the test-negative group had three or more symptoms. 3 months after COVID-19 testing, 66.5% who tested positive and 53.3% who tested negative had symptoms. 30.3% from the test-positive group and 16.2% from the test-negative group had three or more symptoms. At 3 months after initial infection, the most common symptoms were reported at the following prevalence rates: Tiredness: 39.0% of the test-positive group; 24.4% of the test-negative group; Headache: 23.2% of the test-positive group; 14.2% of the test-negative group; Shortness of breath: 23.4% of test positive group (not one of the top 3 symptoms for test-negative); Other/Unspecified: 15.8% of test negative (not one of the top 3 symptoms for test-negative); Latent class analysis identified two classes, characterized by few or multiple symptoms. The estimated probability of being in the multiple symptom class</p>

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			<p>was 29.6% for the test-positive group and 19.3% for the test-negative group. Those who had tested positive for COVID-19, females, older adolescents (age 15-17), and those with lower pretest physical and mental health were more likely to display multiple symptoms.</p>
2/12/2022	What We Know About Long Covid and Exercise	The New York Times	<p>A 31-year-old long-COVID patient was still experiencing multiple symptoms 18 months after initial infection. She saw a cardiologist and a pulmonologist who both ruled out other health issues and suggested she begin exercising, which exacerbated her symptoms and resulted in increased fatigue and an elevated resting heart rate. Self-reported data from more than a million Survivor Corps members show a similar trend – patients frequently report doctors suggesting they exercise, and many say that they feel worse after having done so. “The research that I’ve done has shown that inability to exercise is one of the most common long-term symptoms”. Studies into exercise intolerance after COVID-19 infection have resulted in the emergence of multiple theories as to why it occurs, including veins and arteries malfunctioning and preventing oxygen from being delivered efficiently to their muscles; damage to a certain kind of nerve fiber involved in how organs and blood vessel function; abnormal heart rate response; Postural orthostatic tachycardia syndrome (POTS, a disorder that affects blood flow); and chronic fatigue syndrome.</p>
2/10/2022	Impact of COVID-19 symptoms on social aspects of life among female long haulers: A qualitative study	BMC Public Health	<p>Researchers conducting 15 semi-structured interviews with female long haulers in the United States and found that participants reported persistent symptoms that negatively impacted their social lives in many ways, including physical limitation (two-dimensional: effects on body and mental wellbeing), financial hardship, social isolation, decreased social capital, conflicting social roles, and social stigma. These negative effects of long-COVID hindered female long haulers’ recovery process and cause tremendous stress.</p>

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2/16/2022	The effectiveness of vaccination against long COVID: A rapid evidence briefing	UK Security Health Agency	<p>People with COVID-19 who received 2 doses of the Pfizer, AstraZeneca, or Moderna vaccines or one dose of the Janssen vaccine, were about half as likely as people who received one dose or were unvaccinated to develop long-COVID symptoms lasting more than 28 days. Vaccine effectiveness against most long-COVID symptoms in adults was highest in people aged 60 years and over, and lowest for younger participants (19 to 35 years). In one study, 23.2% of vaccinated long-COVID participants said their symptoms improved compared to 15.4% of unvaccinated long-COVID participants Conclusion: “There is evidence that vaccinated people who are subsequently infected with COVID-19 are less likely to report symptoms of long COVID than unvaccinated people, in the short term (4 weeks after infection), medium term (12 to 20 weeks after infection) and long term (6 months after infection). This is in addition to any benefit of vaccination in preventing COVID-19 infection. There is also evidence that unvaccinated people with long COVID who were subsequently vaccinated had, on average, reduced long COVID symptoms (though some people reported worsened symptoms after vaccination). Additionally, there was evidence that unvaccinated people with long COVID who were subsequently vaccinated reported fewer long COVID symptoms than those who remained unvaccinated. However, there is a risk of bias across all studies due to differences in people who were vaccinated and unvaccinated, the measurement of outcomes, and in the selection of participants.”</p>
2/14/2022	Long COVID could be linked to the effects of SARS-CoV-2 on the vagus nerve	Medical Xpress	<p>New research to be presented at the European Congress of Clinical Microbiology and Infectious Diseases in April suggests that long-COVID symptoms could be linked to the effect of the virus on the vagus nerve, which extends from the brain down through the torso and is responsible for many bodily functions, including controlling heart rate, speech, the gag reflex, transferring food from the mouth to the stomach, moving food through the intestines, and sweating. A pilot evaluation of 348 long-COVID patients found that 66% showed at least one symptom suggestive of vagus nerve dysfunction (VND). Further analysis of the first 22 patients who exhibited VND symptoms found that the most frequent VND-related symptoms were diarrhea (73%), tachycardia (59%), dizziness (45%), dysphagia (45%), and orthostatic hypotension (14%). 86% of the subjects had at least three VND-related symptoms; and the median prior duration of symptoms was 14 months. 27% displayed alteration of the vagus nerve in the neck and 46% of subjects showed flattened ‘diaphragmatic curves’,</p>

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			<p>which translates a decrease in diaphragmatic mobility during breathing, or more simply abnormal breathing. 63% of assessed individuals showed reduced maximum inspiration pressures, showing weakness of breathing muscles. 72% (13 of 18) had a positive screen for self-perceived oropharyngeal dysphagia (trouble swallowing). 42% (8 of 19) had their ability to deliver food to the stomach (via the esophagus) impaired. Gastroesophageal reflux (acid reflux) was observed in 47% (9 of 19) of patients, 33% (3 of 9) of this subset had hiatal hernias.</p>
2/13/2022	Persistence, prevalence, and polymorphism of sequelae after COVID-19 in young adults	MedRxiv	<p>The study involved 501 Swiss army recruits (99.4% male, median age of 21 years). Compared to non-infected controls, participants who were six months removed from initial infection had higher body mass index, higher blood cholesterol, higher LDL cholesterol levels, and lower aerobic thresholds. Significant hyposomnia (reduced ability to smell) was observed in a higher number of COVID-19 cases patients less than six months after infection than in older cases. Compared to the control cases, a poorer sperm count was observed in recent infection cases than in less recent cases. Anxiety levels and scores of COVID-19-related post-traumatic stress disorder (PTSD) were notably higher in COVID-19 cases less than six months post-infection as compared to less recent infection cases. A limited ability to neutralize SARS-CoV-2 antibodies was observed in COVID-19-recovered patients who were unvaccinated while recovered and fully vaccinated individuals had a higher neutralization capacity</p>

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2/16/2022	Risks of mental health outcomes in people with covid-19: cohort study	BMJ	<p>Cohort comprising 153,848 people who survived the first 30 days of COVID-19, and two control groups: a contemporary group (n=5,637,840) with no evidence of SARS-CoV-2, and a historical control group (n=5,859,251) that predated the COVID-19 pandemic. The study found that, among those who survived the first 30 days of COVID-19, there was a 60% (HR 1.60) increased risk for having any new mental health diagnosis or a new mental health-related drug prescription, compared with those who were never infected – largely driven by an 86% (HR 1.86) increased risk in mental-health related drug prescriptions. Compared to those who were never infected, those who survived the first 30 days of COVID-19 were found to have an increased risk of developing anxiety disorders (HR 1.50), depressive disorders (HR 1.39), stress and adjustment disorders (HR 1.38), opioid substance use disorders (HR 1.34), non-opioid substance use disorders (HR 1.20), and sleep disorders (HR 1.41), as well as an 80% increased risk of neurocognitive decline (HR 1.80). People who were infected with COVID-19 had significantly higher risks for several new prescriptions versus individuals free of COVID infection, including any antidepressants (HR 1.55), SSRIs (HR 1.54), benzodiazepines (HR 1.65), any opioids (HR 1.76), Naloxone or naltrexone (HR 1.23), methadone (HR 1.94), and buprenorphine (HR 1.34). The risks of examined outcomes were increased even among people who were not admitted to hospital and were highest among those who were admitted to hospital during the acute phase of COVID-19. Results were consistent with those in the historical control group. The risk of incident mental health disorders was consistently higher in the COVID-19 group in comparisons of people with COVID-19 not admitted to hospital versus those not admitted to hospital for seasonal influenza; people admitted to hospital with COVID-19 versus those admitted to hospital with seasonal influenza; and people admitted to hospital with COVID-19 versus those admitted to hospital for any other cause.</p>
2/18/2022	Long COVID: post-acute sequelae of COVID-19 with a cardiovascular focus	European Heart Journal	<p>“The high burden of cardiopulmonary symptoms along with other organ manifestations underscores the need for multispecialty input, a model that is likely to also profit other chronic diseases. Proactive screening and investigation, where appropriate, could allay fears and anxiety among patients. Considerable efforts to find the right balance between cost-effective investigations and benefit to patients are needed to ensure sustainable service provision in these challenging economic times. Finally, the vast inequalities in healthcare provision exposed by COVID-19 will continue to be magnified</p>

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			<p>by long-COVID, a problem that calls for global humanitarian efforts to promote and fund equitable access to healthcare, social and welfare support, and vaccines across the world.”</p>
2/17/2022	<p>Efficacy of COVID-19 vaccination on the symptoms of patients with long COVID: a target trial emulation using data from the ComPaRe e-cohort in France</p>	<p>Nature via Research Square</p>	<p>N=910 adults in France who had a confirmed or suspected infection and reported persistence of COVID-19 symptoms after more than three months of illness with at least one symptom associated with long COVID. Median age=47, 80.5% females, >60% had a confirmed history of COVID-19. Among the 910 included patients, 455 patients who received their first COVID-19 vaccine injection between baseline and 60 days were classified in the ‘vaccination group’. The median interval between baseline and vaccination was 38 days. Of the vaccinated, (78.9%) had received the Pfizer vaccine. 16.6% of those in the vaccinated cohort had remission of all long COVID symptoms at 120 days after study baseline, compared to 7.5% of the control cohort. The long-COVID ST score (measuring severity) was slightly higher in the control group (14.8) than in the vaccination cohort (13). The long-COVID IT score was lower for vaccinated subjects (24.3) than controls (27.6), implying that the impact on patients' lives due to long COVID was significantly lower in the vaccination cohort than in the control group. The authors postulated that long-COVID might be due to any of the following three reasons: 1) persistent viral reservoir, 2) stimulation of immune system due to the presence of viral fragments, and 3) autoimmunity due to infection.</p>
2/23/2022	<p>Handheld breathing device reduces breathlessness and improves physical fitness in long COVID patients</p>	<p>Medical Xpress</p>	<p>New research presented at The Physiological Society's conference Long COVID: Mechanisms, Risk Factors, and Recovery held February 22–23 shows that a small handheld breathing device helped reduced breathlessness and improved physical fitness of people with long COVID. In a study of 148 long-COVID patients (most of whom had not been hospitalized due to COVID-19 infection), those in the intervention group were given with a breathing device and performed breathing exercises for 20 minutes a day, 3 times a week for 8 weeks. Compared to controls, the intervention group saw a 33% reduction in breathlessness, a 10% increase in estimated fitness, an approximately 36% increase in respiratory strength, and 2 to 14 times greater health improvements.</p>

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2/23/2022	Long COVID 12 months after discharge: persistent symptoms in patients hospitalised due to COVID-19 and patients hospitalised due to other causes-a multicentre cohort study	BMC Med	<p>This prospective cohort study was conducted in 4 hospitals and 29 primary care centers in Spain, exploring the presence of long-term-specific sequelae or persistent symptoms (SPS) 12 months after discharge in survivors hospitalized due to COVID-19 compared to survivors hospitalized due to other causes. N=906; 453 adult patients hospitalized due to COVID-19 and 453 adult patients hospitalized due to other causes from March 1 to April 15, 2020. 36.1% of COVID-19 patients and 35.3% of non-COVID patients showed at least one SPS at 12 months after discharge. Most prevalent SPS in the COVID-19 group 12 months after discharge were persistent pharyngeal symptoms, neurological SPS, confusion or memory loss, thrombotic events, and anxiety. 12 months after discharge, the COVID-19 group showed higher incidence rates of the following SPS, compared to non-COVID patients: pharyngeal symptoms (risk ratio: 8.00), confusion or memory loss (RR 3.5), and anxiety symptoms: (RR: 2.36).</p>
2/22/2022	Persistence of residual SARS-CoV-2 viral antigen and RNA in tissues of patients with long COVID-19	Research Square	<p>Evaluated whether residual viral antigens and viral RNA were present in tissues obtained from the skin, breast, and appendix of two long-COVID patients, approximately 6 to 18 months after COVID-19 diagnosis. “To rule out non-specific staining and to validate our findings, SARS-CoV-2 NP antibody was tested on gastrointestinal tissues that had been previously obtained before 2019 from a separate cohort.” The residual virus was detected within the appendix and tumor-adjacent region of breast tissue by IHC - no viral antigens were identified in the tumor. The skin did not take up the ICH stain, probably due to the high cellular turnover rate of skin cells. Negative-sense RNA and positive-sense RNA were detected in the breast and appendix tissues using RNAscope, indicating constant viral replication.</p>
2/23/2022	Persistent cardiac injury – An important component of long COVID-19 syndrome	EBio Medicine	<p>Acute cardiac injury (ACI), marked by elevation of troponin levels in the blood over the 99th percentile, is shown to occur in nearly 30% of patients admitted to the hospital with COVID-19 infection. A recent study found that, among the 673 patients who developed ACI and had a follow-up visit, 55.1% had persistent elevation in troponin levels over a median follow-up of 2.5 months. “The authors have made a significant case that COVID-19 is associated with persistent cardiac injury in some patients even after the primary infection has resolved.” Kotecha et al. performed cardiac magnetic resonance (CMR) studies in 148 patients with severe COVID-19 and persistent troponin elevation at a median of 68 days post-discharge and observed late gadolinium enhancement and/or ischemia in 54% of patients. The authors postulate that</p>

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			<p>one of the mechanisms leading to persistent cardiac injury in COVID-19 patients after initial infection could be the harboring of SARS-CoV-2 RNA in various tissues in the body for up to 230 days.</p>
2/22/2022	Exploring Trajectory Curves from Loss of Smell and Taste in Previously Hospitalized COVID-19 Survivors: the LONG-COVID-EXP-CM Multicenter Study	Journal of General Internal Medicine	<p>The LONG-COVID-EXP-CM is a multicenter cohort study including patients with a positive diagnosis of SARS-CoV-2 hospitalized during the first wave of the pandemic in five urban hospitals of Madrid (Spain). N=1593; 45% female; median age = 61. Assessed at T0 (hospital admission), T1 (mean: 8.4 months) and T2 (mean: 13.2 months) after discharge. The prevalence of anosmia (loss of smell) decreased from 8.1% at T0, to 4.0% at T1, to 3.1% at T2. 91% of those patients experiencing anosmia at hospitalization had recovered 7 months after. 82% of those with anosmia at T1 had developed it “de novo” (did not experience anosmia at T0). The prevalence of ageusia (loss of taste) decreased from 7.1% at T0, to 3.0% at T1, to 1.75% at T2. 90% of individuals experiencing ageusia at hospitalization had recovered 7 months after. 77% of patients with ageusia at T1 had developed it “de novo”.</p>
2/25/2022	A master autoantigenome links alternative splicing, female predilection, and COVID-19 to autoimmune diseases	Journal of Translational Autoimmunity	<p>The authors compiled a master autoantigenome of 751 potential autoAgs, 657 of which are affected in SARS-CoV-2 infection, and 400 of which are confirmed autoAgs in a wide variety of autoimmune diseases and cancer. “The large number of autoAg candidates associated with SARS-CoV-2 infection provides a mechanistic rationale for the close monitoring of autoimmune diseases that may follow the COVID-19 pandemic.” Additionally, they proposed model to explain how viral infections in general and SARS-CoV-2 in particular can lead to a wide array of autoimmune diseases.</p>
2/28/2022	COVID-19 Schools Infection Survey, England: mental health and long COVID, November to December 2021	UK Office for National Statistics	<p>Since March 2020, 1.0% of primary school-aged students (approximately 4-11 years old) and 2.7% of secondary school-aged students (approximately 11-18 years old) met the Delphi criteria for having experienced long-COVID lasting at least 12 weeks. Delphi criteria is defined as meeting all three conditions: (1) a positive COVID test; (2) the presence of symptoms continuously over a 12-week period or longer; and (3) everyday life is affected by these symptoms. Primary school children with long-COVID (under the Delphi criteria) were significantly more likely to have a probable mental</p>

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			<p>disorder (30.0%) than those without long-COVID (7.7%). Secondary school students with long-COVID under the Delphi criteria were also found to be more likely to have a probable mental disorder than those without long-COVID (22.6% compared with 13.6%), but this is not statistically significant. Both primary and secondary school students who tested positive for COVID-19 showed no significant difference in the number presenting with a "probable mental disorder" compared with those without a positive test. Note: This analysis does not account for mental health status before having COVID-19, thus causality cannot be inferred.</p>
2/28/2022	<p>What is long covid? Current understanding about risks, symptoms and recovery</p>	The Washington Post	<p>Covers the following questions: What is long-COVID? How is long-COVID diagnosed? Are there risk factors? What about long-COVID in children? What is the treatment for long-COVID? What should you do if you think you have long-COVID?</p> <p>Notable quotes from experts: “In the U.S., there’s been basically about 80 million people that have been infected,” he said. “If there’s even 1 percent, just 1 percent of that, you’ve got 800,000 people that are at risk of being affected, and that’s probably an underestimate, frankly.” – Bruce Levy, chief of the division of pulmonary and critical care medicine at Brigham and Women’s Hospital in Boston. “This is a condition that we don’t even have an agreed upon name for yet, and we don’t have any understanding really of what’s going on down at a chemical level. So, until we have that kind of understanding, it’s really important that we not make quick decisions about what long covid can or can’t be.” - Greg Vanichkachorn, medical director of Mayo Clinic’s COVID-19 Activity Rehabilitation Program.</p> <p>Highlighted in the article: Variations in how public health agencies define long-COVID; Symptomology; Wide array of symptoms and severity among long-COVID patients; The four “key cause theories”: type 2 diabetes, viral RNA load during initial infection, latent Epstein-Barr virus in the body, and autoantibodies; Brief mention of research being done on COVID-19 vaccines ability to protect from long-COVID; Post-COVID recovery programs and clinics</p>