



Brain Injury & COVID-19

Literature Review to Inform Recommendations for the Brain Injury
State Plan in Nebraska

Brain Injury & COVID-19 Literature Review

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Executive Summary

Area 1: Health Impacts of COVID-19 on People with Brain Injury (PWBI)



The following were noted in the literature regarding health impacts people with brain injury have due to COVID-19.

- ▶ Changes in mental health
- ▶ Concerns about isolation
- ▶ Pandemic changed ability for TBI patients to have access to services
- ▶ COVID-19 was an “amplifier” of violence
- ▶ Increased linkage/concerns about alcohol usage

Area 2: Impact of Pandemic on PWBI & Family Members/Caregivers



The literature mentioned the following impacts (positive and negative) the pandemic had on individuals with brain injury as well as their family members and caregivers.

- ▶ The mental health of caregivers is closely related to patients’ health outcomes.
- ▶ Lack of information provided to caregivers due to them not being allowed in the clinic setting.
- ▶ Pandemic forced many caregivers into a distant caregiving role, creating anxiety and distress.
- ▶ There is a huge benefit to seeing family during injury recovery.
- ▶ One key gap is to identify how best to support caregivers’ mental health.

Area 3: COVID-19 Long Haul Symptoms



Many of the long-haul symptoms and lasting health impacts of COVID-19 mimic what individuals with brain injury experience. Literature on COVID-19 long haul symptoms notes:

- ▶ Individuals with long COVID-19 experienced an increase in mental health concerns and reported reduced cognitive performance.
- ▶ Preliminary findings suggest that long haul symptoms may improve over time.
- ▶ COVID-19 has not been around long enough to decipher its long-lasting effects on infected patients (specifically those with TBI).

Area 4: Access to Rehabilitation & Community Based Services



Through the literature, the following themes emerged regarding ability for individuals with brain injury to access services.

- ▶ There was an increase in telehealth services provided, which helped those in medically underserved areas have access to care.
- ▶ The increase in telehealth services was a challenge to those with cognitive and sensory deficits.
- ▶ COVID-19 may have exacerbated other systemic issues for certain populations getting access to services.
- ▶ A key area for additional research is how to empower individuals with TBIs and their caregivers to connect virtually.

Other Areas



Additional areas were explored based in initial findings from the literature. This included:

- ▶ Ideal time between injury and rehabilitation services, primary to determine how the pandemic may have created delays or enhanced rehab services due to social distancing restrictions.
- ▶ Vaccination side effects.
- ▶ Returning to work (among individuals with brain injury and those who have not experienced a brain injury by had symptoms from COVID-19).

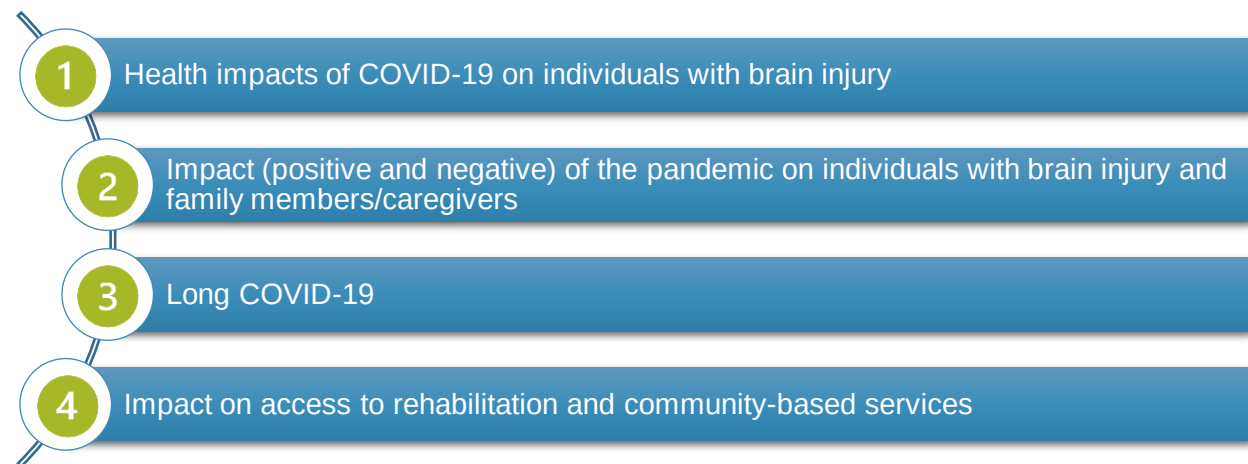
Background

In March 2022, Nebraska VR (Vocational Rehabilitation) developed a Brain Injury Data Workgroup. The intent of the workgroup is to identify ways to better capture the prevalence of brain injury in the state. In addition to understanding how many people in Nebraska may have experienced a brain injury – and particularly those that were considered traumatic brain injury rather than acquired – a key focus is on understanding the demographics and needs among those with brain injury.

A sub-group was formed under the Brain Injury Data Workgroup in June 2022 to explore the connection between brain injury and COVID-19. This was done as part of a supplemental funding opportunity through the Administration for Community Living.¹ The primary goal for this sub-group is to identify and provide recommendations to the Brain Injury Advisory Council regarding activities or strategies that could be integrated into Nebraska's Brain Injury State Plan to mitigate and overcome the effects of the COVID-19 pandemic.

During the first meeting, the sub-group identified four key priority areas to explore (Figure 1). To better understand current research to inform the recommendations, Partners for Insightful Evaluation (PIE) conducted a literature review. A literature review provides an opportunity to not only provide foundational knowledge on a topic, but also identify where there may be gaps in information about a topic. One of the key reasons to conduct a literature review is to identify current themes and recent developments on the topic.

Figure 1: Four areas were explored to inform recommendations for the Brain Injury State Plan related to COVID-19



One challenge with this work is that what is known about COVID-19, especially in relation to brain injury, is ever changing. This literature review aims to compile as much recent information as possible, with additions being made as more articles and research are published. **This current document covers information compiled through May 2023.**

Beyond looking to the four key areas identified in Figure 1, additional areas have and will continue to be explored through the literature review.

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Structure of Document

Each of the focus areas include the following sections:

Overview	Describes what the workgroup wanted to explore and the list of search terms used when conducting the literature review.
Summary of Literature	Table summarizing information for each article. In addition to information about the publication (such as first author, journal, and title of paper), it includes the key findings or results.
Themes by Article	Summarizes each article in 1-2 sentences, providing a way to more efficient way to see the key themes from the literature.
Potential Gaps	Outlines any gaps or additional areas of research that are mentioned in the articles. This highlights what may not be known or still needs to be explored through research.

Based on the findings from the literature review, recommendations and resources will also be compiled for Nebraska. This will be outlined in a separate document.

Focus Area 1: Health impacts of COVID-19 for those with brain injury

Overview

This topic area is focused on understanding the health impacts that COVID-19 has on individuals with brain injury. This could be individuals who had a brain injury prior to having COVID-19, or individuals who experienced a brain injury after having COVID-19. Through the literature review, Nebraska will capture how other states or countries have assessed this and what the findings have been.

Key search terms used: health impacts of Covid-19 and TBI, Covid-19 and TBI, TBI and pandemic health, Covid-19 Health with TBI, TBI and Covid-19

Summary of Literature

2023 & 2024*						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Ovalles, Anell, Ashlyn Bulas, and Kristen Dams-O'Connor.	"Impact of COVID-19 on Individuals with TBI: Nationwide Cross-Sectional Study." <i>Archives of Physical Medicine and Rehabilitation</i> 104.3 (2023): e33.		To investigate the impact of the COVID-19 pandemic on the health and life quality of individuals living with traumatic brain injury (TBI) in the United States.	In this diverse nationwide sample, - 55% of individuals with TBI lost wages due to the COVID-19 pandemic; - Only 16% felt they were able to pay for basic needs (food, shelter, heat). - Those with TBI reported substantially elevated worry and isolation; 29% reported their cognitive function and 36% felt their mood (36%) had changed due to social-distancing and/or shelter-in-place orders. - The majority met criteria for clinically significant depression (78%) and/or anxiety (76%). - Only 11% reported increased alcohol use, and 24% reduced use; however, 24% reported high-risk prescription pain medication use. - Recent physical and verbal violence was common: only 30% indicating that others "never" physically hurt them, and only 42% said they were "never" verbally abused.		Control comparison data suggest disproportionate burden among those with TBI.
Engelking, Toby, et al.	"The impact of Covid-19 on children and young people with acquired brain injuries: A mixed method study." <i>Neuropsychologist</i> 17 (2024).***		To explore the effect of this on the mental health of children and young people with acquired brain injuries (ABI) during COVID-19	Children and young people with ABI experienced greater peer problems and emotional problems than those without an ABI during Covid-19. Parents felt unsupported with their children's education, and they experienced isolation.		This study shows the mental health risk of social isolation for this population but also explores what positives can be learned from the Covid-19 pandemic such as the benefits of a less demanding learning environment and online/in-person hybrid service delivery.
Keetley, Rachel, et al.	"Child and family health-related quality of life and participation outcomes and goals after acquired brain injury: a cross-sectional survey." <i>Brain injury</i> 38.3 (2024): 217-226.		To explore longer-term health-related quality of life (HRQoL) and participation outcomes and goals of children and young people (CYP) with acquired brain injuries (ABI) and their families in a region of the UK and the impact of the COVID-19 pandemic.	67% of CYP were at risk of impaired HRQoL, 72% had severely impaired participation. 53% of parent-carers reported reduced HRQoL and family functioning, 37% of parent-carers screened positive for anxiety/depression. Relationships exist between CYP participation and HRQoL and parental HRQoL and family functioning. Goals were overwhelmingly activity and participation focused. Participants described the global impact of an ABI on the CYP and family as well as the additional impact of the COVID-19 pandemic on CYP and family wellbeing.		Holistic long-term care is vital to effectively monitor and address existing and emerging needs as CYP and families navigate their rehabilitation journey and re-build their lives.
Kersey, Jessica, Amy R. McArthur, and Joy Hammel.	"Ongoing challenges related to the COVID-19 pandemic among people with brain		To examine how changes in personal factors, environmental factors, or the characteristics of	We identified two primary themes with sub-themes: (1) social isolation experiences: (1a) emotional impact and (1b) managing personal risk; and (2) greater barriers but a lack of strategies to address them: (2a) access		Occupational therapy can develop new strategies to re-balance the person–

injury." <i>OTJR: Occupational Therapy Journal of Research</i> (2024): 15394492241233260.	activities affected social participation for people with TBI during the COVID-19 pandemic	and opportunities and (2b) social and societal factors. New environmental barriers and task demands affected occupational performance, and participants identified few successful strategies to overcome these barriers.	environment fit and enhance social participation.
Pinto, Shanti M., et al. "Prevalence of self-reported COVID-19 infection in persons with complicated mild to severe traumatic brain injury (TBI): A TBI model systems study." <i>American Journal of Physical Medicine & Rehabilitation</i> (2024): 10-1097.***	To describe the incidence of self-reported COVID-19 history in a longitudinal cohort of individuals with complicated mild to severe traumatic brain injury (TBI) and describe demographic, injury and functional differences based on history of COVID-19 infection.	Of the 3,627 individuals included in the analysis, 29.5% reported a history of COVID-19 infection. Those with reported COVID-19 history tended to be younger, not of a racial/ethnic minority background, and greater functional status at follow-up based on the Glasgow Outcome Scale-Extended scale compared to those with no reported COVID-19 history ($p < 0.05$). Among those with COVID-19 history, 61.8% did not receive medical care, 27.6% received medical care but no hospitalization, and 10.5% were hospitalized. Of those hospitalized, 21.4% required ventilator use.	Incidence of COVID-19 diagnosis and related hospitalization characteristics in persons with complicated mild to severe TBI was similar to national incidence between March 2020-2023. Secondary effects of the COVID-19 pandemic on persons with TBI require investigation.
Bellon, Michelle, et al. "Community in the pandemic: experiences and strategies by people with acquired brain injury and their families during COVID-19." <i>Disability and Rehabilitation</i> 45.6 (2023): 1038-1045.	To explore experiences of people with acquired brain injury and their families during the COVID-19 pandemic, focusing on how they maintained their communities and sense of belonging, the strategies they found helpful, and advice they have for improving service provision and community connectedness.	Four primary themes were identified from the findings: (1) disruptions to routine; (2) social isolation; (3) using technology; and (4) strategies for staying safe and keeping well.	The study reinforces the role of robust peer/support networks to stay connected, stay well and support others. Government, health services and community groups must provide clear and accessible information and supports, and regularly reach out to ensure the safety and wellbeing of people with ABI and their families during the pandemic.
Carlacci De Mattia, Lucilla, Tomás Campbell, and Neil Parrett. "Impact of Covid-19 lockdown on the mood, behaviour, and social activities of people with brain injury in the UK: Results of a survey of brain injury professionals' reports." <i>Neuropsychologist</i> 15 (2023).	To explore the impact of the Covid-19 related lockdown of March–June 2020 in the United Kingdom (UK) may on the mood and behavior of people with brain injuries.	Care coordinators (n=19) assessed the consequences of lockdown on 130 individuals with ABI (range 3–29 clients per care coordinator; 10–65years+; and mostly living in residential care). The majority of reports were of no change to mood, behavior, or social functioning (105 ratings). However, respondents reported that 88 (68 percent) clients presented with changes: 63 clients (48 percent) had lower mood, higher distress, and agitation, and were less engaged in usual activities; while 25 clients (19 percent) were reported to have improved. Moreover, 13/19 (68 percent) of respondents reported increased vulnerabilities in their clients, and 5/19 (26 percent) reported online exploitation, controlling behavior from partner and financial scams. These data present a mixed picture of how the first national lockdown affected people with ABI.	The data showed a mixed picture with most people showing some deterioration in at least one domain of functioning (mood, behavior, social engagement).
Chassman, Stephanie, et al. "The impact of COVID-19 on access to resources among individuals experiencing homelessness and traumatic brain injury." <i>Trauma Care</i> 3.1 (2023): 24-36.	This study aimed to answer the following research question: What is the impact of COVID-19 on access to resources among individuals experiencing homelessness and TBI?	Three primary themes emerged regarding the types of resources that were restricted by COVID-19: basic/biological needs, financial needs, and a lack of connection.	COVID-19 has shown the social work field the need for continued innovation and better practice standards for individuals who are not housed. For those living with a reported TBI history and experiencing homelessness, COVID-19 made it difficult to access basic services for survival.
Devinne, Sylvia, et al. "Impact of the COVID-19 Pandemic on Participation for Persons with Brain Injury: A Qualitative Analysis." <i>Archives of Physical Medicine and Rehabilitation</i> 104.3 (2023): e34. [Research poster]	To understand the impact of the COVID-19 pandemic on participation for persons with traumatic brain injury.	Several themes emerged relating to participation during the COVID-19 pandemic for people with TBI including: 1) transitioning remote, 2) normalization of 'stay at home' lifestyle, 3) mental health implications, and 4) impact of pandemic mandates on participation. Within these themes, many respondents identified challenges such as isolation, depression, and fear of infection; however, respondents also identified positive experiences such as feeling that participation challenges were no longer restricted to those with TBI or other disabilities, new opportunities for socializing, and more remote job opportunities that eliminate the need for transportation and ability to perform in a distracting environment.	The experiences of participation for people with TBI during the COVID-19 pandemic had many similarities to the experiences of the general population; however, these findings suggest that people with TBI also have distinct positive experiences. There may be an element of resiliency in social engagement that individuals develop post TBI that warrants further investigation as society continues to transition to pre-pandemic patterns.

Hanafy, Sara, et al. "Employment and accommodation needs and the effect of COVID-19 on men and women with traumatic brain injury." <i>Work</i> 75.1 (2023): 41-58.	To investigate support services and workplace accommodation and the impact of COVID19 on work and mental health for persons with TBI, considering sex and gender	Modified hours/days and modified/different duties were the most needed workplace accommodations. Mental challenges impacting well-being was a highlighted concern for both men and women. Women scored poorer on the daily activity domain of the Quality of Life after Brain Injury– Overall Scale ($p=0.02$). Assistance with daily activities was highlighted by women for a successful transition to work, including housekeeping and caregiving. Men were more likely than women to experience change in employment status because of COVID-19 ($p=0.02$). Further, a higher percentage of men expressed concern about the inability to pay for living accommodations, losing their job, and not having future job prospects.	Findings reveal important differences between men and women when transitioning to work post-TBI and emphasize the need for sex and gender considerations.
Katta-Charles, Sheryl, et al. "Depression, anxiety, and suicidality in individuals with chronic traumatic brain injury before and during the COVID-19 pandemic: a National Institute on Disability, Independent Living, and Rehabilitation Research Traumatic Brain Injury Model Systems Study." <i>Archives of physical medicine and rehabilitation</i> 104.4 (2023): 619-630.	To examine the prevalence of depression, anxiety, and suicidality in individuals with chronic traumatic brain injury before and during the COVID-19 pandemic	No meaningful differences in depression, anxiety, or suicidal ideation were observed before vs during the COVID-19 pandemic. Correlations between predictors and mental health outcomes were similar before and during the pandemic.	Contrary to our predictions, the prevalence, severity, and correlates of mental health conditions were similar before and during the COVID-19 pandemic. Results may reflect generalized resilience and are consistent with the most recent findings from the general population that indicate only small, transient increases in psychological distress associated with the pandemic. While unworsened, depression, anxiety, and suicidal ideation remain prevalent and merit focused treatment and research efforts.
Kim, Rachel C., et al. "Pediatric traumatic brain injury outcomes and disparities during the COVID-19 pandemic." <i>Journal of pediatric surgery</i> 59.5 (2024): 893-899.	To study the impact of the COVID-19 pandemic on traumatic brain injury (TBI) patient demographic, clinical and trauma related characteristics, and outcomes.	Four hundred-thirty patients were treated for pediatric TBI in the pre-COVID-19 period, and 166 patients during COVID-19. In bivariate analyses, the racial/ethnic makeup, age, and sex varied significantly across the two time periods ($p < 0.05$). Unwitnessed TBI events increased during the COVID-19 era. Logistic regression analyses also demonstrated significantly increased odds of death, severe disability, or vegetative state during COVID-19 (AOR 7.23; 95 % CI 1.43, 36.41).	During the COVID-19 pandemic, patients admitted with pediatric TBI had significantly different demographics with regards to age, sex, and race/ethnicity when compared to patients prior to the pandemic. There was an increase in unwitnessed events. In the COVID period, patients had a higher odds ratio of severe morbidity and mortality despite adjustment for confounding factors.
Leiphart, Thaddeus J., and James Leiphart. "The effect of the COVID-19 pandemic and lockdown on operative traumatic brain injury in Northern Virginia." <i>Cureus</i> 15.9 (2023).	To use state and hospital data to determine whether the COVID-19 pandemic had a significant impact on surgeries for traumatic brain injury (TBI).	When comparing the data, there was a 60% reduction in cases of operative TBI during the peak months of COVID-19 compared to the same months in previous years ($p<0.005$). Comparing data on the number of Virginia and Northern Virginia COVID-19 cases and data on the age of individuals undergoing TBI surgery four weeks later showed a statistically significant negative correlation ($p<0.05$) in which the average age of individuals undergoing TBI surgery was lower in the four-week block following a four-week block of increased COVID-19 incidence.	Our findings indicate a correlation between the period of decreased activity from COVID-19 restrictions in Virginia and a decline in both the number of TBI surgeries and the age of individuals undergoing these surgeries.
Moreno, Alexander, Hua Sun, and Michelle McKerral. "Social participation and health-related quality of life before and during the second wave of the Covid-19 pandemic in individuals with traumatic brain injury: a follow-up exploratory correlational study." <i>Journal of Rehabilitation Medicine</i> 55 (2023).	To compare social participation and health-related quality of life (HRQoL) in a sample of individuals with TBI before and during the second wave of COVID-19 and explore the relationships between the perceived impacts of COVID-19, social participation, and HRQoL.	Compared with pre-pandemic levels, individuals with traumatic brain injury reported a statistically significant decrease in the Quality of Life after Brain Injury Questionnaire total score and its emotional subscale (with medium to large effect sizes), but without statistically significant differences in Mayo-Portland Adaptability Inventory-4th edition scores. Increased difficulties with access to resources during COVID-19 were associated with increased adjustment problems on the Mayo-Portland Adaptability Inventory-4th edition, and with daily life and autonomy difficulties, emotional issues, and lower physical functioning on the Quality of Life after Brain Injury Questionnaire.	The relationships identified in this exploratory correlational study suggest that COVID-19 had a negative impact on quality of life in individuals with traumatic brain injury, but not specifically on their social participation.
Sung, Jonghyun, et al. "Comparison of clinical characteristics of traumatic brain injury	To investigate the change in the number of patients with head	Between 2020 and 2021, the number of patients with traumatic brain injury decreased by 251 (32%). No significant differences were observed in sex,	Partial restrictions on social activities owing to COVID-19 are ongoing. Further

patients according to the mechanism before and after COVID-19." <i>Korean Journal of Neurotrauma</i> 19.3 (2023): 307.	trauma according to the trauma mechanism among severely injured patients transferred to the emergency department of Wonju Severance Christian Hospital before and during the coronavirus disease 2019 (COVID-19) pandemic.	age, or time of accident. From 2020 to 2021, among the trauma mechanisms, the number of cases involving rolling down slightly reduced compared with those involving other mechanisms. Furthermore, cerebral contusions among intracranial lesions significantly increased during the COVID-19 pandemic.	investigation of the clinical characteristics of trauma patients over a longer period is required.
Venkatesan, Umesh M., et al. "Societal participation of people with traumatic brain injury before and during the COVID-19 pandemic: a NIDILRR Traumatic Brain Injury Model Systems Study." <i>Archives of physical medicine and rehabilitation</i> 104.7 (2023): 1041-1053.	To examine the effect of the COVID-19 pandemic on societal participation in people with moderate-to-severe traumatic brain injury (TBI).	Out and About, but not Productivity or Social Relations, scores were appreciably lower among DP (during pandemic) participants compared to PP (pre-pandemic) participants (medium effect). Demographic and clinical characteristics showed similar patterns of association with participation domains across PP and DP. When their unique contributions were examined in regression models, age, self-identified race, education level, employment status, marital status, income level, disability severity, and life satisfaction were variably predictive of participation domains, though most effects were small or medium in size. Depression and anxiety symptom severities each showed small zero-order correlations with participation domains across PP and DP but had negligible effects in regression analyses.	Consistent with the effect of COVID-19 on participation levels in the general population, people with TBI reported less community involvement during the pandemic, potentially compounding existing postinjury challenges to societal integration. The pandemic does not appear to have altered patterns of association between demographic/clinical characteristics and participation. Assessing and addressing barriers to community involvement should be a priority for TBI treatment providers. Longitudinal studies of TBI that consider pandemic-related effects on participation and other societally linked outcomes will help to elucidate the potential longer-term effect the pandemic has on behavioral health in this population.

*For 2024, January through August 2024 only. Inclusion criteria for this literature review were: A focus on people with TBI and their physical and mental health, to include factors related to physical and mental health. Only results from the first two pages of electronic search results are included. Exclusion criteria for this literature review section include articles focused on the COVID-19 virus as a causal factor in TBI and/or TBI-type symptoms and articles related to any of the other focus areas.

*** Full text not available

2022						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Damara	Epidemiological Pattern of Traumatic Brain Injury in the COVID-19 Pandemic: A Systematic Review and Meta-Analysis	Elsevier	We evaluated the severity of TBI, mortality, presence of neurological deficits, radiology diagnosis, cause of injury, and the type of management of TBI during versus before the pandemic.	Compared with before the pandemic, the TBI mortality rate had increased during the COVID-19 pandemic in the low-to middle-income countries. In addition, the radiological findings showed a reduced rate of Subdural hematoma in low-to middle-income countries and an increased incidence of Subarachnoid hemorrhage in high income countries. Our overall analysis showed an increased rate of assaults as the cause of TBI, especially in low-to middle-income countries.	A total of 18,490 subjects from 13 studies were included in the present study. The results of the meta- analysis showed a higher TBI mortality rate during the COVID-19 pandemic in the low-to-middle income countries (odds ratio,1.65;95%confidence interval,1.12e2.41; P < 0.05; I2 [40.8%; P [0.18)	Our results have indicated that during the COVID-19 pandemic, the TBI mortality rate had increased in low- to middle-income countries. The rate of assault as the cause of TBI had also increased during the pandemic.
De Luca	Is the "Family Glass Cabin" Useful to Safely Allow Inpatient– Caregiver Interaction in the COVID-19 Era? A	Journal of Clinical Medicine	This study aimed at investigating the role of a "Family Glass Cabin" (FGC) both in improving cognitive function and communicative abilities of people with ABI and in potentiating the	Although the majority of people infected with SARS-CoV-2 fully recover within a few weeks, a considerable number of patients still suffer from long-lasting problems similar to multi-organ damage in the acute phase of infection or experience	An increase in psychosocial and behavioral problems was indeed shown in ABI patients. In fact, the Headway survey indicated that 65% of their ABI respondents reported feeling isolated as a result of lockdown, and 60%	Indeed, this promising tool may safely overcome social distance to allow direct contact between people with ABI and their caregivers. It was observed that the FGC had positive effects on both stimulating functional recovery in the patients and reducing

	Pilot Study on Severe Acquired Brain Injury		mental health of their caregivers.	symptoms continuously for a long time after recovery	reported that this had a negative impact on their mental health (including increased anxiety and fear of their future). The health emergency, in fact, has not allowed canonical medical visits, as health workers have been employed in acute COVID-19 services. This has led to increased psycho-social distress, anxiety, isolation, and apathy. Moreover, without the support offered by family and friends during hospitalization, these patients experienced extraordinary social isolation, which further increased stress, anxiety, and depression, with a negative impact on their motivation to participate in physiotherapy and rehabilitation	anxiety and burden in their caregivers. In particular, our data suggest that the real presence of a caregiver (although mediated by the FGC) can be useful to potentiate general communication and interpersonal abilities and improve the global cognitive status and sensory-motor outcomes of patients with ABI. Moreover, the FGC was also useful to provide not only the patients but also their caregivers with an emotional and social experience promoting the caregivers' psychological well-being. Indeed, caregivers' emotional burden and anxiety symptoms were significantly reduced at the end of the experiment.
Dreer	The Impact of the COVID-19 Pandemic on Aspects of Health Among Community Dwelling Survivors of a Moderate-Severe Traumatic Brain Injury (TBI)	Archives of Physical Medicine and rehabilitation	To understand the impact of the COVID-19 pandemic on aspects of health and lifestyle behaviors among community dwelling survivors of a traumatic brain injury (TBI).	The pandemic negatively impacts numerous health areas among community dwelling survivors of TBI. All health areas were endorsed as goals of interest for change. The top five health goals included: physical activity and exercise (92.9%), mental activity (85.7%), nutrition and dietary intake (78.6%), health knowledge and information (78.6%), and stress management (71.4%) which are tied with mental health (71.4%). To a somewhat lesser extent, social relationships (64.3%), spirituality/purpose and meaning (50.0%), sleep (35.7%), leisure (28.6%), alcohol use (17.9%), and tobacco use (17.9%) were also of interest. Every health goal received at least one ranking of being a number one goal to address as part of a health intervention.		Given the range of health goals that individuals ranked as first choice preferences, the findings highlight the need for health and wellness programs that can be individually tailored.
García-Rudolph	The impact of COVID-19 on home, social, and productivity integration of people with chronic traumatic brain injury or stroke living in the community	Medicine	Compare community integration of people with stroke or TBI living in the community before and during the coronavirus severe acute respiratory syndrome coronavirus 2 disease (COVID-19)	The older age group (54+ age group) significantly reduced their participation in home activities, being this the only group who did.	This older group significantly increased their productivity activities, as well as the individuals with lower level of independence (G4), men (G8), and individuals with stroke	Specialized support needed for specific groups
Haag	The Shadow Pandemic: A Qualitative Exploration of the	J Head Trauma Rehabil	To explore the impact of the COVID-19 pandemic on survivors and service providers.	COVID-19 has increased rates and severity of intimate partner violence (IPV) and barriers to services in terms of both provision and uptake. Three main themes		The COVID-19 pandemic has intensified IPV/BI, increased challenges for women survivors and service providers, and accentuated

	Impacts of COVID-19 on Service Providers and Women Survivors of Intimate Partner Violence and Brain Injury			emerged: (1) implications for women survivors of IPV/BI; (2) implications for service delivery and service providers supporting women survivors of IPV/BI; and (3) key priorities. Increased risk, complex challenges to mental health, and the impact on employment were discussed. Adaptability and flexibility of service delivery were identified as significant issues, and increased outreach and adaptation of technology-based services were noted as key priorities.		the continued lack of IPV/BI awareness. Recommendations for service delivery and uptake are discussed.
Kim	Differential Impact of the COVID-19 Pandemic on Health Care Utilization Disruption for Community-Dwelling Individuals with and Without Acquired Brain Injury	Archives of Rehabilitation Research and Clinical Translation	To delineate health care disruption for individuals with acquired brain injury (ABI) during the peak of the pandemic and to understand the impact of health care disruption on health-related quality of life (HRQoL).		Individuals with and without disability living in the community experienced pronounced disruption in TBI- and stroke specific care, health care related general and major medical care, and mental health care. However, those who experienced a disruption in care specific to TBI or mental health care were most vulnerable to decreased HRQoL. While people with ABI used telehealth as a viable alternative to in-person visits during the pandemic, it is not a panacea and should be adopted using a nuanced approach.	Evidence supports additional need for telehealth options. Telehealth was a viable alternative to in-person visits for individuals with and without ABI, but limitations included difficulty with technology, difficulty with comprehensive examination, and decreased rapport with providers.
Kumar	Changes in alcohol use and mood during the COVID-19 pandemic among individuals with traumatic brain injury: A difference-in-difference study	PLoS One	To evaluate the impact of COVID-19 pandemic exposure on changes in alcohol use and mood from years 1 to 2 after traumatic brain injury (TBI).	Among persons living with TBI, those exposed to the pandemic had significant increases in average alcohol consumption.	Pandemic-exposed Hispanics with TBI had large elevations in anxiety symptoms, perhaps reflecting health inequities exacerbated by the pandemic, and suggesting a need for targeted monitoring of psychosocial distress.	Overall, there were no significant changes in depressive and anxiety symptoms over time between pandemic exposed and unexposed groups; however, pandemic-exposed Hispanics with TBI reported significant increases in anxiety symptoms from year-1 to year-2 post-injury compared to pandemic-unexposed Hispanics.
Laufer	Traumatic Brain Injury during the SARS-CoV-2 Pandemics in Slovenia: A Single Center Study	Clinical Med	We aimed to compare the clinical characteristics and outcomes of TBI patients before and during the SARS-CoV-2 pandemic.	Mild TBI was less frequent during the SARS-CoV-2 period. The severity, mechanisms, and outcomes of TBI differ among countries. However, those factors also reflect social factors restricted during the lockdown periods, changes in lifestyle, and altered patient care protocols.	In order to better prepare for the future of pandemics, it is important to understand this and to improve our care for patients with TBI.	Our results demonstrated a significant impact of SARS-CoV-2 pandemic on the frequency, mechanism, and consequences of TBI, and may help improve care for our patients.
Nouraeinejad **not yet in print*	A proposal to apply brain injury recovery treatments for cognitive impairment in COVID-19 survivors	Neuroscience	The author proposes applying brain injury recovery treatments for cognitive impairment in COVID-19 survivors.	There is still little information about the nature and broader prevalence of cognitive problems during post-infection in COVID-19 survivors. This is also the case for pathobiological findings related to these complications. In the meantime, there is mounting alarm regarding potential long-term outcomes of COVID-		

				19, with descriptions of 'long COVID' symptoms keeping up into the chronic stage, which include 'brain fog'. The cognitive impairment or brain fog creates many difficulties in daily activities and makes problems for those who wish to successfully return to their job.		
Rajalu	Traumatic brain injury during COVID-19 pandemic—time-series analysis of a natural experiment	BMJ Open	This study aims to find if the incidence and pattern of traumatic brain injury (TBI) changed during the COVID-19 pandemic. We also aim to build an explanatory model for change in TBI incidence using Google community mobility and alcohol sales data.	A significant decrease in traffic accidents, falls, mild/moderate injuries and, an increase in assault and severe injuries is seen during the pandemic period. There was an increase in the proportion of TBI due to assault during the period of lockdown.	Decongestion of roads and regulation of alcohol sales can decrease TBI occurrence substantially. Analysis shows that alcohol sales are also a significant predictor of the number of TBI cases.	An increase in violent trauma during lockdown needs further research in the light of domestic violence. Acute care facilities for TBI should be maintained even during a strict lockdown as the proportion of severe TBI requiring admission increases.

2021

First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Agoston	COVID-19 and Traumatic Brain Injury (TBI); What We Can Learn from the Viral Pandemic to Better Understand the Biology of TBI, Improve Diagnostics and Develop Evidence-Based Treatments	Frontiers in Neurology	The conceptual and technical lessons that can be learned from COVID-19 and could lead to clearer classification, improved diagnosis, and potentially improved treatment efficacy of TBI are presented in this paper.	The combination of the initial physical damage and the ensuing pathobiological responses result in different disease phenotypes that are characterized by distinct dominant pathologies. These make TBI several orders of magnitude more complex than COVID-19.	Lessons learned from COVID-19 should change how we use and interpret existing biomarker data. COVID-19 has majorly altered the clinical trial landscape in TBI as in many other disorders and not only from the logistical and organizational perspective.	The patient population in the post-COVID-19 era will be different in many ways and will present new challenges for diagnosis and prognosis in TBI.
Fama	The Impact of the COVID-19 Public Health Crisis on Communication and Quality of Life: Insights from a Community of Stroke and Brain Trauma Survivors	American Journal of Speech-Language Pathology	We investigated the impact of public health guidelines and related behavioral changes on self-perceptions of communication abilities and psychosocial factors in this population.	Participants (N = 50) reported a number of changes in their day-to-day activities that reflect the current social distancing guidelines, such as reduced outings into the community and fewer in-person conversations with those living outside one's home. Overall, feelings of connectedness to others and overall quality of life were reported to be decreased when compared to before the COVID-19 pandemic, whereas receptive language abilities and technology skills were reported to have improved. Perhaps most interestingly, certain behavioral changes (including healthy movement activities and participation in virtual programs) had specific relationships with perceived communication abilities and social engagement. Based on anecdotal evidence, the extra time spent at home by stroke	Changes in daily life resulting from the COVID-19 pandemic have had a tangible impact on self-perceived psychosocial elements (e.g., quality of life) and communication abilities among stroke and other brain trauma survivors. Clinicians and researchers may consider these perceived changes when engaging with this population as the effects of the pandemic continue and in the period of community re-entry that may follow. Our results show that stroke and other brain trauma survivors have changed their behaviors during the pandemic and that they perceive some changes in psychosocial elements and in communication ability.	This population is known to experience increased feelings of isolation even under "normal" circumstances, so the importance of fostering connection for these individuals is even more critical in this unusual time of social distancing and reduced community access. Participation in virtual groups, such as those offered by the SCC, appears to foster resilience against feelings of reduced connectedness, so such opportunities should be made available to this population wherever possible.

				survivors and their family members during the pandemic is likely to have negative impacts but may have some positive effects as well. For example, there is potential for increased connectedness (e.g., to other members of the household given additional time spent together) as well as decreased connectedness (e.g., to one's larger social network/community given inability to spend time together in person). The ability to participate in one's preferred leisure activities, exercise, and other hobbies may be limited in cases where access to community businesses is required (e.g., visiting one's local gym or going bowling).	Overall, participants reported changes in psychosocial factors during the COVID-19 pandemic, which is consistent with early studies reporting such changes in the population more broadly. The COVID-19 pandemic has led to changes in daily behaviors with tangible impacts on self-perceived psychosocial elements and communication abilities among stroke and other brain trauma survivors. This population is known to experience increased feelings of isolation even under "normal" circumstances, so the importance of fostering connection or these individuals is even more critical in this unusual time of social distancing and reduced community access.	
Morrow	Disability and the COVID-19 Pandemic: A Survey of Individuals with Traumatic Brain Injury	Archives of Physical Medicine and Rehabilitation	To identify the consequences of the coronavirus 2019 (COVID-19) pandemic for individuals with traumatic brain injury (TBI), with particular attention to unique effects for individuals with chronic disability	As a group, respondents with TBI reported less pandemic-related behavior change (e.g., daily habits, virtual social visits, and masking) than NC peers. Both non injured comparison (NCs) and respondents with TBI identified health care providers as trusted sources of public health information. One-third of individuals with TBI indicated that brain injury has made coping with the pandemic more difficult, and respondents identified mental health challenges and social isolation as key barriers		Health care providers should look for ways to provide tailored education and reduce social isolation for individuals with disability during the ongoing COVID-19 pandemic.
Needham	Brain Injury in COVID-19 is Associated with Autoinflammation and Autoimmunity	BMJ	We sought to investigate the dynamics of, and relationship between, serum markers of brain injury (neurofilament light [NfL], Glial Fibrillary Acidic Protein [GFAP] and total Tau) and markers of dysregulated host response including measures of autoinflammation (proinflammatory cytokines) and autoimmunity. Brain injury biomarkers were measured using the Quanterix Simoa HDx platform, cytokine profiling	However, given the growing evidence of the detrimental effects of excess inflammation in COVID-19 more broadly, it is plausible that the elevation of brain injury biomarkers is driven by a maladaptive host response. This may be the result of neuroinflammation per se, or inflammatory injury to the cerebrovascular bed, which subsequently results in microvascular ischemic brain injury.	We observed autoantibody responses to many different targets (most commonly lung surfactant protein A1 and myelin associated glycoprotein), but the particular target of the autoantibody did not seem to relate to the presence of brain injury; rather, it seemed that the more diverse the autoantibody repertoire generated (reflecting a more generalized immune response), the more significant the degree of brain injury. Our data confirms and extends previous studies investigating brain injury biomarkers in COVID-19, which have suggested that blood NfL concentrations are elevated in	Our data suggest that brain injury occurring during acute COVID-19 may also result from similar mechanisms, and provide a plausible mechanistic basis for these manifestations, given the scant evidence to support direct viral invasion of the brain by SARS-CoV-2.

			by Luminex (R&D) and autoantibodies by a custom protein microarray. The aim of this study was to examine how frequently brain injury occurred in COVID-19, both acutely and in convalescence, and whether elevated brain injury biomarkers were associated with a dysregulated host inflammatory response.		acute COVID-19 infection, and associate with severity of illness and therefore poor outcome.	
Wilkie	The Impact of Psycho-Social Interventions on the Wellbeing of Individuals with Acquired Brain Injury During the COVID-19 Pandemic	Health Psychology	This paper lays the foundation for new interventions that not only reduce impairment and distress, but also create opportunities for meaning and enhanced wellbeing in people living with chronic conditions and those individuals living with ABI in particular.	The community neurorehabilitation service offered five 'COVID adapted' interventions either online or outdoors to support the psycho-social needs of participants during the COVID pandemic between March 2020 and November 2020. The five interventions included: -Online 'Fun' Social Support Group Online Psychotherapy Group Online Psychoeducation Group Surf-Ability	This evaluation provides new qualitative data to support the use of online and outdoor interventions to enhance wellbeing in individuals living with ABI during the COVID-19 pandemic.	Findings support the proposal that providing a context for positive experience and emotion, while also emphasizing opportunities for meaning, purpose and personal growth may be an effective way to build wellbeing despite suffering. The way community neuro-rehabilitation services are run is likely to change, as at the time of writing the world is continuing to navigate the global pandemic and is likely to be continually impacted by its legacy.

Themes by Article

First Author	Year	Key Themes from Article
Agoston	2021	The COVID-19 pandemic has majorly impacted biomedical research of TBI; experimental and clinical studies have either slowed or halted and resources have been reallocated, thus resulting in a "lost year" for the TBI field.
Damara	2022	Compared with before the pandemic, the TBI mortality rate had increased during the COVID-19 pandemic in the low-to middle-income countries. In addition, the radiological findings showed a reduced rate of Subdural hematoma in low-to middle-income countries and an increased incidence of Subarachnoid hemorrhage in high income countries. Our overall analysis showed an increased rate of assaults as the cause of TBI, especially in low-to middle-income countries.
De Luca	2022	The pandemic has forced many caregivers of individuals with chronic or acute illnesses into a distant care-giving role, amplifying their anxiety and distress
Dreer	2022	The pandemic negatively impacted numerous health areas among community dwelling survivors of TBI.
Fama	2021	Changes in daily life resulting from the COVID-19 pandemic have had a tangible impact on self-perceived psychosocial elements (e.g., quality of life) and communication abilities among stroke and other brain trauma survivors.
García-Rudolph	2022	Besides, women's mental health seemed to be more affected when economic conditions worsened during the pandemic. Also, women reported greater concern for their personal finances.

Haag	2022	Participants referred to COVID-19 as an “amplifier” of violence.
Kim	2022	Individuals with and without disabilities living in the community experienced pronounced disruption in TBI- and stroke-specific care, health care related general and major medical care, and mental health care.
Kumar	2022	Among persons living with TBI, those exposed to the pandemic had significant increases in average alcohol consumption. Pandemic-exposed Hispanics with TBI had large elevations in anxiety symptoms, perhaps reflecting health inequities exacerbated by the pandemic, and suggesting a need for targeted monitoring of psychosocial distress.
Laufer	2022	The SARS-CoV-2 pandemic has brought unique challenges in everyday life. Changes in daily life were also visible in the epidemiology of TBI. Retrograde analysis from single centers demonstrated a decreased number of TBI cases in comparison with previous years and months preceding the pandemic. In addition, the mechanism of the injuries, patterns, severity, and outcomes were also influenced by the SARS-CoV-2 pandemic.
Morrow	2021	Results from this survey suggest that some individuals with TBI may benefit from tailored and ongoing public health education, as well as support in making behavioral adjustments for increased safety and social Traumatic Brain Injury and COVID-19 1081 www.archives-pmr.org connectedness during the COVID-19 pandemic. Considering how the pandemic has affected individuals with TBI may also allow for more proactive planning for supporting individuals with chronic disability during future large-scale crises.
Needham	2021	This study sought to look at TBI and COVID-19 biomarkers to predict severity of illness and patient outcomes.
Nouraeinejad	2022	This article explored implanting post traumatic brain injury care to those suffering from long-COVID-19; especially those who were experiencing brain fog.
Rajalu	2022	We report a significant decrease in the number of TBI cases seen in the ED of a neuropsychiatric hospital during the pandemic. Analysis shows that alcohol sales are also a significant predictor of the number of TBI cases. A vastly helpful public health intervention would be the mandatory recording of alcohol use in all trauma and injury cases.
Wilkie	2021	Findings support the proposal that providing a context for positive experience and emotion, while also emphasizing opportunities for meaning, purpose and personal growth may be an effective way to build wellbeing despite suffering.

Potential Gaps

These were the gaps or additional areas of research mentioned in the articles reviewed.

- While mAb- and mRNA-based treatments can be exciting and powerful therapies in treating some of the TBI-induced pathologies, such precision medicines require similarly precise knowledge about the identity of their molecular targets and critically, their therapeutic windows (Agoston, 2021).
- We lack long-term follow-up and are unaware of whether the effects of this intervention may last over time. (De Luca, 2022)
- Addressing the impact of the COVID-19 pandemic on health areas along with taking into consideration the likely disruptions in healthcare will help identify survivors who may benefit from health promotion interventions to prevent or intervene on secondary health condition (Dreer, 2022).
- While we cannot draw firm conclusions about the cause of reduced Quality of Life (QOL) in our sample, we did find that lower QOL ratings were associated with more time spent watching television, using technology, and video chatting. Again, our data do not reveal the direction of these relationships, so it is unclear whether lower satisfaction with one's QOL leads to an increase in these activities, or vice versa, or whether a third variable is the driver of both changes. In the context of psychosocial impacts of the COVID-19 pandemic, we also found that time spent on video chat with friends/family was negatively correlated with perceptions of friendships. (Fama, 2021)
- An increase in violent trauma during lockdown needs further research in the light of domestic violence. (Rajalu, 2021)
- Some respondents with TBI also noted that pandemic-related changes have exacerbated existing cognitive communication deficits (e.g., memory deficits), or that TBI has made it more difficult to cope with mental health challenges during the pandemic. We do not know the reason for reported

behavioral stability in the group of respondents with TBI. It may be because of baseline lifestyle differences, differing sources of public health information during an evolving crisis, cognitive-communication deficits or, speculatively, because maintaining stable behavior patterns may feel protective in the face of vast uncertainty and change. (Morrow, 2021)

- There are some limitations in both the data available and our analysis approach. Though our binge drinking measure was consistent with the National Institute on Alcohol Abuse and Alcoholism (NIAAA) guidelines, we did not have information available in this study on alcohol use disorder nor, more generally, consequences of drinking. We were unable to determine whether participants had COVID-19 and did not have measures on the mediating psychosocial factors (e.g., loss of a loved one, discrimination) that may explain our results. (Kumar, 2022).

Focus Area 2: Impacts of pandemic on survivors and caregivers

Overview

This focused on understanding the impacts that the pandemic had on their family members and caregivers of those living with brain injury. Through the literature review, Nebraska will capture how other states or countries have assessed the impact with that population and what the findings were.

Key search terms used: COVID-19 TBI family impact, COVID-19 and TBI caregivers, COVID-19 impact on survivors and caregivers

Summary of Literature

2023 & 2024*						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Mauldin, Laura, and Carlie Defelice.	"The invisible frontline: experiences of spousal caregivers during COVID-19." <i>Journal of Applied Gerontology</i> 43.2 (2024): 160-169.		To explore the experiences of spousal caregivers [including but not limited to people with TBI] during the COVID-19 pandemic	Findings show caregivers 1) adjusted care practices related to food and supply deliveries, socializing online, and infection control; 2) experienced impacts on care, including the loss of home health aides and reduced outpatient care; and 3) experienced emotional distress due to isolation, increased care demands, and resulting heightened anxiety and stress.		These findings indicate specific types of ongoing resources caregivers may continue to need as the pandemic wanes, such as access to online support, a more robust infrastructure for food delivery, and planning for an increased projected shortage of home health aides.
Roberson, C. Jean, et al.	"Addressing caregiver needs of brain injury survivors through telehealth: A pilot qualitative study." <i>Family relations</i> 73.3 (2024): 1920-1932.		To identify effective means for delivering services to address the unique needs of caregivers for traumatic brain injury (TBI) survivors.	Overarching themes from focus groups include (a) isolation, which was made even worse when COVID hit and became even more complicated with other family stressors; (b) boundary issues, which happens when a caregiver's life becomes consumed with ensuring their loved one can survive and have quality of life; (c) challenges to online therapy, one of which can be the constant presence of the person with the TBI; and (d) benefits to therapy—in particular, therapy that can be facilitated online, which makes it more accessible. Results indicate an improvement in overall functioning of caregivers when accessing telehealth services.		On a micro level, results demonstrate that telehealth services can help TBI caregivers prevent boundary enmeshment. On a macro level, results have implications for increased investment and resources for those who serve the TBI population through an online format as well as proposed best practices for the method of service delivery.
Beal, Erin M., Cara Pelser, and Peter Coates.	"Lockdown life-experiences of partners of individuals with an acquired brain injury during the COVID-19 pandemic: a qualitative study." <i>Brain Impairment</i> 24.2 (2023): 260-273.		To investigate the experience of individuals living with their partner with an acquired brain injury (ABI) during the first lock down period of the COVID-19 pandemic.	ABI occurs within a relational framework, which means that it has repercussions not only for the individual but also the entire family system. COVID-19 prevented family systems (living separately) from coming together which negatively impacted them; however, it also slowed life down, with many people working from home with flexible arrangements in place which participants found to be beneficial. Three main themes emerged from the interview data: partner focus, slowing down and support networks. The narratives identified the struggles of having to continue their partner's rehabilitation when face to face services could not visit the home, the		This research suggests that it is imperative to consider individual experiences and choices. Some families benefited from reduced treatment and a slowed pace of life, whilst others may find this overwhelming and burdensome. The study makes recommendations for

		importance of establishing routine, the positives of a slower paced life (due to COVID-19) that enabled them to build stronger relationships with their partners, and the difficulties of being separated from family and loved ones.	supporting couples after an ABI during the ongoing pandemic.
Brickell, Tracey A., et al. "Health outcomes before and during the COVID-19 pandemic in caregivers of service members and veterans with traumatic brain injury." <i>Quality of Life Research</i> 32.12 (2023): 3463-3474.	To examine change in health-related quality of life (HRQOL) during the COVID-19 pandemic in caregivers of service members/veterans (SMVs) with traumatic brain injury (TBI), by comparing HRQOL during the first year of the pandemic to HRQOL 12 months pre-pandemic.	Using ANOVA, during the pandemic, the Moderate-Severe Impact group reported worse scores on 19 measures ($d = 0.41-0.89$) compared to the No Impact group and 18 measures ($d = 0.31-0.62$) compared to the Mild Impact group ($d = 0.31-0.38$). The Mild Impact group reported worse scores on two measures compared to the No Impact group ($d = 0.42-0.43$). Using the entire sample, the majority of HRQOL measures were classified as Asymptomatic (47.2–94.7%), followed by Persistent (2.4–27.2%). Few were classified as Developed (0.4–12.6%) or Improved (2.4–13.8%). Using repeated measures ANOVA, no meaningful effects sizes were found for mean scores on all measures completed pre-pandemic compared to during the pandemic ($d \leq 0.17$).	The vast majority of caregivers reported stability in HRQOL pre-pandemic compared to during the pandemic. The COVID-19 pandemic was not associated with a high prevalence of decline in caregiver HRQOL.
De Luca, Rosaria, et al. "Psycho-Emotional Well-Being in Caregivers of People with Acquired Brain Injury: An Exploratory Study on the Human Immersion Model during the Omicron Wave." <i>Clinics and Practice</i> 13.2 (2023): 487-496.kerker	To investigate the effects of a "human immersion model" (HIM) in improving psychological well-being in caregivers of patients with acquired brain injury (ABI) during the Omicron wave in Italy.	We found significant changes in the caregivers' scores analyzed for anxiety, as per SAS ($p < 0.0007$, $d = 1.02$), burden and stress (ZBI-22; $p < 0.001$, $d = 0.65$), and emotive intelligence (TEIQue-SF; $p < 0.0007$, $d = 0.82$).	Our data suggest that the HIM may be useful to promote ABI caregivers' psycho-emotional well-being in the context of critical periods such as the COVID-19 pandemic.
Muliira, Joshua K., et al. "The needs of families caring for patients with traumatic brain injury: a scoping review." <i>Disability and rehabilitation</i> (2023): 1-9.	To synthesize existing literature into a map of the common needs of families caring for patients with traumatic brain injury (TBI) at home. [Does not explicitly address COVID]	A total of 12 publications were identified. The results suggest that the common needs of families caring for patients with TBI at home include: information about TBI as a disease; information about the continuum of TBI healthcare services; information about adaptive technologies; education and skilling of FCs; psychological support and counseling; physical and occupational therapy services; follow-up care and transitional care management; respite care; peer support; financial assistance, advocacy, and legal services; emotional support from the family and community; and assistance with physical patient care and instrumental activities of daily living.	The mapped needs provide insight into supportive interventions required to enhance the health outcomes of patients with TBI and their families during and after rehabilitation. The needs also highlight directions for research and healthcare services for patients with TBI.
Riccardi, Jessica Salley. "Exploring the Caregiver-Reported Impact of the COVID-19 Pandemic on Children with Traumatic Brain Injury." <i>Seminars in Speech and Language</i> . Thieme Medical Publishers, Inc., 2023.	To explore the impact of the COVID-19 pandemic on children with TBI and their families, compared to typically developing (TD) children and their families.	Overall, caregivers reported no negative impact of the COVID-19 pandemic on their family's or child's functioning and association with demographic factors and domains of functioning showed no clear patterns. The findings of this exploratory study support continued longitudinal investigation with larger sample sizes of the provision of supports for all families and children in light of the COVID-19 pandemic.	Additional research is needed to understand the effectiveness of targeted services for students with TBI in domains of functioning that are significantly poorer than TD children (e.g., quality of life, executive functioning, fatigue).

*For 2024, January through August 2024 only. Inclusion criteria for this literature review were: A focus on the caregivers and family of people with TBI and their physical and mental health, to include factors related to physical and mental health. Only results from the first two pages of electronic search results are included. Exclusion criteria for this literature review section include articles focused on the COVID-19 virus as a causal factor in TBI and/or TBI-type symptoms and articles related to any of the other focus areas.

2022						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Dellafiore	The impact of COVID-19 pandemic on family caregivers' mental health: a rapid systematic review of the current evidence	Acta Biomed	This study aimed to synthesize the current evidence on the impact of the COVID-19 pandemic on caregivers' mental health.	Firstly, the main theme derived from the rapid systematic review focused on informal caregivers' adverse and stressful effects due to the COVID-19 pandemic. Informal caregivers play a significant role in the diagnostic	The narrative synthesis has brought out two main themes that represent the current debate in literature: "Family caregivers COVID-19 related stress", and "(Mal)adaptive	This study provides an evidence synthesis of the negative mental health impact experienced by caregivers of older adults during the COVID-19 pandemic.

				process, treatment, and recovery of patients with chronic disease, but they also reported increased anxiety, depression, and burden during the COVID-19 emergency.	strategies to the "new" normality".	
Mukhti	Family Caregivers' Experiences and Coping Strategies in Managing Stroke Patients during the COVID-19 Pandemic: A Qualitative Exploration Study	International Journal of Environmental Research and Public Health	This study aims to explore the burden, experience, and coping mechanism of the family caregivers supporting stroke survivors during the COVID-19 pandemic.	Three themes on burdens and experiences were identified. They were worsening pre-existing issues, emerging new issues, and fewer burdens and challenges. Two themes on coping strategies were also identified. They were problem-focused engagement and emotion-focused engagement	While family caregivers mostly faced the extra burden through different experiences, they also encountered some positive impacts from the pandemic. The integrated healthcare system, especially in the era of digitalization, is an important element to establish the collaborative commitment of multiple stakeholders to compensate burden and sustain the healthcare of stroke survivors during the pandemic.	Sustainability of care should be put as a main priority, and it should not be compromised. Communication between family members, healthcare staff, and local authorities, such as police, should be in place and efficient to reduce bureaucracy and fasten the process. Furthermore, in the era of digitalization, we would like to urge efforts to introduce, encourage, and emphasize the consistent use of telehealth in the healthcare system to oppose the identified burdens and challenges that emerged from the issues of restrictive travel measures, strict SOP execution, the changes made by healthcare settings, and the constraints on supportive persons.

2021

First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Creutzfeldt	Family Presence for Patients with Severe Acute Brain Injury and the Influence of the COVID-19 Pandemic	Journal of Palliative Medicine	The global COVID-19 pandemic made strict visitation policies necessary. We explored the experiences of family members of patients with severe acute brain injury focusing on the impact of family presence in the hospital.	Families described their presence at the bedside as helping them to (1) cope with their own grief and uncertainty, (2) advocate for their loved one and support their recovery, (3) observe the health care team discuss and plan the patient's care, contributing to a sense of trust, and (4) receive emotional support themselves. Families' absence made all of these activities challenging.	Family presence at patient's bedside fulfills important needs. Visitation restrictions require hospitals to be creative and inclusive to help maintain these connections. The need for personal connection with clinicians and with the patient may be particularly important after SABI when family members not only experience the personal tragedy of having a critically ill loved one, but also feel a heightened need to advocate for and make important treatment decisions on behalf of their loved one who is too ill to speak for themselves.	Limitations to this study include (1) limited generalizability due to single-center design, (2) lack of clinicians' perspectives who are also distressed by seeing patients alone, (3) lack of patients' perspectives given their inability to communicate, and (4) interviews before the pandemic included only families present at bedside, whereas interviews afterward were by phone, potentially introducing differences in responses or selection bias. Family members have important needs for maintaining connection with critically ill loved ones and the clinicians caring for those loved ones. Understanding the diversity of needs is an important step toward meeting those needs.
Garcia-Rudolph	The impact of coronavirus disease 2019 on emotional and behavioral stress of informal family caregivers of individuals with stroke or traumatic brain injury at chronic	Brain and Behavior	We aimed at comparing the levels of stress in emotional and behavioral aspects, before and during coronavirus disease 2019 (COVID-19), as reported by informal family caregivers of individuals with chronic	Higher distress and lower life satisfaction of caregivers are associated with low long term functional outcomes of persons with acquired brain injury, even after accounting for injury severity and cognitive functioning of care recipients. In this study, we focused on one of such measurements: the	Our results can be used to suggest possible therapeutic interventions or support provided by clinicians to informal caregivers, specifically targeting the identified items or subtotals.	One hundred twenty-two informal caregivers (62.3% IC-STROKE and 37.7% IC-TBI) were assessed online between June 2020 and April 2021 and compared to their own assessments performed in-person 1.74 ± 0.88 years before the COVID-19 lockdown. IC-STROKE significantly increased their level of stress during COVID-19 in five emotional items

	phase living in a Mediterranean setting		traumatic brain injury (TBI) or stroke living in the community, considering two different stratifications of the recipients of care (cause and injury severity).	Head Injury Behavior Scale (HIBS) (Godfrey et al., 2003). The Psychosocial Unit of the hospital routinely performs HIBS follow-up every 3 years.		(impatience, frequent complaining, often disputes topics, mood change and overly sensitive) and in one behavioral item (overly dependent). IC-TBI stress level only increased in one behavioral item (impulsivity). Our results suggest specific items in which informal caregivers could be supported considering cause or severity of the recipients of care.
Othman	The needs of traumatic brain injury survivors' caregivers and the implication required during the COVID-19 pandemic: Public health issues	Journal of Public Health Research	This study aims to explore the needs of the caregivers of TBI survivors during the COVID-19 pandemic.	Lack of information provided, is one of the most frequently cited problems within studies that reflect the experiences of caregivers.	The results showed that there were three significant themes namely, (a) Support needed, (b) the information needed for care, and (c) developing self-resilience. The results also showed that caregivers really need support from the various parties, and the participants lack information on specific care techniques for the severe traumatic brain injury (TBI) survivors. In conclusion, caregivers require approval and seek more useful information to provide excellent care to their loved ones.	Being aware of the caregiver's needs would enable them to offer improved customized care
Sutter-Leve	The Caregiver Experience After Stroke in a COVID-19 Environment: A Qualitative Study in Inpatient Rehabilitation	Academy of Neurologic Physical Therapy	This study aims to answer the primary research question: What is the level and nature of stress experienced by caregivers of persons with newly acquired stroke in the inpatient rehabilitation setting and how has the COVID-19 pandemic impacted the caregiver experience?	Evidence suggests the mental health of caregivers is closely related to patients' health outcomes. Regarding communication, therapists should not be the only providers updating the family. Nurses and physicians can also communicate with family, providing the reassurance needed to know the patient is safe and well taken care of. Moreover, education of the primary diagnosis was a critical piece of the caregiver's experience, so a regular phone call may provide a time to share additional resources to satisfy this need.	Caregiver attendance at therapy sessions and frequent, direct communication between staff and caregivers improved caregiver readiness for family member discharge following inpatient rehabilitation.	The rehabilitation setting is a unique place for this healing, in part, because of the personal connections made between the patient, caregiver, and care team. In the current state of the rapidly changing COVID-19 environment, we recommend that members of the health care team consider how maintaining a high-quality caregiver experience may influence their patient's outcomes.

Themes by Article

First Author	Year	Key Themes from Articles
Creutzfeldt	2021	Families described their presence at the bedside as helping them to (1) cope with their own grief and uncertainty, (2) advocate for their loved one and support their recovery, (3) observe the health care team discuss and plan the patient's care, contributing to a sense of trust, and (4) receive emotional support themselves.
Dellafore	2022	Focused on the immense amount of stress placed on caregivers during the pandemic. Greater anxiety and depression for even informal caregivers
Garcia-Rudolph	2021	In order to have better outcomes for TBI survivors, caregivers need to be supported.

Mukhti	2022	Sustainability of care should be put as a main priority, and it should not be compromised. The communication between family members, healthcare staff, and local authorities, such as police, should be in place and efficient to reduce bureaucracy and fasten the process.
Othman	2021	Support needed. Information needs about care. Developing self-resilience
Sutter-Leve	2021	Evidence suggests the mental health of caregivers is closely related to patients' health outcomes.

Potential Gaps

These were the gaps or additional areas of research mentioned in the articles reviewed:

- Building and maintaining empathic connections and providing emotional support virtually require new skills, both verbal and nonverbal. All of these changes require additional resources from hospitals including IT support and provision of devices so that all patients and families have an equal opportunity to participate, and health care providers are not additionally burdened by managing communication devices. (Creutzfeldt)
- Lack of information provided is one of the most frequently cited problems within studies that reflect the experiences of caregivers. Caregivers usually have no standard information on how to take care of patients with TBI. Based on this finding, the caregiver needs to be provided with information regarding the care of TBI patients at home.

Focus Area 3: Long COVID

Overview

This topic area is focused on better understanding long COVID, also called post-acute sequelae of COVID-19. While some of the implications among those who have had a brain injury are addressed in Area 1, this looks more in-depth at the long COVID symptoms and impacts. This also includes understanding the symptoms among individuals who have NOT had a brain injury, particularly since they mirror the symptoms of those who have experienced brain injury. This was identified as a priority area for Nebraska as it may help identify or understand what services, support, and resources may be needed in the future and if/how that aligns with brain injury services.

Key search terms used: COVID-19 long-haulers, long haulers syndrome, COVID-19 long haulers + TBI

Summary of Literature

2023 & 2024*						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Agoston, Denes V.	"Traumatic brain injury in the long-COVID era." <i>Neurotrauma Reports</i> 5.1 (2024): 81-94.		Reviews what is known about long-COVID/PASC, its underlying—suspected—pathologies, the pathobiological changes induced by TBI, in other words, the TBI endophenotypes, discuss the intersection of long-COVID/PASC and TBI-induced pathobiologies, and how by considering some of the known factors affecting the person's biological background and the inclusion of mechanistic molecular biomarkers can help to improve the clinical management of TBI patients.			

*For 2024, January through August 2024 only. Inclusion criteria for this literature review were: A focus on long COVID and people with TBI. Only results from the first two pages of electronic search results are included. Exclusion criteria for this literature review section include articles focused on the COVID-19 virus as a causal factor in TBI and/or TBI-type symptoms, and articles focused on any of the other focus areas.

2023						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Stephani Sutherland	Long COVID Now Looks like a Neurological Disease, Helping Doctors to Focus Treatments	Scientific American Magazine: Online https://www.scientificamerican.com/article/long-covid-now-looks-like-a-neurological-disease-helping-doctors-to-focus-treatments1/	Addressing the need for care providers to shift their approach to how long COVID is treated.	Patients with long COVID often have unrealistic expectations of a quick recovery and need their expectations reset with empathy. Psychological care, support groups, and lifestyle choices such as better sleep habits and breathing exercises can play a significant role in improving symptoms. Long COVID, a condition that affects individuals who have recovered from acute COVID-19 but continue to experience persistent symptoms, is now being recognized as a neurological disease. Research suggests that the causes of long COVID may converge in the brain and nervous system, leading to the wide range of symptoms observed in affected individuals. By understanding long COVID as a neurological condition, doctors and researchers can focus on developing targeted treatments that address the underlying neurological mechanisms.	Some patients benefit from reducing various treatments they have accumulated, as stopping certain treatments can lead to improved symptoms. Long COVID can persist for years, and it is a condition that healthcare professionals will be addressing for decades. The underlying causes of long COVID are still uncertain, and patients may have a combination of different problems that need to be addressed. The unpredictability of symptoms is a significant challenge for patients with long COVID, as symptoms can vary	

				This shift in perspective may help improve the management and treatment of long COVID, which can be debilitating for millions of individuals worldwide.	in severity and persist for a long time	
Hannah E. Davis	Long COVID: major findings, mechanisms and recommendations	Nature Reviews Microbiology	Updated findings on long COVID	Long COVID is a debilitating illness that affects at least 10% of individuals infected with SARS-CoV-2, with more than 200 identified symptoms and impacts on multiple organ systems. An estimated 65 million individuals worldwide are believed to have long COVID, and the number of cases continues to increase. Biomedical research has made progress in identifying pathophysiological changes and risk factors associated with long COVID. The onset of symptoms in long COVID can vary among individuals. Long COVID also affects children, and understanding its impact on pediatric populations is important.	Major Findings related to cognitive function: Neurological and cognitive systems: Neurological and cognitive symptoms are common in long COVID, including sensorimotor symptoms, memory loss, cognitive impairment, and autonomic dysfunction. Cognitive impairment in long COVID can be debilitating and comparable to cognitive aging or intoxication at the drink driving limit. Possible mechanisms for neurological symptoms include neuroinflammation, vascular damage, and neuronal injury. Long COVID is associated with abnormalities in brain imaging, altered pupillary light responses, and impaired retinal microcirculation.	Future long COVID research should account for biases, address SARS-CoV-2 testing issues, incorporate findings from viral-onset research, include marginalized populations, and involve meaningful patient engagement throughout the research process. The impact of vaccinations on long COVID is an area of study and investigation. Current diagnostic and treatment options for long COVID are insufficient, and there is a need for prioritizing clinical trials that address leading hypotheses. Long COVID shares similarities with other viral-onset illnesses such as myalgic encephalomyelitis/chronic fatigue syndrome and postural orthostatic tachycardia syndrome, providing a foundation for further research.
Jaycie Loewen	Mild COVID Linked to Brain Damage: What That Means for You	Cognitive FX	Provide an update on COVID's impact on the brain.	COVID-19 can cause cognitive symptoms in some patients, even in mild cases, leading to a condition known as long COVID. A study published in Nature by Smith et al. focused on patients with mild COVID-19 cases and found changes in the brain that corresponded to common symptoms such as loss of smell and taste, headaches, and memory problems. The study revealed that some patients had lost up to 2% of brain volume and gray matter thickness in specific areas of the brain, which may explain the cognitive symptoms experienced by COVID-19 patients. The differences in cognitive function between infected and healthy patients were more pronounced in older age groups. The brain changes observed in mild COVID-19 cases may be caused by neurovascular coupling dysfunction, inflammation, and direct viral infection of brain cells.	Cognitive tests showed that patients had difficulties with attention, visual screening ability, and processing speed after COVID-19 infection.	The aim of treatment is to improve symptoms such as fatigue, brain fog, sleep disturbances, visual difficulties, and headaches. Treatment for long COVID symptoms focuses on restoring healthier neurovascular coupling in the brain through multidisciplinary therapies, including cardio exercise, neuromuscular therapy, cognitive therapy, vision therapy, and more.

				It is unclear whether the brain damage caused by mild COVID-19 is reversible or irreversible, but treatment approaches show promise in addressing long COVID symptoms.		
Dave Davies	Millions of people have long COVID brain fog — and there's a shortage of answers	NPR https://www.mprnews.org/story/2023/05/10/million-s-of-people-have-long-covid-brain-fog-and-theres-a-shortage-of-answers?gclid=CjwKCAjwyeyuiBhA5EiwA5WD7_QHVVvg6i6zA1RGkqVZxK71Mji_aSvYeBmvVmLBxity_nwhDUOPCCvBoCLV0QAyD_BwE	Highlight the need for additional research needed for long COVID	Long COVID can result in a loss of employment, income, and important relationships, impacting the overall well-being of individuals. Neuropsychologist James C. Jackson, a research professor at Vanderbilt University, highlights the need for urgent attention and support for long COVID patients, stating that the response to long COVID has been less urgent compared to the response to developing a COVID-19 vaccine. Jackson's book, "Clearing the Fog," serves as a practical guide for long COVID patients and their families, offering advice on finding help, information on treatments, and strategies for managing symptoms. Estimates suggest that around 200 million people worldwide may be affected by long COVID, emphasizing the global nature of this issue. Cognitive impairment associated with long COVID includes memory problems, processing speed issues, attention difficulties, and executive dysfunction, which can severely impact daily functioning and social interactions. Mental health issues such as depression, anxiety, PTSD, and increased suicide risks are commonly observed in individuals with long COVID due to factors like job loss, social isolation, and loss of hope. Social isolation worsens the experience of long COVID patients, as they may feel misunderstood and face negative reactions when attempting to connect with others. The lack of social support can lead to increased depression and further isolation. Asking for help directly from friends, family, or support groups can be crucial in navigating these processes effectively.		Seeking help for long COVID, especially in cases where employment is lost or individuals are unable to work, may involve exploring options such as Social Security, short-term disability, and long-term disability. It is important to recognize that long COVID can cause brain injury (hypoxia), and the medical community needs to broaden the definition of brain injury to include conditions like long COVID and refer patients for appropriate cognitive rehabilitation.

2022

First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Callan	I can't cope with multiple inputs': a qualitative study of the lived	BMJ Open	To explore the lived experience of 'brain fog'—the wide variety of	The profound psychosocial impact of the condition on relationships, personal and professional identity;	These qualitative findings complement research into the epidemiology and mechanisms of	

Del Brutto	Cognitive sequelae of long COVID may not be permanent: A prospective study.	Eur J Neurol.	This study aimed to assess whether COVID-19-related cognitive decline is a permanent deficit or if it improves over time.	In this population-based cohort of community-dwelling middle-aged and older adults who were carefully followed up before and after the pandemic, COVID-19 survivors developed significant cognitive decline 6 months after the infection that improved 1 year later. This suggests that the so-called "brain fog" may dissipate over time.	A recent study showed that COVID-19-related cognitive complaints may persist after 12 months of follow-up, but mostly in women and in patients with increased antinuclear antibody titers, suggesting that autoimmunity is in the path of this sequela. Study results suggest that long COVID-related cognitive impairment may spontaneously improve over time. Therefore, it seems prudent to repeat cognitive assessment in individuals complaining of "brain fog" in the very few months after COVID-19	Further studies attempting to administer interventions for cognitive decline affecting long COVID patients should take this spontaneous improvement into account.
Joshee	Long-Term Effects of COVID-19	Mayo Clinic Foundation	This review serves as a guideline for effective management based on current evidence, but clinicians should modify recommendations to reflect each patient's unique needs and the most up-to-date evidence. The presence of long-term effects presents another reason for vaccination against COVID-19. This review aims to report the up-to-date epidemiology, athophysiology, clinical predictors, management recommendations, and the unanswered questions and future directions for the systematic effects of long-term COVID-19 infections that clinicians can refer to when managing COVID-19 long haulers (Table 2).	Overall, the most common symptoms of long-term pulmonary sequelae experienced by those with COVID-19 include fatigue, dyspnea, and/or cough. The prevalence of these symptoms and the severity of abnormalities on imaging depend on the severity of acute illness and intensive care unit (ICU) admission status.	Other rare long-term systemic effects of COVID-19 involve the renal, endocrine, integumentary, and GI systems. Elevated blood sugar levels have been observed in many patients during acute COVID-19 infection.	The findings in this review show that the effects of COVID-19 do not end with acute infection resolution. In all patients, interdisciplinary monitoring is required to detect post-acute COVID-19 symptoms before long-term systemic damage occurs. The clear association between COVID-19 and long-lasting sequelae that has the potential to affect multiple organ systems is another reason why everyone should be vaccinated. No longer can any demographic be confident that their illness may be mild and that they will completely recover from it.
Stefanou	Neurological manifestations of long-COVID syndrome: a narrative review	The Adv Chronic Dis	In this narrative review, we sought to present a comprehensive overview of our current understanding of clinical features, risk factors, and pathophysiological processes of neurological 'long-COVID' sequelae.	Nonetheless, although cautious optimism has been expressed for the beginning of the end of the pandemic, concerns have been raised that 'long-COVID' could comprise a 'next public health disaster in the making. Consequently, prevention of 'long-COVID' ranks very high on the public health agenda. Currently, however, there is only scant understanding of the underlying processes implicated	In this narrative review, we sought to present a comprehensive overview of our current understanding of clinical features, risk factors, and pathophysiological processes of neurological 'long-COVID' sequelae.	Furthermore, as causal treatments for 'long-COVID' are currently unavailable, we propose therapeutic approaches for symptom-oriented management of neurological 'long-COVID' symptoms. In addition, we emphasize that collaborative research initiatives are urgently needed to expedite the development of preventive and therapeutic strategies for

				in the pathogenesis of 'long-COVID' syndrome, a fact that is also reflected in the tentative definitions and preliminary classification schemes proposed by national and international health organization.		neurological 'long-COVID' sequelae.
Vanichkachorn	Post-COVID-19 Syndrome (Long Haul Syndrome): Description of a Multidisciplinary Clinic at Mayo Clinic and Characteristics of the Initial Patient Cohort	Mayo Clinic	To describe characteristics of a series of patients reporting prolonged symptoms after an infection with coronavirus disease 2019 (COVID-19).	Although advanced age and the presence of several comorbidities are positively associated with increased mortality and hospitalization during acute infections, patients in CARP were younger (mean age, 45.414.2 years) than groups associated with severe infection, high mortality, and hospitalization	Most of the patients did not have COVID-19 related symptoms that were severe enough to require hospitalization, were younger than 65 years, and were more likely to be female, and most had no preexisting comorbidities before severe acute respiratory syndrome coronavirus 2 infection. Symptoms including mood disorders, fatigue, and perceived cognitive impairment resulted in severe negative impacts on resumption of functional and occupational activities in patients experiencing prolonged effects.	

2021

First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Lopez-Leon	More Than 50 Long-Term Effects of COVID-19: A Systematic Review and Meta-Analysis	Research Square	The search's objective was to identify peer-reviewed human studies in English that reported symptoms, signs, or laboratory parameters of patients at a post-COVID-19 stage (assessed two weeks or more after initial symptoms) in cohorts of COVID-19 patients. Only studies with a minimum of 100 patients were included.	Symptoms, signs, or abnormal clinical parameters persisting two or more weeks after COVID-19 onset that do not return to a healthy baseline can potentially be considered long-term effects of the disease. Although such alteration is mostly reported in severe and critical disease survivors, the lasting effects also occur in individuals with a mild infection who did not require hospitalization. It has not yet been established if sex, gender, age, ethnicity, underlying health conditions, viral dose, or progression of COVID-19 significantly affect the risk of developing long-term effects of COVID-19.	We identified a total of 55 long-term effects associated with COVID-19 in the literature reviewed (Table 3). Most of the effects correspond to clinical symptoms such as fatigue, headache, joint pain, anosmia, ageusia, etc. Diseases such as stroke and diabetes mellitus were also present. Measurable parameters included elevated laboratory parameters, i.e., interleukin-6 (IL-6), procalcitonin, serum ferritin, C-reactive protein (CRP), N-terminal (NT)-prohormone BNP (NT-proBNP), and D-dimer. Abnormal chest XRay/computed tomography (CT) was also identified	Other symptoms were related to lung disease (cough, chest discomfort, reduced pulmonary diffusing capacity, sleep apnea, and pulmonary fibrosis), cardiovascular (arrhythmias, myocarditis), neurological (dementia, depression, anxiety, attention disorder, obsessive-compulsive disorders), and others were unspecific such as hair loss, tinnitus, and night sweat (Table 2, Fig. 2). Two meta-analyses showed low heterogeneity ($I^2 < 25\%$), two medium heterogeneity, and the high rest heterogeneity ($I^2 > 75\%$). There is a need to standardize biological measures such as peripheral blood markers of genetic, inflammatory, immune, and metabolic function to compare studies. Besides studying symptoms and markers, an open question should be included. Proper documentation in medical charts by health care providers and collaboration from the patients to

						report their symptoms are of equal importance.
Michelen	Characterizing long COVID: a living systematic review	BMJ Global Health	The breadth of reported symptoms suggests a complex, heterogeneous condition affecting both those who were hospitalized and those managed in the community. Our review identifies weakness (41%; 95% CI 25% to 59%), general malaise (33%; 95% CI 15% to 57%), fatigue (31%; 95% CI 24% to 39%), concentration impairment (26%; 95% CI 21% to 32%) and breathlessness (25%; 95% CI 18% to 34%) as the most common symptoms reported.	Long COVID has been defined pragmatically as 'not recovering for several weeks or months following the start of symptoms. Others have distinguished between postacute COVID-19, referring to symptoms beyond 3 weeks, and chronic COVID-19, referring to symptoms beyond 12 weeks, while the National Institute for Health and Care Excellence distinguishes between ongoing symptomatic COVID-19 lasting from 4 to 12 weeks and post COVID-19 syndrome continuing for over 12 weeks. The number of people living with long COVID is unknown.	There is a paucity of evidence on the long-term effects of COVID-19 in low-to- middle income countries and in people who were not hospitalized. Similarly, there were no studies identified focusing on children, despite evidence showing that children and young people are also affected by long COVID. Additionally, no study stratified by ethnicity, an important risk factor for the acute phase	

2020

First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Higgins	COVID-19: from an acute to chronic disease? Potential long-term health consequences	Crit Rev Clin Lab Sci	In this review, we turn to previous similar coronaviruses (i.e. SARS-CoV-1 and Middle East respiratory syndrome coronavirus [MERS-CoV]) in combination with known health implications of SARS-CoV-2 infection to predict potential long-term effects of COVID-19, including pulmonary, cardiovascular, hematologic, renal, central nervous system, gastrointestinal, and psychosocial manifestations, in addition to the well-known post-intensive care syndrome. It is necessary to monitor COVID-19 patients after discharge to understand the breadth and severity of long-term effects.	In the United States, on 2 December 2020, there are 100,226 patients currently hospitalized with COVID-19, 19,396 of which have been admitted to ICU and 6,855 of which are currently on a ventilator [134]. ICU-admitted COVID-19 patients may have additional long-term effects on top of those due to the viral infection alone	Another important consideration of long-term effects of COVID-19 is the mental health impact to survivors, including anxiety, depression, and PTSD, even for those not admitted to the ICU, as well as somatic symptoms, including sleep disturbances and chronic fatigue syndrome/myalgic encephalomyelitis	COVID-19 has simply not been with us long enough to decipher its long-lasting effects on infected patients. The adverse effects apparent during COVID-19 infection are widespread. In addition to those described above, these include persistent symptoms (e.g. fatigue, dyspnea, joint pain, chest pain), as well as bone (e.g. femoral head necrosis), ocular (e.g. conjunctivitis, retinal changes), and dermatologic (e.g. erythematous rash, urticaria) manifestations.

Themes by Article

First Author	Year	Key Themes from Article
Callen	2022	Services for such patients should include: an ongoing therapeutic relationship with a clinician who engages with their experience of neurocognitive symptoms in its personal, social and occupational context as well as specialist services that include provision for neurocognitive symptoms, are accessible, easily navigable, comprehensive and interdisciplinary.
CDC	2022	The CDC highlighted the new data on adults experiencing long covid. Statistics were updated 2022.
Chen	2022	This study finds post-COVID-19 condition prevalence is substantial; the health effects of COVID-19 seem to be prolonged and can exert stress on the healthcare system.

Davies	2023	Long COVID can result in a loss of employment, income, and important relationships, impacting the overall well-being of individuals. Seeking help for long COVID, especially in cases where employment is lost or individuals are unable to work, may involve exploring options such as Social Security, short-term disability, and long-term disability. It is important to recognize that long COVID can cause brain injury (hypoxia), and the medical community needs to broaden the definition of brain injury to include conditions like long COVID and refer patients for appropriate cognitive rehabilitation.
Davis	2023	Biomedical research has made progress in identifying pathophysiological changes and risk factors associated with long COVID. Possible mechanisms for neurological symptoms include neuroinflammation, vascular damage, and neuronal injury. Long COVID is associated with abnormalities in brain imaging, altered pupillary light responses, and impaired retinal microcirculation.
Del Brutto	2022	Study results suggest that long COVID-related cognitive impairment may spontaneously improve over time.
Higgins	2020	Continued monitoring of COVID-19 patients after discharge is necessary to understand the breadth and severity of long-term effects.
Joshee	2022	Guidelines will need to be continuously updated to reflect the most up-to-date body of knowledge. Every patient, symptom, and circumstance is unique; thus, the guidelines recommended in this article should be modified according to each patient's needs and the clinicians' discretion.
Loewen	2023	The study revealed that some patients had lost up to 2% of brain volume and gray matter thickness in specific areas of the brain, which may explain the cognitive symptoms experienced by COVID-19 patients. It is unclear whether the brain damage caused by mild COVID-19 is reversible or irreversible, but treatment approaches show promise in addressing long COVID symptoms.
Lopez-Leon	2021	Clinicians urged to be aware of the symptoms and study long-term outcomes.
Michelen	2021	The long-term effects of COVID-19, in both hospitalized and non-hospitalized individuals, including children and at-risk populations, should be a priority for future research using standardized and controlled study designs.
Stefanou	2022	There is only scant understanding of the underlying processes implicated in the pathogenesis of 'long-COVID' syndrome, a fact that is also reflected in the tentative definitions and preliminary classification schemes proposed by national and international health organization.
Sutherland	2023	Long COVID, a condition that affects individuals who have recovered from acute COVID-19 but continue to experience persistent symptoms, is now being recognized as a neurological disease. Research suggests that the causes of long COVID may converge in the brain and nervous system, leading to the wide range of symptoms observed in affected individuals. By understanding long COVID as a neurological condition, doctors and researchers can focus on developing targeted treatments that address the underlying neurological mechanisms.
Vanichkachorn	2022	Symptoms including mood disorders, fatigue, and perceived cognitive impairment resulted in severe negative impacts on resumption of functional and occupational activities in patients experiencing prolonged effects

Potential Gaps

These were the gaps or additional areas of research mentioned in the articles reviewed:

- A deeper understanding of long COVID is currently prevented by the limitations of the published literature. (Michelen)
- More information about post-acute COVID-19 continues to be discovered as the pandemic continues. This will help develop a detailed explanation of the mechanisms behind symptoms and classify the risk factors that predispose patients to adverse outcomes. Guidelines will need to be continuously updated to reflect the most up-to-date body of knowledge. (Joshee)
- Limitations of this systematic review and meta-analyses include the small sample size for some outcomes, which makes it difficult to generalize these results to the general population. (Lopez-Leon)

- We urgently need data from long-term surveillance of COVID-19 patients to inform healthcare workers on how to monitor the health of survivors, provide early intervention that may provide benefit, and reduce the likelihood of overwhelming the medical system in the future due to subsequent health complications of many millions of patients. (Higgins)

Focus Area 3B: Treatment of Long COVID-19

Overview

This topic area is meant to explore what treatment options are currently available for the symptoms of long COVID-19.

Key search terms used: long Covid-19 treatment; long-haul treatment

Summary of Literature

2022						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Al-Aly	Outcomes of SARS-CoV-2 reinfection	Emerg Microbes Infect	In this work, we use the vast electronic health care databases of the US Department of Veterans Affairs to address the question of whether SARS-CoV-2 reinfection adds to the health risks associated with a first SARS-CoV-2 infection.	Furthermore, impaired health as a consequence of the first infection might result in increased risk of adverse health consequences upon reinfection.	The risks were evident in the acute and post-acute phase of reinfection. The evidence suggests that for people who already had a first infection, prevention of a second infection may protect from additional health risks. Our results show that beyond the acute phase, reinfection with SARS-CoV-2 contributes substantial additional risks of all-cause mortality, hospitalization, and post-acute sequelae in the pulmonary and broad array of pulmonary organ systems.	Prevention of infection and reinfection with SARS-CoV-2 should continue to be the goal of public health policy.
Antonelli	Risk factors and disease profile of post-vaccination SARS-CoV-2 infection in UK users of the COVID Symptom Study app: a prospective, community-based, nested, case-control study.	The Lancet Infectious Diseases	This study aimed to identify risk factors for postvaccination SARS-CoV-2 infection and describe the characteristics of post-vaccination illness.	Identifying and protecting individuals at increased risk of post-vaccination infection is becoming increasingly salient as more people are vaccinated.	Groups at increased risk of SARS-CoV-2 infection before vaccines became available included frontline health-care workers and individuals from areas of greater relative deprivation (probably reflecting increased exposure), and increasing age, male sex, multimorbidity, and frailty are associated with poorer COVID-19 outcomes.	To minimize SARS-CoV-2 infection, at-risk populations must be targeted in efforts to boost vaccine effectiveness and infection control measures.
Damiano	Cognitive decline following acute viral infections: literature review and projections for post-COVID-19	Eur Arch Psychiatry Clin Neurosci.	This article aims to review the state of the art regarding the knowledge about the impact of acute viral infections on human cognition, laying a foundation to explore the possible cognitive decline	Recent findings suggest probable short- and long-term COVID-19 impacts in cognition, even in asymptomatic individuals, which could be accounted for by direct and indirect pathways to brain dysfunction.	Some authors have suggested that due to anti-inflammatory properties, antimalarial drugs could be used to prevent neuropsychiatric COVID-19 complications.	Recent findings suggest probable short- and long-term COVID-19 impacts in cognition, even in asymptomatic individuals, which could be accounted for by direct and indirect pathways to brain dysfunction.

			followed coronavirus disease 2019 (COVID-19).			
Delgado-Alonso	Cognitive dysfunction associated with COVID-19: A comprehensive neuropsychological study.	J Psychiatr Res	Recent evidence suggests that patients suffering post-acute COVID syndrome frequently report cognitive complaints, but their characteristics and pathophysiology are unknown. This study aims to determine the characteristics of cognitive dysfunction in patients reporting cognitive complaints after COVID-19 and to evaluate the correlation between cognitive function and anxiety, depression, sleep, and olfactory function.	Patients with COVID-19 showed worst scores in the recall and recognition trials of the FGT, Inhibition test, NBV, TMT-A and TMT-B, and in several visual tasks of the WAF battery (intrinsic visual alertness, unimodal selective attention, visual vigilance, and smooth pursuit eye movements).	Patients with COVID-19 reporting cognitive symptoms showed a reduced cognitive performance, especially in the attention-concentration and executive functioning, episodic memory, and visuospatial processing domains.	Patients with COVID-19 reporting cognitive symptoms showed a reduced cognitive performance, especially in the attention-concentration and executive functioning, episodic memory, and visuospatial processing domains. Future studies are necessary to disentangle the specific mechanisms associated with COVID-19 cognitive dysfunction.
Haroon	Therapies for Long COVID in non-hospitalized individuals: from symptoms, patient-reported outcomes and immunology to targeted therapies (The TLC Study)	BMJ Open	We aim to evaluate the symptom burden and underlying pathophysiology of Long COVID syndromes in non-hospitalized individuals and evaluate potential therapies.	The cause of Long COVID is poorly understood. Evidence from existing studies on COVID-19 suggests a significant burden of pathophysiological insults and sequelae such as lung scarring, kidney injury, myocarditis and systemic inflammatory states that may promulgate long-term symptoms. It is possible that autoimmune pathways may be triggered by COVID-19, leading to multisystem inflammatory damage.	People living with Long COVID have indicated that they are suffering with a range of symptoms, feel abandoned' and 'dismissed' by healthcare providers and receive limited or conflicting advice.	The etiology and risk factors for Long COVID also need further investigation as literature suggests a disproportionately higher prevalence of Long COVID among women, older adults and individuals with specific symptom clusters.
Ho Cheng	Long COVID and its Management	International Journal of Biological Sciences	This review will first introduce the general background of long COVID, and then discuss its risk factors, diagnostic indicators and management strategies to determine symptoms that are associated with confirmed SARS-CoV-2 infection beyond 12 weeks in non-hospitalized adults and the risk factors associated with developing persistent symptoms.	Appropriate treatments are provided according to clinical symptoms. Comprehensive assessment through medical history and examination is essential. It is recommended to obtain a complete assessment including full blood count, renal function test, C-reactive protein, liver function test, thyroid function, hemoglobin A1c (HbA1c), vitamin D, magnesium, B12, folate and ferritin levels.	For patients presenting with cardiopulmonary symptoms, chest imaging, electrocardiography and pulmonary function tests should be considered. Oxygen supplementation is commonly provided for patients with dyspnea and during pulmonary rehabilitation. In particular, corticosteroid treatments have been showed to resolve pneumonia and improve clinical functions. Antibiotic and anti-viral compounds such as Azithromycin, Remdesivir and Favipiravir are being explored for their effectiveness in controlling long COVID	Considering the impact of long covid to individual's wellbeing and society, it is important to take preventive measures besides trying to avoid infection. Vaccination, Anti-inflammation treatment, Nutritional control and lifestyle modifications.
Liu	One-Year Trajectory of Cognitive Changes in Older Survivors of COVID-19 in Wuhan, China	JAMA Neurol	To investigate the 1-year trajectory of cognitive changes in older COVID-19 survivors.	Our research, along with that of others, has demonstrated an association between SARS-CoV-2 infection and cognitive performance in older adults,	Recent studies found that COVID-19 was associated with an increase in risk of being diagnosed with dementia within 6 months after infection. Consistent with this, we found that approximately 3.3% of COVID-19 survivors had	COVID-19 survival was associated with an increase in risk of longitudinal cognitive decline, highlighting the

				months after infection. However, the long-term trajectory of cognitive changes after SARS-CoV-2 infection remains unknown.	dementia and 9.1% had MCI at 12 months after discharge; in particular, the incidences of dementia and MCI were 15.00% and 26.15% in individuals with severe cases, respectively.	importance of immediate measures to deal with this challenge.
Koc	Long COVID and its Management	International Journal of Biological Sciences	This review will first introduce the general background of long COVID, and then discuss its risk factors, diagnostic indicators and management strategies.	Appropriate treatments are provided according to clinical symptoms. Comprehensive assessment through medical history and examination is essential. It is recommended to obtain a complete assessment including full blood count, renal function test, C-reactive protein, liver function test, thyroid function, hemoglobin A1c (HbA1c), vitamin D, magnesium, B12, folate and ferritin levels.	For patients presenting with cardiopulmonary symptoms, chest imaging, electrocardiography and pulmonary function tests should be considered. Oxygen supplementation is commonly provided for patients with dyspnea and during pulmonary rehabilitation. In particular, corticosteroid treatments have been showed to resolve pneumonia and improve clinical functions. Antibiotic and anti-viral compounds such as Azithromycin, Remdesivir and Favipiravir are being explored for their effectiveness in controlling long COVID	Considering the impact of long covid to individual's wellbeing and society, it is important to take preventive measures besides trying to avoid infection. Vaccination, Anti-inflammation treatment, Nutritional control and lifestyle modifications
Sacks-Zimmerman	Rehabilitation of Neuropsychiatric Symptoms in Patients with Long-COVID: Position Statement	Archives of Physical Medicine and Rehabilitation	Thus, we present a biopsychosocial framework for Long-COVID and provide treatment strategies based on evidence from current literature of post-viral chronic illness. These recommendations will guide rehabilitation professionals in 1) identifying common neuropsychiatric symptoms in Long-COVID that can be targeted for intervention and 2) addressing these symptoms via integrative interventions taking into account the biopsychosocial presentation of Long-COVID symptoms.	By applying evidence-based CBT/CR practices used in other chronic medical conditions, we may expect comparable efficacy in the Long-COVID population. Further, evidence-based treatments such as CBT and cognitive rehabilitation (CR) have been used in tandem to effectively to treat neuropsychiatric symptoms in a wide variety of medical populations with symptom chronicity including post-concussive syndrome, breast cancer treatment, and fibromyalgia. CR and CBT have been effective in treating sequelae of other post-viral syndromes, as well as mild to moderate traumatic brain injury (TBI). Moreover, evidence-based practice standards from CR, as used for patients with TBI and stroke, can be applied to treat similar cognitive symptoms in persons with Long-COVID.	Development of standardized intervention modules, conceptualized as an evidence-based, flexible toolbox for use in a variety of settings, would serve as a catalyst for clinical research on treatment efficacy in Long-COVID and promote translational research to optimize intervention effectiveness. The exposure and response-prevention aspects of this treatment may also target symptoms related to trauma.	Thus, we present a biopsychosocial framework for Long-COVID and provide treatment strategies based on evidence from current literature of post-viral chronic illness. These recommendations will guide rehabilitation professionals in 1) identifying common neuropsychiatric symptoms in Long-COVID that can be targeted for intervention and 2) addressing these symptoms via integrative interventions taking into account the biopsychosocial presentation of Long-COVID symptoms.
Shaffer	Lots of long COVID treatment leads, but few are proven	PNAS	Attempts to understand and treat long COVID have been underway almost since the pandemic began. Amid a maze of clues, some ideas are starting to coalesce.	Despite high hopes for antivirals and promising results tackling vascular inflammation and microclots, researchers and clinicians like Chheda know that what helps one patient experiencing long COVID might do little for the next.	Vagus nerve stimulation also could potentially alleviate some of the misery of long COVID, noting that the nerves detect inflammation and send the signal to the brain that the body is sick. Companies and clinicians haven't yet tested antivirals in a clinical trial for long COVID.	In April, President Biden pledged an additional \$1 billion for long COVID research and treatment and gave the Secretary of Health and Human Services 90 days to produce a roadmap for developing "the first-ever

						interagency national research action plan on long COVID"
Subramanian	Symptoms and risk factors for long COVID in non-hospitalized adults	Nature Medicine	We undertook a retrospective matched cohort study using a UK-based primary care database, Clinical Practice Research Datalink Aurum, to determine symptoms that are associated with confirmed SARS-CoV-2 infection beyond 12 weeks in non-hospitalized adults and the risk factors associated with developing persistent symptoms.	It is recognized that approximately 10% of individuals with COVID-19 develop persistent and often relapsing and remitting symptoms beyond 4 to 12 weeks after infection.	Among the cohort of patients infected with SARS-CoV-2, risk factors for long COVID included female sex, belonging to an ethnic minority, socioeconomic deprivation, smoking, obesity and a wide range of comorbidities. The risk of developing long COVID was also found to be increased along a gradient of decreasing age. SARS-CoV-2 infection is associated with a plethora of symptoms that are associated with a range of sociodemographic and clinical risk factors.	
Rogers	Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with comparison to the COVID-19 pandemic.	Lancet Psychiatry	We aimed to assess the psychiatric and neuropsychiatric presentations of SARS, MERS, and COVID-19.	Given that a very large number of individuals will be infected with SARS-CoV-2, the immediate impact on mental health could be considerable. Although there are many ways in which mental health might be adversely affected by a pandemic, this review suggests, first, that most people do not suffer from a psychiatric disorder following coronavirus infection, and second, that so far there is little to suggest that common neuropsychiatric complications beyond short-term delirium are a feature.	Given this psychiatric morbidity and high frequency of persistent fatigue, some patients might have difficulty in returning to their previous employment, at least in the short term, although physical—as well as mental—recovery is intrinsic to such a broad functional outcome.	Clinicians must be aware of the possibility of depression, anxiety, fatigue, post-traumatic stress disorder, and rarer neuropsychiatric syndromes in the aftermath. The quality of studies to date has been variable, and ongoing surveillance is essential.

2021

First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Lam	Effects of the COVID-19 Pandemic on Treatment Efficiency for Traumatic Brain Injury in the Emergency Department: A Multicenter Study in Taiwan	Clinical Medicine	The COVID-19 pandemic had a significant impact on the treatment efficiency for TBI in the ED. The impacts of preventing large gatherings and the city-wide semi-lockdown after a COVID-19 outbreak with community spread differed from impacts of self-initiated reductions in outdoor activities due to social panic during the early stages of the pandemic.	A significant decrease in ED visits for injury was observed in many countries after the pandemic was declared. Although no widespread transmission of COVID-19 infection was reported in Taiwan in 2020, a similar trend in decreased ED visits was reported in Taiwan.	Traumatic brain injury (TBI) is one of the most common diseases treated in the ED, and nearly 80% of treated cases are classified as mild injuries. Although the number of TBI cases has steadily increased over time [18,19], the number of TBI cases in the ED declined significantly during the COVID-19 pandemic, which is known as the "coronavirus lockdown effect".	Minimizing the spread of COVID-19 in the community and in hospitals and protecting ED capacity is vital to maintaining treatment efficiency for TBI. The proportion of older patients and the proportion of serious head injuries increase when overall numbers of TBI decline due to decreased participation in outdoor activities and commuting.

Themes by Article

First Author	Year	Key Themes from Article
Al-Aly	2022	Prevention of infection and reinfection with SARS-CoV-2 should continue to be the goal of public health policy.
Antonelli	2022	To minimize SARS-CoV-2 infection, at-risk populations must be targeted in efforts to boost vaccine effectiveness and infection control measures.
Damiano	2022	This article suggests pharmaceuticals to aid in the recovery from long COVID and alleviate symptoms.
Delgado-Alonso	2022	Patients with COVID-19 reporting cognitive symptoms showed a reduced cognitive performance, especially in the attention-concentration and executive functioning, episodic memory, and visuospatial processing domains.
Haroon	2022	It is unknown how to best address the symptom burden.
Ho Cheng	2022	Proactive measures are key to relieve the potential impacts by Long COVID.
Koc	2022	Considering the impact of long covid to individual's wellbeing and society, it is important to take preventive measures besides trying to avoid infection.
Lam	2021	Minimizing the spread of COVID-19 in the community and in hospitals and protecting ED capacity is vital to maintaining treatment efficiency for TBI.
Lui	2022	COVID-19 survival was associated with an increase in risk of longitudinal cognitive decline, highlighting the importance of immediate measures to deal with this challenge.
Sacks-Zimmerman	2022	Caring for patients with Long-COVID, concurrently addressing both neuropsychiatric symptoms and barriers to treatment engagement is paramount.
Shaffer	2022	Proven treatments are few. But a handful of clinical trials are starting to recruit participants. And as the pressing need keeps growing, so does confidence that the mysteries of long COVID can be cracked.
Subramanian	2022	It is recognized that approximately 10% of individuals with COVID-19 develop persistent and often relapsing and remitting symptoms beyond 4 to 12 weeks after infection.
Rogers	2022	Clinicians must be aware of the possibility of depression, anxiety, fatigue, post-traumatic stress disorder, and rarer neuropsychiatric syndromes in the aftermath.

Potential Gaps

These were the gaps or additional areas of research mentioned in the articles reviewed:

- A deeper understanding of what the predictors of long COVID-19 is needed.
- Clinical trials are needed to address efficacy of treatments.
- Current diagnostic and treatment options for long COVID are insufficient, and there is a need for prioritizing clinical trials that address leading hypotheses.
- The impact of vaccinations on long COVID is an area of study and investigation.

Focus Area 4: Impact on access to rehabilitation and community-based services

Overview

This topic area is meant to explore what impact the pandemic had on access to rehabilitation and community-based services. It is important not only in understanding how it may have or could still impact those with brain injury, but also the impact on the brain injury service delivery system given some of the long-haul COVID symptoms mirror that of brain injury. This helps explore the implications for future service delivery and needs.

Key search terms used: TBI access to rehabilitation services COVID-19

Summary of Literature

2023 & 2024*						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Palusak, Cara, et al.	"Caregiver and student perspectives on school services for students with traumatic brain injury during the COVID-19 pandemic." <i>Journal of Pediatric Rehabilitation Medicine</i> Preprint: 1-14.		To identify unique challenges created by COVID-19 school closures for students with traumatic brain injury (TBI) and their families with relation to special education accommodations, therapy services, social support systems, and mental health complications.	Central themes encompassing the student- and caregiver-reported challenges and advantages of COVID-19 school closures were changes in education delivery, special education services, and accommodations for children with TBI, and social relationships for students with TBI and their caregivers.		COVID-19 and the transition to remote learning significantly impacted special education services and education received by students with TBI. Families in this study discussed both perceived obstacles to and advantages of remote learning in this population. As remote and asynchronous learning are now commonly integrated into the curriculum, research should clarify the facilitators and barriers for successful service provision for students with TBI.
Petersen, Tarryn, and Mogammad Shaheed Soeker.	"An Exploration of the Experiences and Perceptions of TBI Survivors About Accessing Vocational Rehabilitation During the COVID-19 Pandemic." <i>Occupational therapy international</i> 2024.1 (2024): 8414358.		To explore the experiences and perceptions of TBI survivors about accessing vocational rehabilitation during the COVID-19 pandemic and how this has affected their worker roles.	Three themes emanated from the study, namely, Theme 1: "The barriers to accessing rehabilitation during the COVID-19 pandemic" represents the participants' barriers to accessing rehabilitation programs throughout the COVID-19 pandemic. Theme 2: "Lack of rehabilitation negatively influenced the individual with TBI occupational performance" describes how the lack of occupational therapy (OT) rehabilitation during the COVID-19 pandemic impacted the participants' quality of life. Theme 3: "Factors that facilitated access to rehabilitation during the COVID-19 pandemic" describes the factors that facilitated access to OT rehabilitation services during the COVID-19 pandemic.		The study found that there were barriers and facilitators to accessing occupational therapy rehabilitation during the COVID-19 pandemic for TBI survivors. More research needs to be conducted to explore the efficacy of telehealth/telemedicine for occupational therapy rehabilitation and the role of the occupational therapist in global pandemics.
Quillico, E. L., et al.	"COVID-19's impact on a community-based physical activity program for adults with moderate-to-severe TBI." <i>Disability and Rehabilitation</i> 46.10 (2024): 2014-2022.		To provide an in-depth exploration of COVID-19's impact on the TBI-Health program for adults with moderate-to-severe TBI and determine how their physical activity behaviors could be supported in the pandemic.	Three major themes were identified: Need for PA after TBI included specific benefits of PA after TBI and desire for an adapted PA program. Lasting impacts of the TBI-Health program identified belonging to the TBI-health community, benefits, and knowledge transfer from the program. Resilience and loss through the pandemic comprised the repercussions of COVID-19, loss of the PA program, adapting PA to the pandemic, and resilience after TBI.		This study provides insights about impacts of participating in community-based peer-assisted PA programs after moderate-to-severe TBI and ways to support PA in unforeseen circumstances.
Tsow, Rebecca, et al.	"A Look at Traumatic Brain Injury Community Programs in British Columbia: Barriers and facilitators of implementation." <i>Brain Injury</i> 38.7 (2024): 539-549.		To 1) Characterize the delivery of programs that support acceptance and resiliency for people with	Systemic challenges such as access to and allocation of funding require navigation support. Resource consistency and availability, including stable program leaders and a welcoming atmosphere, are important for program		This study informs individual- and community-level approaches to promote meaningful life after brain injury. Findings highlight existing

	brain injury in the healthcare sector; 2) Understand the barriers and facilitators in implementation of programs to support self-acceptance and resiliency for people with brain injury	implementation and sustainability. Shared experiences promote connection with the community and personal development.	resources and support future programming for people with brain injury.
Salazar, Ana Paula, et al. "Impact of the COVID-19 pandemic on community-based brain injury associations across Canada: a cross-sectional survey study." <i>Frontiers in Public Health</i> 11 (2023): 1166106.	To understand the effects of the pandemic on clients who live with brain injury, as well as on the provision of community brain injury services/programs in Canada.	Of the 45 key representatives from associations in Pacific/Western (40%), Central (56%), and Atlantic Canada (4%), the majority were paid executive directors (67%). Participants reported that the most frequent psychosocial challenges experienced by their clients during the pandemic were social isolation (98%), loneliness (96%), and anxiety (93%). To alleviate these challenges, associations implemented wellness checks and psychosocial support. Most respondents (91%) affirmed that clients faced multiple technological barriers, such as a lack of technological knowledge and financial resources for devices and/or the internet. In the open-ended questions, twenty-nine (64%) associations reported providing clients with devices, technology training, and assistance. Regarding public health measures, thirty (67%) respondents reported that clients had challenges understanding and/or following public health guidelines. Forty-two associations (93%) provided tailored information to help clients understand and comply with public health measures. Although associations (67%) received pandemic-related funding from the Canadian government they still struggled with the association's sustainability. Thirty-four (76%) lost funding or financial resources that prevented them from delivering programs or required the use of reserve funds to continue to do so. Only 56% reported receiving sufficient funding to address additional COVID-19-related expenses.	Although the pandemic added further challenges to the sustainability of brain injury associations across Canada, they quickly adapted services/programs to respond to the increasing and varied needs of clients, while complying with protective measures. To ensure community associations' survival it is essential to aptly recognize the vital role played by these associations within the brain injury care continuum.
Salazar, Ana Paula, et al. "Understanding the early impacts of the COVID-19 pandemic on brain injury associations across Canada: a qualitative study." <i>INQUIRY: The Journal of Health Care Organization, Provision, and Financing</i> 60 (2023): 00469580231209161.	To gain an in-depth understanding of the challenges faced by brain injury survivors during the first year of the pandemic and how community brain injury associations adapted their services to respond to these needs.	Findings from seven focus-group with 31 representatives of Canadian brain injury associations revealed 4 main themes: (1) Addressing evolving client needs; (2) Keeping clients safe; (3) Challenges and opportunities navigating the digital world; and (4) Sustaining brain injury associations in the face of uncertainties and disruptions. To comply with public health measures, associations reported pivoting their service delivery online, despite recognizing the difficulties this could create for many brain injury survivors in accessing and using technology. Our findings also highlight concrete directions for not-for-profit organizations providing instrumental help with activities, acting as a liaison and interpreter of public health guidelines, and in connecting with clients using technology while handling potential cognitive and technological challenges.	Addressing these issues has the potential to protect people living with brain injury and community associations from external threats, like pandemics, in the future.
Unruh, Deanne, et al. "Stakeholder Perspectives on the School Experiences of Students with Traumatic Brain Injury: The Effects of COVID-19 Pandemic on Service Delivery." <i>Journal of School Health</i> 93.5 (2023): 378-385.	To explore the school experiences of students with TBI.	Key themes from the analysis include (a) incidence of brain injuries decreased; (b) screen time for students with TBI exacerbated symptoms; (c) COVID protocols at school made it difficult for educators to identify and provide accommodations for students with TBI; (d) COVID protocols at school could inadvertently exacerbate mental health difficulties after a TBI; and (e) COVID-related logistics increased the time between an injury and return to school or return to play.	The results from this study suggest that professional development for teachers supporting students with TBI is needed, especially for online learning environments. Additionally, because mental/behavioral health concerns may arise for students with TBI in online learning environments, school healthcare providers can work with families to assess a student's mental health, making referrals to appropriate supports. There is a significant need for professional development and school-wide infrastructure supportive of students with TBI.

*For 2024, January through August 2024 only. Inclusion criteria for this literature review were: A focus on the impact of COVID on services for people with TBI. Only results from the first two pages of electronic search results are included. Exclusion criteria for this literature review section include articles focused on the COVID-19 virus as a causal factor in TBI and/or TBI-type symptoms and articles related to any of the other focus areas.

2022						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Tverdal	Referrals to Early Specialized Rehabilitation after Traumatic Brain Injury during the Covid-19 Pandemic	J Rehabil med	To quantify potential changes in direct referral to early specialized rehabilitation during the COVID-19 pandemic and the injury pattern of patients hospitalized with traumatic brain injury (TBI) at a level 1 trauma center.	The COVID-19 pandemic has put health services under pressure, and hospitals in Norway were reorganized to be able to treat a large number of patients with COVID-19.	During the COVID-19 pandemic, both the non-urgent neurosurgical and the rehabilitation services were downscaled. Combining trauma referral and TBI severity with referral to specialized rehabilitation provides the opportunity to explore the pandemic's impact on the patients' needs. The COVID-19 pandemic has not resulted in any notable reduction in the number of TBI referrals, or influenced the direct pathway to early, specialized rehabilitation. This study did not find evidence of a change in acute care management, although the full consequences of the pandemic for the rehabilitation of patients with TBI may not be realized for years to come.	For patients with moderate-severe TBI, the direct pathway to early specialized rehabilitation was maintained during 2020-21. However, the pandemic continued and the long-term impact for rehabilitation services is not yet known.
2021						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Lester	The Impact of the COVID-19 Pandemic on Traumatic Brain Injury Management: Lessons Learned Over the First Year	World Neurosurg	We aimed to evaluate the effect the COVID-19 pandemic has had on traumatic brain injury (TBI) specifically. We reviewed the literature published on COVID-19 and TBI referrals, management, and rehabilitation.	Throughout the pandemic, TBIs have continued to be treated with the highest priority. TBI was more likely to be managed conservatively the COVID-19 pandemic necessitating fundamental changes to societal and social conventions, it stands to reason that the daily challenges faced by TBI patients have been exacerbated. actively during the pandemic.	The introduction of telerehabilitation allowed TBI patients to engage with rehabilitative therapies from home, facilitating communication between patients, caregivers, and health care workers. With the COVID-19 pandemic necessitating fundamental changes to societal and social conventions, it stands to reason that the daily challenges faced by TBI patients have been exacerbated.	There is a need for further large, multicenter retrospective studies to assess its true impact on TBI.
Malec	Response to the COVID-19 Pandemic Among Posthospital Brain Injury Rehabilitation Providers	ACRM	This article describes steps taken to contain this threat by 7 leading posthospital ABI rehabilitation organizations. Outpatient and day treatment facilities were temporarily suspended. In other settings, procedures for isolation, transportation, cleaning, exposure control, infection control, and use of personal protective equipment (PPE) were reinforced with staff. Visitation and community activities were restricted. Staff and others	The coronavirus 2019 pandemic threatened access to care and the health and safety of staff, persons served, and families in these settings.	Telehealth played a major role in reducing direct interpersonal contact while continuing to provide services both to outpatients and within facilities. Estimates suggest that from a quarter to one-third of individuals hospitalized with COVID-19 may develop neurologic symptoms, with neuroinvasive presentations being linked to more severe COVID-19 cases. The preferential effect on neuroanatomic structures may include brain stem	The group of organizations comprising the newly formed Foundation to Advance Brain Rehabilitation (www.fabr.org) plan to compare outcomes aggregated across facilities and organizations from before with those obtained during the pandemic to explore the effect of service delivery changes on effectiveness.

			required to enter facilities were screened with symptom checklists and temperature checks. Individuals showing symptoms of infection were quarantined and tested, as possible.		regions linked to regulatory functions, such as respiration and cardiac function, possibly exacerbating the disease course. More discrete neurologic complications can include stroke, even in persons with few if any risks factors, and seizures.	
Rault	Decreased number of deaths related to severe traumatic brain injury in intensive care unit during the first lockdown in Normandy: at least one positive side effect of the COVID-19 pandemic	Acta Neurochirurgica	The incidence of admissions for severe TBI in Normandy decreased by 33% during the containment. The etiology of TBI significantly changed during the containment: there were fewer traffic road accidents and more TBI related to alcohol consumption.	Patients with severe TBI during the containment had a better prognosis according to the impact score ($p=0.04$). We observed a significant decrease in the rate of short-term mortality related to severe TBI during the period of lockdown ($p=0.02$).	This drop in the number of TBI had also another benefit: limiting the number of patients admitted to intensive care units for TBI, which has freed some places for COVID-19 patients.	Containment related to the COVID-19 pandemic has resulted in a modification of the mechanisms of severe TBI in Normandy, which was associated with a decline in the rate of short-term death in intensive unit care.

2020						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Kolakowsky-Hayner	Sex and Gender Issues for Individuals with Acquired Brain Injury During COVID-19: A Commentary	Archives of Physical Medicine and Rehabilitation	This commentary highlights 3 key areas to attend to during this pandemic to help assuage such disparities and limitations.	Although men have significantly higher rates of ABI, women and LGBTQ individuals have worse long-term outcomes and experience higher rates of social, financial, and structural barriers than men with ABI. Women and LGBTQ individuals in general, and especially those with ABI, are more likely to be victims of abuse and violence, including IPV, which almost always results in multiple repeat injuries, including traumatic brain injury. Unfortunately, COVID-19 has increased the likelihood of this occurrence.	According to one meta-analysis of 16 clinical COVID-19 symptoms, fever, cough, and fatigue were the most common. Although women and men appear to contract COVID-19 at the same rate, more severe morbidity and overall mortality rates are much higher in men. However, in general, both men and women with COVID-19 have been shown to have higher rates of anxiety, depression, anger, loneliness, hazardous and harmful alcohol use, posttraumatic stress symptoms, and lower mental. The restructuring of the social and health care system (e.g., conversion of rehabilitation units into COVID-19 units and some therapy services being deemed nonessential) are likely to magnify the inequities in the accessibility of necessary services among women with ABI. Although all individuals with ABI may experience greater challenges in accessing essential services in light of the shift in how these services can be accessed (e.g., changes in business operations, social distancing guidelines, greater reliance on the internet, curbside pick-up may not be wheelchair accessible, limited public transportation may limit the ability to get to medical noncancelled appointments, medical transportation services may be extremely limited or also cancelled.), women with ABI are more likely to lack the resources (internet access or even a computer) and support (family member, caregiver) to help them navigate these increased challenge wellbeing than the general population.	Although more men are afflicted with ABI, women and LGBTQ+ individuals are disproportionately affected by poorer outcomes, many of which are systemic. The restrictions and changes brought about by COVID-19 have the potential to broaden the existing disparities and exhaust the limited functional resources of these individuals. Special attention and intervention are warranted in the areas of IPV

Themes by Article

First Author	Year	Key Themes from Article
Kolakowsky-Hayner	2020	Women and LGBTQ individuals with ABI are faced with greater social and economic disparities, as well as general and technological accessibility issues, which are expected to be worsened by the current pandemic. The majority of essential services and everyday activities, including shopping, health care, and even social interactions, transitioning to electronic online formats, Individuals with cognitive and sensory deficits are faced with navigating these complex and unfamiliar environments that are rarely accommodating to their unique post-ABI challenges
Lester	2021	With the COVID-19 pandemic necessitating fundamental changes to societal and social conventions, it stands to reason that the daily challenges faced by TBI patients have been exacerbated.
Malec	2021	Reopening closed services, further development of telehealth, care of staff, organizational flexibility and preparedness
Rault	2021	The overall rate of admissions decreased during the COVID lockdown. There was fewer car accidents related TBIs, but an increase in alcohol related TBIs. There was a significant decrease in the rate of short-term mortality related to severe TBIs during the lockdown.
Tverdal	2022	Moreover, there was no change in the number of hospital admissions or patient characteristics, and acute management was maintained. However, the true long-term consequences for rehabilitation are not yet known.

Potential Gaps

These were the gaps or additional areas of research mentioned in the articles reviewed:

- With the anticipated ascendance of telehealth as a service option, expanded research in variations of this modality, accessibility, and engagement are needed to support the development of best practices in telehealth (Malec)
- The restrictions and changes brought about by COVID-19 have the potential to broaden the existing disparities and exhaust the limited functional resources of these individuals (Kolakowsky-Hayner)

Additional Focus Areas

While conducting the literature review and through discussion during workgroup meetings, additional topics were identified as areas to explore. This section provides a summary of what those topics were.

Time Between Injury & Rehabilitation Services

Overview

Given some of the social distancing guidance and restrictions on services, many individuals who experienced a brain injury during the pandemic may have experienced delays with accessing rehabilitation services and treatment. In other cases, people may have been in rehabilitation services longer. A literature review was done to identify any findings or relationships between the length of time since injury and access to rehabilitation services. This will help identify if individuals may have “lost their window of opportunity” with rehabilitation.

Key search terms used: TBI and treatment time, TBI and treatment window, delays in TBI treatment during pandemic

Summary of Literature

2022						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Lam	Effects of the COVID-19 Pandemic on Treatment Efficiency for Traumatic Brain Injury in the Emergency Department: A Multicenter Study in Taiwan	Clinical Medicine	Our study aimed to evaluate TBI treatment efficiency in the ED during the COVID-19 pandemic.	TBI treatment efficiencies in the ED coinciding with a small-scale local COVID-19 outbreak in 2020 (P1) and large-scale community spread in 2021 (P2) were compared against the pre pandemic efficiency recorded in 2019.	The interval between ED arrival and brain CT was significantly shortened during P1 and P2 compared with the pre-pandemic interval, and no significant delay between ED arrival and surgical management was found, indicating increased treatment efficiency for TBI in the ED during the COVID-19 pandemic.	Minimizing viral spread in the community and the hospital is vital to maintaining ED treatment efficiency and capacity. The ED should retain sufficient capacity to treat older patients with serious TBI during the COVID-19 pandemic.
2019						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Marklund	Treatments and rehabilitation in the acute and chronic state of traumatic brain injury	J Intern Med	The awareness of the potential short- and long-term consequences of sports-related concussions (SRC) has increased markedly during the last decades. Conversely, the rules and regulations on the management of SRCs have evolved based on clinical management paradigms supported by experimental evidence of brain vulnerability post-injury and the possible lasting effects of repeated SRCs.	It is well established that concussions can have considerable adverse effects on cognitive functioning and balance in the first 24–72 hours following a SRC.		A system needs to be in place to allow for repeated qualified assessment reflecting the dynamic process of recovery and changes in rehabilitation needs over time: for example, a patient who several weeks after TBI cannot participate actively in rehabilitation may risk being discharged to community services without specialist rehabilitation follow up and thus without access to interdisciplinary rehabilitation a few weeks later when s/he may have regained to ability to participate actively.

Mohamadpour	The Importance of Therapeutic Time Window in the Treatment of Traumatic Brain Injury	Front. Neurosci., Sec. Neurodegeneration	This review discusses the importance of therapeutic time window; the time interval between TBI onset and the initiation of treatment.	Therapeutic time window is complex, as brain injury is both acute and chronic, resulting in multiple drug targets that appear and disappear with differing kinetics.	Despite the importance of treatment gap, we know relatively little about the time course of pathophysiological events that can be successfully targeted with drugs first dosed many hours to days following TBI.	
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Vaccination Side Effects

Overview

This component of the literature review focuses on identifying common side effects that people may have experienced from the COVID-19 vaccination – particularly among individuals with brain injury or symptoms that are similar to brain injury symptoms.

Key search terms used: adverse reaction, COVID-19, neuropathy, SARS-CoV-2, side effect, vaccination

Summary of Literature

2022						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Copaescu	What have we learned about the allergenicity, and adverse reactions associated with the severe acute respiratory syndrome coronavirus 2 vaccines: One year later	Ann Allergy Asthma Immunol	We highlight the history of these amazing achievements with a focus on the description of the classification and mechanisms of allergic reactions and adverse events relevant to the allergist and immunologist that have been associated with the SARS-CoV-2 vaccines.	The adverse reactions associated with the coronavirus disease 2019 (COVID-19) vaccines can be broadly classified as reactogenic or allergic. Initial reports of allergic reactions led to a risk management strategy that triaged patients based on their prior history of a potential reaction to a vaccine or a component of the existing (messenger [m]RNA) vaccines	The risk of a reaction compared with the benefit of protection from severe illness and hospitalization is extremely small, and we can be reassured that although there are still many unanswered questions and controversies, there is already a very sound approach to ensure safe COVID-19 vaccination even in those with anaphylactic first-dose reactions.	The international rollout of COVID-19 vaccination started with reports of immediate allergic reactions. Although we still need to understand the mechanisms of these reactions, we can be reassured that patients with underlying allergic disease will not need to avoid SARS-CoV-2 vaccination. In addition, the vast majority of those with a first-dose reaction will tolerate subsequent doses.
Hassine	Covid-19 vaccines and variants of concern: A review	Rev Med Virol	This review article suggests that frontrunners Covid-19 vaccines have good neutralizing activity against the Alpha strain, an intermediate impact on Gamma and Delta strains, and a reduced effect on the Beta strain. Nevertheless, long-term evaluation of neutralizing activity is needed to evaluate the persistence of protective antibodies against novel variants.	Rare adverse events have also been reported soon after administration of viral vector and mRNA vaccines. Although many Covid-19 vaccines have been developed, additional effective vaccines are still needed to meet the global demand	Rare adverse events have also been reported following Covid-19 immunization – including TTS, anaphylaxis, myocarditis, and GBS. More research is needed to fully understand the link between Covid-19 vaccines and rare side effects and long-term investigation is further required to assess delayed reactions to immunization.	Although many Covid-19 vaccines have been developed, additional effective vaccines are still needed to meet the global demand.
Kakovan	Stroke Associated with COVID-19 Vaccines	J Stroke Cerebrovasc Dis	This paper aims to review reports of stroke associated with COVID-19 vaccines and provide	COVID-19 vaccines may trigger stroke with thrombotic thrombocytopenia with or without the presence of anti-platelet	Unusual thrombotic events with thrombocytopenia following COVID-19 vaccination and the presence of anti-PF4 antibody have led to the	Clinicians should be aware of the possible stroke after COVID-19 vaccination to ensure rapid diagnosis and treatment. Since the advantages

			a coherent clinical picture of this condition.	factor 4 antibody (an PF4 antibody).	concept of VITT, which is also called thrombosis with thrombocytopenia syndrome (TTS). Most of the evidence pertaining to stroke following COVID-19 vaccination are case reports, therefore, the incidence of stroke after COVID-19 vaccination is not precisely known. Most patients who suffered from stroke after COVID-19 vaccination were women, under 60 years of age, and after the ChAdOx1 nCoV-19 vaccine.	of COVID-19 vaccination outweigh the risk of stroke or any other neurological complication, the public should be reassured that the vaccination program is still the best way to combat COVID-19.
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2021						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Finsterer	Neurological side effects of SARS-CoV-2 vaccinations	Neurologica	This narrative review was conducted to collect and discuss published data about neurological side effects of SARS-CoV-2 vaccines in order to discover type, frequency, treatment, and outcome of these side effects.	The most frequent neurological side effects of SARS-CoV-2 vaccines are headache, Guillain-Barre syndrome (GBS), venous sinus thrombosis (VST), and transverse myelitis. Other neurological side effects occur in a much lower frequency.	Treatment of these side effects is not at variance from similar conditions due to other causes. The worst outcome of these side effects is associated with VST, why it should not be missed and treated appropriately in due time.	In conclusion, safety concerns against SARS-CoV-2 vaccines are backed by an increasing number of studies reporting neurological side effects. The most frequent of them are headache, GBS, VST, and transverse myelitis. Healthcare professionals, particularly neurologists involved in the management of patients having undergone SARS-CoV-2 vaccinations, should be aware of these side effects and should stay vigilant to recognize them early and treat them adequately.

Returning to Work

Overview

This topic area is meant to explore the impact on returning to work after having the COVID-19 virus – for individuals with brain injury and also those who may not have experienced a brain injury.

Key search terms used: Covid-19 returning to work, working after pandemic, return to work pandemic

Summary of Literature

2022						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Hürlimann	Return to work after hospitalization for COVID-19 infection	Eur J Intern Med	The objective of this prospective observational study is to describe return to work, resumption of hobbies and physical activities, presence of fatigue, depression, and restriction of participation at 7 months	Our study shows that return to work 7 months after hospital discharge for COVID-19 infection is common, but often at the expense of hobbies and physical activity, and despite fatigue and restriction of participation. This indicates that recovery is not complete when the patient returns to work.	We propose to take resumption of hobbies and physical activity into consideration when evaluating recovery in a rehabilitation setting.	We recommend systematic screening of all COVID-19 patients having needed ICU care and those, whose hospital stay exceeds 9.5 days for eligibility for a rehabilitation program. We do so because the prevalence of post-COVID-19 sequelae is high and adequate measures may accelerate return to work. This could lead to less socio-economic costs and a higher degree of patient satisfaction.

			post hospitalization due to COVID-19.			
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2021						
First Author	Title	Journal	Aims	Key Points	Findings/Results	Additional Findings & Suggestions
Godeau	Return-to-work, disabilities and occupational health in the age of COVID-19	Scand J Work Environ Health.	The authors highlight the importance of the societal consequences of the outbreak and changes in the world of work to manage occupational health.	The key points identified – such as individual socioeconomic factors, psychological effects and occupations with highest risk of contamination – modify return-to-work approaches. Preliminary studies suggest that long recovery duration is related to high severity (7), but this is still a matter of debate for patients suffering from “long COVID-19” a condition for which the long-term effects remain unknown.	It is estimated that around 800 million people of working age worldwide were living with disabilities before the SARS-CoV-2 pandemic. In early January 2021, the cumulative COVID-19 hospitalization rate reached 207.4/100 000 (18–49-year-olds) and 505.7/100 000 (50–64-year-olds), respectively, in the United States.	The consequences of the epidemic must be evaluated over time for people who suffered from functional limitations before COVID-19 as their physical and mental condition may be modified by the epidemic and, specifically, the consequences of lockdown
Stewart-Patterson	The Importance of Keeping Patients with Post-Acute Sequelae of SARS-CoV-2 Infection (Long COVID) Engaged in Work	Am Fam Physician	The prevalence of persistent PASC symptoms may lead people to leave their jobs temporarily. The American College of Occupational and Environmental Medicine advises that prolonged absence from the workplace is detrimental to a person's mental, physical, and social well-being.	A World Health Organization report found that up to 10% of people with COVID-19 are still symptomatic at 12 weeks. Symptoms include excessive fatigue, cough, chest pain, shortness of breath, ² and cognitive complaints of concentration and memory, ¹ which, in the authors' experience, patients may refer to collectively as “cognitive fog.”	Accommodations are guided by physician-directed restrictions and limitations, broadly defined as: • Restrictions generally address risk and indicate tasks that a person is capable of doing at work but should not do for medical reasons. • Limitations generally address capacity and speak to what a person is not currently capable of doing at work for medical reasons.	Appropriate physician accommodation guidance for patients with post-acute sequelae of SARS-CoV-2 infection can preserve their remaining functionality and protect against the secondary effects on the health of worklessness.