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Long COVID and oral health care considerations



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ABSTRACT

Background. People who have recovered from the initial severe acute respiratory syndrome coronavirus 2 infection are at risk of developing long COVID, a prolonged suite of signs and symptoms that may interfere with daily life and the ability to undergo routine oral health care.

Methods. The available literature on long COVID was reviewed and compiled to produce a review of the syndrome as currently understood. Articles were evaluated with a focus on how long COVID may affect the provision of oral health care and on ways in which treatment may need to be modified to best care for this vulnerable patient population.

Results. Long COVID includes a wide variety of symptoms, such as fatigue, shortness of breath, chest pain, risk of developing thromboembolism, and neurologic and psychiatric complications. These symptoms may arise at various times and in a wide range of patients, and they may necessitate modification of routine oral health care interventions.

Conclusions. Recommendations for the treatment of affected people in an oral health care setting are presented, including a thorough evaluation of the patient history and current status, understanding of how related symptoms may affect oral health care interventions, and which modifications to treatment are needed to provide safe and appropriate care.

Practical Implications. Oral health care professionals must be aware of long COVID, an increasingly prevalent condition with a widely variable presentation and impact. Oral health care professionals should be prepared to treat these patients safely in an outpatient oral health setting.

Key Words. Long COVID; COVID-19; patient treatment; medically complex dental treatment.

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During the first year of the COVID-19 pandemic, oral health care professionals (OHCPs) were faced with many new challenges, but a primary concern centered around mitigating transmission of the causative virus—severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)—in an oral health care setting. However, with emerging knowledge of conditions affecting people after recovering from the acute phase of COVID-19 and after having been released from hospital care, it is possible to start to formulate suggestions on how to provide oral health care for people in an outpatient setting that is both appropriate and will not result in care-related complications. New information about COVID-19 is being published at an unprecedented pace, resulting in more than 132,000 available peer-reviewed and non-peer-reviewed publications, on a wide range of issues, over 16 months.¹ This pace may abate, but different and updated reports related to COVID-19 will continue to emerge and most probably, over time, will amend how we approach this disease and its aftermath.

Both the scientific and lay literature have increasingly turned attention to the propensity for some people to experience prolonged and disruptive long-term health consequences after having ostensibly recovered from the acute stage of COVID-19.² This group of signs and symptoms has commonly been referred to as “long COVID,” and affected people are often identified as “COVID long-haulers.” The specific symptoms, timeline, severity, and impact of this new syndrome can vary from person to person, and, in these ways, long COVID resembles myalgic encephalomyelitis and other heterogeneous syndromes.³

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Other terms have also been suggested, including “post-acute COVID-19 syndrome,” “post-COVID syndrome,” “persistent post-COVID syndrome,” and “chronic COVID syndrome.” The condition is also sometimes referred to according to specific affected organ systems.⁴

People with this condition have been active in advocating for recognition of and research on this illness, and they advocate for the use of the name “long COVID.”⁵ These patients provide support for one another, visibility for the condition, and continue to push for additional research and attention by national and international groups to this condition.⁶ Clarity of terminology is important, as the condition cannot currently be consistently coded or tracked, making research sparser and more difficult to conduct.⁷ With clear diagnostic criteria, better tracking of affected people, and more research, the full scale of long COVID and its impact on patients can continue to be elucidated.⁸

To date, the lack of adequate focus on, empathy for, and support for this condition has been a source of frustration for affected people. Thus, with an increasing number of COVID long-haulers, it behooves OHCPs to recognize this sequela of COVID-19 and be prepared to treat this patient population in an ambulatory outpatient setting. Through familiarity and ongoing attention to the evolving literature about long COVID, OHCPs will be able to appropriately evaluate and treat patients who, having recovered from the acute phase of COVID-19, continue to experience the wide array of symptoms that comprise long COVID. This article provides a brief review of long COVID and examines how this condition may require modification to routine oral health care in an outpatient setting.

METHODS

A search for articles about long COVID was performed in PubMed⁹ and in a National Library of Medicine COVID repository—LitCovid—for indexed and published articles on long COVID through May 25, 2021.¹ The PubMed search (“Long COVID” [All Fields] OR “Post-acute COVID” [All Fields] OR “Post COVID Syndrome” [All Fields] OR “Persistent Post COVID Syndrome” [All Fields]) resulted in 254 articles published in English; the LitCovid search resulted in 246 articles. All types of articles, including original research, case reports and case series, reviews, editorials, and letters written in English, were reviewed. Articles were included on the basis of their content and relevance to characterizing this patient population and their ability to seek oral health care within an outpatient setting. No attempt was made to appraise the quality of the identified literature. Assessing potential complications associated with oral health care was classified according to 4 criteria¹⁰:

1. a person’s ability to achieve hemostasis
2. a person’s ability to respond to bacteria emanating from the oral cavity
3. potential drug actions and drug interactions with medications taken by the person and medications administered and prescribed by the OHCP
4. a person’s ability to cope with stress and response to tissue healing.

RESULTS

The prevalence of long COVID is difficult to assess given the wide range of signs and symptoms experienced and lack of a definitive definition of this condition. Estimates range from as low as 10% to as high as 87% of patients having at least 1 ongoing symptom after being infected with SARS-CoV-2.³ This includes up to 15% of patients initially hospitalized with COVID-19 who may need to be rehospitalized with persistent or new symptoms in the months after their initial illness. In those with less severe initial disease, up to one-third of patients may experience worse symptoms during long COVID.¹¹ The frequency of long COVID, severity of symptoms, and number of symptoms are higher in older patients with more comorbidities, particularly in those with underlying respiratory disease, and obesity. Rates also seem to be higher in women and among racial minority groups.^{2,12} Given the frequency of asymptomatic or mildly symptomatic cases of COVID-19, however, most cases of long COVID seem to occur in patients who were otherwise healthy and in those who were not hospitalized during their initial disease course.¹³ Children are also affected by long COVID in approximately 13% of cases and exhibit symptoms similar to those of adults, including fatigue, dyspnea, chest pain, headaches, difficulty concentrating, weakness, and changes in smell and taste.^{14,15}

ABBREVIATION KEY

- OHCP:** Oral health care professional.
SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2.

Table. Signs and symptoms associated with long COVID, medications routinely used in the treatment of these findings, their impact on oral health care interventions, and treatment modifications recommended for patients.

SIGNS AND SYMPTOMS	MEDICATIONS	IMPACT ON ORAL HEALTH CARE INTERVENTION	TREATMENT MODIFICATION
Fatigue	NA*	Decreased ability to withstand treatment	Short appointments, work with patient on timing and length of appointments
Shortness of Breath	Supplementary oxygen, systemic corticosteroids, bronchodilators, β_2 -agonists	Decreased mobility, decreased functional capacity	Pulse oximetry monitoring, monitoring for infection, patients should be instructed to bring any supplemental oxygen and new inhaled medications
Chest Pain	NA	If present, discontinue treatment	Symptom monitoring
Heart Failure	NA	Decreased functional capacity	Caution with chair positioning, confirm ability to tolerate planned procedure
Venous Thromboembolism	Antiplatelet and anticoagulant medications	Possible prolonged or excessive bleeding	Monitor hemostasis, apply local measures as needed, provide breaks, short appointments to prevent new thrombus formation
Seizures	NA	May lead to weakness, paralysis, paresthesia	Monitor for signs and symptoms, adjust home care according to functional capacity
Muscle Weakness	NA	Changes in balance and gait may affect ingress and egress from dental operator	Caution with ingress and egress
Postural Orthostatic Tachycardia	NA	May be exacerbated by changes during the positioning of the dental chair	Avoid rapid chair positioning and confirm patient tolerance of position
Neuropathic Pain and Headache	Triptans	Can affect the orofacial region	May require evaluation and treatment by orofacial pain specialists
Cognitive Changes	NA	May show reduced memory and ability to make decisions	If necessary, involve other decision makers, ensure informed consent
Psychiatric Illness	Antianxiety and antidepressive medications	Inability to submit to care, decreased reliability	Treatment of patient concerns, understanding, monitoring and treatment of decreased salivary flow and resultant caries and periodontal disease
Chronic Pain	Possibly treated with habit-forming medications including opioids	Inability to tolerate prolonged procedures and certain positions	Short appointments and adjustments to patient needs, positioning and breaks as needed, avoid provision of opioid analgesics
Kidney Impairment	NA	Decreased metabolism of medications eliminated in the kidneys	Changes in dose and timing according to kidney function
Hepatic Impairment	NA	Decreased metabolism of hepatically processed medications	Changes in dose and timing, avoid hepatically metabolized medications as possible

* NA: Not applicable.

The same syndrome has also been identified in patients who either did not test positive or were not able to access COVID-19 testing during their initial illness.¹⁶ Given the lack of widespread access to testing, particularly at the beginning of the COVID-19 pandemic, patients experiencing symptoms consistent with a possible or probable infection should be considered to have long COVID.¹⁷ In addition, symptoms are known to vary with time; new symptoms may appear in an erratic order and timeline, and symptom nature, timing, and course are incompletely characterized.^{16,18}

A list of symptoms associated with long COVID and possible treatment options are presented in the table. As with other postviral syndromes, the signs and symptoms of long COVID are primarily immune related and include fatigue, prolonged difficulties with mentation, headaches, decreased respiratory function, and risk of developing venous thromboembolism. These findings and the associated medications used to control reported signs and symptoms were reviewed as to their potential to affect oral health care. People with long COVID will no longer test positive for active replication of SARS-CoV-2 and are not considered infectious.¹⁹ However, as the COVID-19 pandemic continues and additional strains of the SARS-CoV-2 mutate and spread, people with long COVID are able to be reinfected and may experience a return of initial symptoms. In addition, it is increasingly recognized that patients who have been vaccinated against COVID-19 may

develop “breakthrough” infections, which may result in long COVID after recovery from the infectious phase of the disease.²⁰

It is theorized that long COVID occurs mainly because of a prolonged and excessive immune response. In support of this theory, patients have been found to have elevated levels of interleukin-6 and transforming growth factor- β , as in other inflammatory syndromes.^{21,22} The Centers for Disease Control and Prevention has now also characterized a multisystem inflammatory syndrome after the acute phase of SARS-CoV-2 infection that overlaps with long COVID and can lead to severe symptoms and hospitalization.²³ As with other viruses causing illness, SARS-CoV-2 may remain latent in the nervous system, which may lead to neurologic symptoms.²⁴ Acute illness with COVID-19 may also lead to organ damage that results in some of the symptoms observed in long COVID. Alternatively, or in addition, it is theorized that COVID-19 reveals undiagnosed underlying illnesses that manifest as long COVID.¹³

Patient evaluation is based primarily on symptoms and organ systems affected, and it is highly variable given the heterogeneous manifestation of long COVID. As there is a lack of understanding of underlying etiologies, treatment consists primarily of symptom monitoring, patient validation and reassurance, and administration of medications to alleviate symptoms and prevent exacerbation or more dire consequences.²⁵ Recovery from symptoms is the main outcome measure considered.⁶ Multidisciplinary clinics are being established for care of these patients in major medical centers, and care frequently combines various modalities including occupational and physical therapy, cognitive behavior therapy, mental and physical health care, nutritional counseling, the establishment of clear and achievable goals, and support from other affected people.^{3,6,26,27}

Systems affected

The most common symptoms of long COVID appear to be shortness of breath or difficulty breathing, reported in up to 90% of patients, and fatigue, reported in 69% of patients.^{28,29} Pulmonary symptoms appear to be particularly common immediately after COVID-19 but seem to decrease with time.¹⁸ As with the initial infection, pulmonary dysfunction during long COVID can lead to pulmonary fibrosis, lasting hypoxia, and permanent lung damage.²²

Cardiac sequelae include chest pain, ongoing myocardial inflammation, right heart failure, decreased cardiac contractility, arrhythmias particularly including atrial fibrillation and flutter, tachycardia, palpitations, and atherosclerotic progression and plaque rupture.^{22,30} Patients are also found to have labile heart rates and blood pressure.¹⁷ Those with long COVID also have higher rates of postural orthostatic tachycardia syndrome, which is a known complication of other viral illnesses, as well as resting and postural hypotension and syncope.^{31,32} Although many of these patients are treated primarily by monitoring, in some cases addition of a β -blocker is necessary.²

Patients with long COVID are also at higher risk of developing a thromboembolism than the general population, although the risk is still estimated to be less than 5%. Paradoxically, patients may also have thrombocytopenia and decreased levels of fibrinogen despite their increased risk of experiencing clotting.²² Given the fatigue and exercise intolerance that many of these patients experience, they are less mobile, which also adds to their risk of developing clots. Treatment, particularly in the first months after COVID-19, often consists of antiplatelet medications, direct oral anticoagulants, or low-molecular-weight heparin to reduce this risk.²

Neurologic symptoms are also common in long COVID and include headaches, seizures, neuropathies and neuropathic pain, and development of Guillain-Barré syndrome and encephalopathy. Seizure risk is elevated during COVID-19 and remains elevated after recovery, and, in conjunction with other neurologic risks, can lead to long-term complications such as weakness, paralysis, and paresthesia.²⁴ Even when not a result of seizures or other complications, patients may exhibit muscle pain and weakness and changes in balance and gait.¹⁷ Neuropathies were found more commonly in patients who were placed in a prone position during hospital admissions, but they may develop in any patient, as the virus has been found to infect nociceptors in addition to developing autoinflammation in the nervous system.³³ This phenomenon may also be related to the reports of loss of taste and smell in long COVID, as well as reports of prolonged cough attributed to hypersensitivity and neuromodulation.³⁴ Patients who previously had COVID-19 are also known to have higher

rates of migrainelike headaches.^{2,35} Cognition is also frequently affected after COVID-19, leading to difficulties with mentation, memory, executive function, and new-onset or progressive dementia.^{36,37}

In addition to changes in cognition, patients frequently experience psychological and psychiatric symptoms including anxiety, depression, mood swings, increased hopelessness, and sleep issues, such as changes in sleep cycles, quality, and length. Each of these symptoms was observed more frequently in populations hospitalized for COVID-19.³¹ It is difficult to definitively attribute some of these psychiatric components to long COVID, as a significant psychological toll and trauma are experienced by many people affected by the COVID-19 pandemic.³⁸

In addition, increasing evidence has indicated a rise in chronic pain in patients after the acute phase of COVID-19, including headaches, neuropathic pain, and chest pain as mentioned above, but also consisting of generalized body aches and limb, joint, and muscle pain.³⁹ These symptoms are found more frequently in elderly populations and in those with comorbidities, and they can have a bidirectional relationship with psychological sequelae of the infection.⁴⁰ The limitations to care during the COVID-19 pandemic have complicated the provision of care to all populations with chronic pain and will negatively affect the ability to access care for patients with long COVID with these findings.^{41,42}

Other systems affected by long COVID may include the kidneys, liver, and gastrointestinal tract.²³ Patients with acute kidney injury during their course of COVID-19 may have prolonged renal impairment after recovery.² Patients may also experience elevated liver enzymes and jaundice as a result of COVID-19 and because of medications used during the course of COVID-19 and long COVID.¹⁷

In addition to system-specific effects, patients with long COVID have been found to have decreased quality of life, risk of experiencing malnutrition, and general functional impairments.^{2,22} Decreased quality of life was present in 44.1% of a population studied by the Centers for Disease Control and Prevention.³⁶ As a result of the various symptoms experienced and of the combined impact of the disease, many patients with long COVID are unable to return to work for prolonged periods, including health care workers affected by this condition.^{17,37} Although some of these long COVID symptoms apply to the broader population that has experienced the profound effects of lockdowns and the high stress during this pandemic, these effects do seem to be more intense in the long COVID population.¹²

DISCUSSION

Reducing complications associated with the provision of oral health care to people with long COVID does not differ substantially from providing safe care to other medically complex patients. As with all patients, OHCPs should always coordinate and collaborate with a patient's overall health care team. OHCPs must also evaluate and treat patients with all medical conditions, including long COVID, with care and only after a full evaluation of each patient's ability to withstand the stress of treatment has been completed. In long COVID, many common manifestations are seen in other medical conditions as well and will be familiar to OHCP. OHCPs are encouraged to proceed cautiously with the treatment of patients with long COVID, with consideration for short appointments, adjustments to chair positioning, and other modifications that will allow these patients to withstand treatment despite their functional limitations. OHCPs are also encouraged to work with the other specialists caring for patients affected by long COVID, to understand the nature of the patient's condition and its impact on their daily lives and ability to withstand care, and any objective measures being monitored in their recovery from this condition. Given the primarily symptom-based nature of treatment for patients with this syndrome, determinations of patient fitness, ability to withstand treatment, and recovery will be achieved primarily through careful patient interviews and evaluations, as well as through interprofessional communication.

Beyond systemic conditions, although minimally reported to date, COVID long haulers may also develop oral manifestations associated with both their precarious immune status and concomitant infectious and other systemic diseases. One study noted the development of altered taste and smell, salivary gland ectasia, white tongue, dry mouth, facial muscle weakness and dysesthesia, oral ulcers, temporomandibular disorder, and other new abnormalities in a population of people who had had COVID-19.⁴³ These findings warrant additional characterization and study. Oral manifestations may

also include a flare-up of an underlying mucosal disease, which would require appropriate recognition and treatment. Given the impact of COVID-19 and its associated inflammatory complications, such as multisystem inflammatory syndrome in children, some of these same complications can also be anticipated in children.

Patient treatment considerations

Owing to the high prevalence of long COVID, its prolonged course, and the greatly reduced energy level of people affected by it, patients most likely will seek oral health care in the communities where they reside. As we reviewed above, patients may have a wide variety of symptoms in various combinations and severities, with symptoms possibly coming and going or changing in intensity over time. Assessment and evaluation of patients with long COVID, as with all patients, include recognition of

- the nature and scope of the underlying disease
- the ability of patients to achieve hemostasis
- patients' risk of developing infections
- potential actions and interactions of medications
- the ability of patients to tolerate stress and trauma
- the need to modify any oral health care intervention.¹⁰

To address the hypercoagulable state in long COVID, patients may be treated with various antiplatelet medications, direct oral anticoagulants, or low-molecular-weight heparin.² As with patients with other conditions treated with these medications, the OHCP must ascertain which medication and dose the patient is taking and be cognizant of potential excessive or prolonged bleeding due to such agents. Given the underlying risk of developing hypercoagulability in these patients, it is also prudent to limit the length of appointments and procedures and to provide breaks as needed to prevent stasis of blood during dental treatment. To our knowledge, no evidence has been identified to date that suggests the presence of impaired wound healing in this population.

Patients with long COVID may take multiple types of medications, including both targeted drugs and immunomodulators. This may include glucocorticosteroids, putting patients at risk of experiencing the known complications of these agents, such as further risk of infection, changes in mood, increased blood sugar, and adrenal insufficiency.² When prescribing or administering medications in the oral health care setting, OHCPs must be aware of both untoward and undesired medication-associated actions and interactions. Given the decreased renal function in some of these patients, as well as possible decreased hepatic function, prescription dose and timing may also need to be modified.¹²

Patients with long COVID may also be at risk of developing additional viral, fungal, or bacterial infections, including reactivation of latent infections or new inoculations.²¹ For this reason, patients must be carefully monitored for evidence of head and neck infections, and it is prudent to treat these patients quickly and definitively if symptoms develop.

For most people with long COVID who experience prolonged fatigue, dental appointments may need to be shortened and the stress of appointments should be modified. Appointments should be staged according to the patient's tolerance and willingness, rather than the OHCP's convenience. Adding to this is the significant financial toll faced by many patients with both COVID-19 and long COVID, which may result in their seeking only medically necessary care.¹¹ Patients with long COVID also experience prolonged and severe fatigue as well as postexertional malaise that may affect their ability to withstand treatment, and this must be evaluated and respected. Cognitive dysfunction resulting from long COVID may also affect provision of care owing to patient confusion, compromised ability to provide informed consent, and forgetfulness. Together with the anxiety inherent among those with long COVID and the many unknowns facing these patients, this may present a barrier to a patient's willingness to proceed with recommended treatment. It is essential that patients be recognized, respected, and treated as necessary and that OHCPs respect the difficulties facing this population.⁴⁴

People with long COVID who are seeking oral health care can be expected to display respiratory difficulties and complications. These may include having an increased oxygen requirement, decreased functional capacity, inability to tolerate a supine position, and shortness of breath. All of these issues should be considered, prepared for, and treated when they do occur.

Patients may also have unpredictable and quickly changing blood pressure and heart rates, which may affect an OHCP's ability to provide safe care, and that must be closely monitored. Patients with decreased ejection fractions usually require adjustments to care to reduce stress, including confirming their fitness to tolerate the planned oral care interventions and monitoring for symptoms. The increased cardiac demand in these patients may also put them at risk of developing angina, which should be monitored and treated.

Patients experiencing neurologic effects of long COVID may have difficulty tolerating oral health care interventions and may seek specialized settings for treatment. This may include patients with decreased taste and smell, who may need detailed evaluation, reassurance, and monitoring for symptom recovery. Patients with increased or new headaches or other new pain syndromes as a result of long COVID may also come to oral health care specialty clinics for evaluation and treatment. In addition, patients may have decreased strength or paralysis and paresthesia, affecting their ability to ambulate in the oral health care environment and tolerate prolonged procedures.

Long COVID is also well recognized as having profound psychological effects, which may affect a patient's reliability, willingness to undergo planned treatments, and comportment in the oral health care setting. Furthermore, medications to treat psychological and psychiatric conditions may result in decreased salivary flow and increased susceptibility to the development of caries and periodontal disease.

Over time, more will be known about the etiology and course of this syndrome, and accordingly, our appreciation of long COVID is sure to change. This evolution will shape our ability to provide appropriate and safe care to this vulnerable, medically complex population. This patient population is protected, however, under the Americans with Disabilities Act and must be accommodated as are all others, carefully evaluated, and provided with appropriate care according to their abilities.⁴⁵

CONCLUSIONS

An increasing number of patients recovering from COVID-19 are developing a new syndrome known as long COVID. This condition can affect multiple organ systems and may lead to fatigue, respiratory difficulties, renal and hepatic impairments, the need for antiplatelet and anticoagulant medications, psychiatric complications, and various other symptoms. Many of these medical concerns will require modification to routine oral health care interventions. These patients are generally ambulatory and can be expected to appear in any oral health care setting. Given the wide and expanding prevalence of this condition, it is incumbent that all OHCPs be familiar with and ready to treat patients with long COVID. ■

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