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Supporting Students With Post-Acute Sequelae of SARS-CoV-2 Infection: Applying Lessons Learned From Postconcussion Symptoms

By Susan C. Davies, Julie Walsh-Messinger, & Noah Greenspan

The SARS-CoV-2 virus, which causes the COVID-19 disease, has swiftly infected millions of people since it was first identified in late 2019. While much remains unknown about the virus, it is increasingly clear that many survivors (including children and adolescents) struggle with ongoing symptoms for months after they receive a negative test.

According to Centers for Disease Control and Prevention's (CDC) most recent guidelines (2021), students who had COVID-19 are permitted to return to school after 10 days since symptoms first appeared if they are fever-free and other symptoms are improving. In general, children appear to recover from COVID-19 more quickly than adults and have less severe symptoms overall; most youth will recover within a few weeks and not require special support upon return to school (Götzinger et al., 2020). However, some students who return to school may experience persistent symptoms or develop post-acute COVID-19 complications. These may include dyspnea, cough, loss of smell or taste, fever, diarrhea, nausea, headache, fatigue, exercise intolerance, chest pain, cardiac arrhythmias, brain fog, and memory impairment (CDC, 2021).

The medical community has used varied terminology to describe those who experience protracted COVID-19 symptoms or develop post-COVID complications. The United Kingdom's National Health Service, which recognized lingering viral effects much earlier than other nations, uses the term "long COVID." In the United States, "COVID long hauler" and "long-term COVID" are more frequently used. However, these terms may be somewhat misleading, as the chronicity of this postviral syndrome is unknown. The CDC uses the term "post-COVID conditions" to describe persistent health issues after a COVID-19 infection in their recent guidelines for healthcare professionals (CDC, 2021). The National Institute of Health recently started using the term "post-acute sequelae of SARS-CoV-2 (PASC) infection" and we encourage its use because the term more accurately refers to the symptoms and complications experienced after the virus is no longer detected via testing. Further complicating our understanding of PASC is disagreement regarding what symptom duration defines the condition, as various time frames have been suggested, including more than 3 weeks (Teneforde et al., 2020), 1 month (CDC; 2021), and 3 months (Dennis et al., 2020).

While PASC now receives frequent media coverage, the scientific literature lags, with less than a dozen published or preprint studies which focus on nonhospitalized adults (Bliddal et al., 2021; Dennis et al., 2020; Hellmuth et al., 2021; Logue et al., 2021; Mahmud et al., 2021; Makaronidis et al., 2021; Peterson et al., 2020), college students (Walsh-Messinger et al., in press), and children (Buonsenso et al., 2021). Thus, members of the medical community may be relatively unaware of or untrained regarding persistent post-COVID symptoms and complications, and school might be the place such issues are first identified.

Many PASC symptoms resemble persistent symptoms experienced by some students who have sustained concussions (e.g., headache, fatigue, brain fog, memory impairment). Because both conditions involve "invisible" issues in previously healthy individuals, and because there is

limited research on this novel coronavirus, schools might effectively apply strategies recommended for students with persistent postconcussion symptoms to support students with PASC. Such strategies include temporary academic and environmental accommodations while symptoms resolve.

COVID Effects on Health and Well-Being

Acute severity in children and adolescents. Children and adolescents were initially considered low risk for contracting severe COVID-19, but research now suggests that 8–20% require hospitalization (Kim et al., 2020; Liao et al., 2020). Although rare, it is now apparent that children and adolescents are also at higher risk of developing COVID-19 associated multisystem inflammatory syndrome, typically 2–4 weeks after the onset of acute COVID-19 symptoms (Cheung et al., 2020; Toraih et al., 2021). Multisystem inflammatory syndrome presents with features similar to Kawasaki disease and toxic shock syndrome, including persistent fever, systemic shock, elevated markers of inflammation, swelling of the legs and hands, cardiac and kidney damage, and gastrointestinal symptoms.

Prevalence and symptomatology of PASC. In children and adolescents, PASC is more common than initially thought, with preliminary estimates that 30–50% experience persistent symptoms and post-COVID complications for 6 weeks or more, many of whom continue to report at least one symptom 6 months after acute illness (Buonsenso et al., 2021; Ludvigsson, 2021; Walsh-Messinger et al., in press). Although research remains scarce in all populations, one peer-reviewed study and two preprint studies of PASC in children and university students suggest that fatigue, exercise intolerance (i.e., exacerbation of symptoms following minimal physical exertion), headache, rhinitis, dyspnea, cough, chest pain and tightness, muscle and joint pain, insomnia, impaired concentration, brain fog, and appetite loss are most frequently reported (Buonsenso et al., 2021; Dobkin et al., 2021; Walsh-Messinger et al., in press). Known symptoms associated with PASC are included in Figure 1.

Anxiety, depression, and posttraumatic stress disorder (PTSD) symptoms are frequently reported by adults with PASC (Mazza et al., 2020; Uzunova et al., 2021), similar to reports after the first coronavirus outbreak (Sheng et al., 2005). Although rare, it should be noted that there are case reports of post-acute COVID psychosis in adults (Ferrando et al., 2020; Lim et al., 2020). Neuroinflammation is linked to both depression and psychosis, which could explain the increase in depression, and, to a much lesser extent, psychosis (Mazza et al. 2020). It has also been proposed that combinations of biological vulnerability, stress, SARS-CoV-2 infection of the central nervous system, cytokine storm, and smell loss likely contribute to the development or exacerbation of anxiety (Uzunova et al., 2021). Again, limited research is available to indicate whether children and adolescents with PASC also experience increased psychiatric symptoms. We found that depression was significantly increased in college students with PASC compared to students who fully recovered from disease within a month, but there was no difference compared to students who never contracted COVID-19 (Walsh-Messinger et al., in press). Until more research is available to provide guidance, we recommend close monitoring for increased anxiety, depression, and PTSD symptoms.

PASC risk factors. While estimates vary widely, 50-90% of PASC cases are female, with similar rates reported in adult (Dennis et al., 2020; Petersen et al., 2020), child, adolescent, and young adult samples (Buonsenso et al., 2021; Walsh-Messinger et al., in press) and a child case series (Ludvigsson, 2021), suggesting that female sex may be a risk factor for developing

post-COVID syndrome. What is striking about this postviral syndrome in adults is that it frequently affects those who were previously healthy, with no obvious risk factors beyond biological sex, and who experienced mild-to-moderate acute illness. In a few cases, children who were asymptomatic during the acute phase developed PASC weeks later (Buonsenso et al., 2021). Until scientists identify genetic, immunological, environmental, or other risk factors, it should be assumed that anyone may develop PASC.

Collaborative Care

When a health issue affects a student's learning, school personnel must communicate effectively with one another, with medical personnel, and with the family to prevent and address obstacles to effective and efficient care (Agency for Healthcare Research and Quality, 2014). Post-acute COVID care coordination is essential because the disease can damage or disrupt multiple organ systems; thus, treatment may involve numerous medical specialists (e.g., cardiologists, neurologists, pulmonologists) in addition to the primary care physician.

COVID is an emotionally charged topic. Many people feel passionately (and differently from one another) about mask-wearing, vaccines, quarantines, and remote learning. Parents, educators, and healthcare professionals may disagree on some of these issues, which can create barriers to collaborative care. Even when there are such disagreements, it is essential that school personnel listen to parents, validate feelings, avoid defensiveness, recognize fears and frustrations, focus on solutions, and work together toward common goals. A school-based team can facilitate this collaborative process and ensure that every student who returns to school post-COVID is monitored for return to academics and activity.

A COVID team leader. The first author's previous work on concussions emphasized the importance of developing a school-based concussion team, with a designated team leader (Davies, 2016). Similarly, it can be helpful to have a school-based "COVID team leader" who serves as the central communicator for everyone involved in the student's care. This person can oversee the environmental and academic accommodations, disseminating them to teachers and communicating with the family and community-based healthcare providers. Depending on the roles and responsibilities of school personnel, this might be the school nurse, school psychologist, school counselor, an administrator, or someone else. In many cases, the best person to serve in this role is the 504 coordinator or RTI/MTSS leader, due to their understanding of both accommodations and progress monitoring. Other staff can assist as needed, particularly if they have taken the time to educate themselves on outcomes of COVID-19 in children.

It is helpful for the team leader to secure a signed release of medical information from the parent to allow two-way communication between the school and healthcare providers. The COVID team leader can help ensure that school staff understand how to appropriately communicate what is involved in this plan in a way that maintains student privacy, per the Health Insurance Portability and Accountability Act, which protects information on a student's health (U.S. Department of Health and Human Services, n.d.) and the Family Educational Rights and Privacy Act, which protects information on a student's school records (U.S. Department of Education, n.d.)

Return to school and activity. Just as every concussion is different, everyone reacts to COVID-19 differently; symptom clusters and recovery rates will vary. The overall recovery

trajectory is not linear, as the disease presents with variable symptoms that can fluctuate day to day, and even throughout the day. One might feel “better,” only to walk up a flight of stairs and end up with profound fatigue and unable to get out of bed for a week or more. Thus, a very gradual return to physical activity is essential. For example, the recovering student might engage in no more than 50% of what they feel capable of on any given day. A good rule of thumb is to think of the recovering student as having a strict \$100 daily “budget,” which they can expend on academics, physical activity, and/or emotional stress or excitement, but spending even just \$1 more may set their recovery back days or even weeks. It is also important that they get plenty of rest and drink electrolytes (e.g., Gatorade, Pedialyte, Nuun) throughout the day.

As with students returning to school postconcussion, it is recommended that educators front-load adjustments for students with post-acute COVID symptoms. This means providing ample support and accommodations, then gradually withdrawing them as the symptoms subside and stamina increases. Because the COVID recovery trajectory can be particularly erratic, it is recommended that the student be symptom free for an extended period of time before very gradually withdrawing accommodations, erring on the side of waiting longer than may seem necessary. Withdrawal of accommodations should be carefully monitored, and any resurgence of symptoms during this time warrants reinstatement of accommodations.

Herein, we recommend the process outlined below for return to school, modified from our concussion response process (Davies, 2016) and drawing from our PASC research in college students (Walsh-Messinger et al., in press) and evaluation and treatment of adults (Greenspan et al., 2021). For schools or students engaged in remote learning due to COVID-19, it is still important to follow this (or a similar) process. It should be noted that as knowledge of PASC evolves, this process and recommended adjustments should be modified accordingly:

1. COVID diagnosis is reported to school.
2. School official asks the parent to notify the school if the child remains symptomatic after the quarantine period.
3. Educational materials outlining post-acute COVID symptoms and potential complications are sent to the parent.
4. Upon return to school, COVID Team Leader coordinates the assessment of the child's medical and academic needs.
5. The COVID team determines appropriate academic and environmental accommodations.
6. The COVID Team Leader disseminates accommodations to teachers and other relevant personnel and oversees progress monitoring.
7. Accommodations are gradually withdrawn as the student recovers.

To aid in symptom monitoring, we have developed a tool (see Table 1) to assess severity of PASC symptoms; however, we caution educational professionals to keep in mind that our knowledge of PASC continues to evolve and this tool may need to be modified as we learn more about PASC in children and adolescents.

Academic and Environmental Accommodations

The following general and symptom-based accommodations are modified from those developed for students with persistent postconcussion symptoms (CDC, n.d.; Davies, 2016). Most of these

can apply to (or be modified for) students enrolled in online learning and we offer some specific remote learning suggestions.

General

- Flexible attendance schedule with the understanding that the student might have several good days or weeks in a row which could be followed by bad days or weeks causing them to miss school.
- Optional remote learning for days in which they cannot attend school in person.
- No physical education class or rigorous physical play at recess; all other physical activity (e.g., walking between classrooms) should be minimized.
- Allow student to audit class (i.e., participate without producing grades).
- Avoid overstimulating environments (e.g., hallway at class transitions, band practice).
- Allow students to drop high level or elective classes or take an incomplete without penalty if adjustments go on for a long period of time.
- Remove or limit high-stakes testing or projects.
- Alternate periods of mental exertion with longer periods of mental rest.
- Allow the student to drink electrolyte beverages in class throughout the day.
- Do not penalize students for forgetting assignments or for writing errors, as this is a common manifestation of brain fog.
- Modify workload. Exempt nonessential written class work or homework when possible.
- Reduce class assignments and homework to critical tasks only.
- Base grades on adjusted work.
- Provide extended time to complete assignments/tests. Adjust due dates or have a no-deadline policy.
- Once key learning objective has been presented, reduce length of assignments/workload to maximize cognitive stamina (e.g., assign 5 of 30 math problems).
- Allow alternative means of assessment (e.g., student can demonstrate understanding orally to the teacher or via multiple choice format instead of in writing).
- Provide written instructions for work that is deemed essential.
- Provide class notes by the teacher or a peer. Allow use of a computer, smartphone, or voice recorder.
- Allow use of notes for test taking.
- Allow time to visit the school nurse for headaches and other symptoms.
- Allow strategic rest breaks (e.g., between classes or 5–10 minutes every 30–40 minutes during the day).
- Allow hall passing time before crowds have cleared.
- Develop a plan so student can discreetly leave class as needed for rest.
- Students with smell or taste loss may experience a decrease in appetite. In such cases, caloric intake during lunch should be discreetly monitored.
- Develop a plan for students with GI symptoms to quickly and discreetly access the restroom.
- Encourage student to explore alternative extracurricular activities that are nonphysical and not emotionally or intellectually taxing.

- Develop an emotional support plan for the student (e.g., identify an adult at school to talk with if the child feels overwhelmed).
- Provide supportive therapy or a support group for students to discuss their COVID-19 experiences and recovery.
- Address potential issues associated with COVID-19 stigma by providing education about PASC to all students (at a developmentally appropriate level).
- Regularly assess for depression, anxiety, and PTSD symptoms.
- Allow the student to attend class with their camera off so they can lay in bed if needed.
- Flexible attendance schedule that allows the student to join class for only part of the day, at whatever interval they can (e.g., attend class for an hour in the morning or 30 minutes before lunch and 30 minutes in the afternoon).
- Learning via an online platform can be more emotionally and cognitively draining than learning in person. As such, workload should be adjusted.
- Anticipate that attention, concentration, and memory difficulties may hinder organization and self-sufficiency (even in older students) and more frequent contact with a parent or caregiver should be maintained so they are aware of what is expected of the student.
- Some students may be reluctant to accept accommodations and instead push through symptoms to complete work because of the anxiety of work piling up (Halstead et al., 2013; Sady et al., 2011). Thus, it is helpful, when possible, to excuse assignments altogether. If an assignment cannot be excused entirely, providing a parallel self-care “assignment” could provide incentive for the student to use the accommodations and work at a more reasonable pace.
- Medical professionals who are unaware of PASC or who are untrained in its treatment may provide recommendations that differ from our suggestions. In such cases it is recommended that the COVID team leader consult with a clinician who has experience treating PASC cases, ideally child and adolescent cases. Many post-COVID clinics are opening across the United States and abroad. When possible, we recommend consulting with a clinician affiliated with one of those clinics, particularly as published research on COVID-19 effects and treatment increases.

As our understanding of PASC unfolds, educators will need to continue developing knowledge and skills to help students recover without detriment to their education. Similarly, the entire school community should understand that teachers, administrators, staff, and support personnel may also be struggling with their own recovery or loss related to death or significant illness of family members. School psychologists can help by providing information to all students, families, and school staff about how COVID can affect health and well-being. They can also take the lead in implementing PASC support strategies and encouraging teachers and staff with PASC to slow down and focus on their own recovery.

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