

Good afternoon. I'm Nikki Grimsley, and I'm representing the Clinician Outreach and Communication Activity or COCA with the Emergency Risk Communication Branch at the Centers for Disease Control and Prevention. I'd like to welcome you to today's COCA Call: Evaluating and Supporting Children and Adolescents Presenting with Post-COVID Conditions. All participants joining us today are in listen only mode.

Free continuing education is offered for this webinar and instructions on how to earn continuing education will be provided at the end of the call.

In compliance with continuing education requirements, all planners and presenters must disclose all financial relationships in any amount with ineligible companies over the previous 24 months as well as any use of unlabeled product or products under investigational use.

CDC, our planners, and presenters wish to disclose they have no financial relationships with ineligible companies whose primary business is producing, marketing, selling, reselling, or distributing healthcare products used by or on patients. Content will not include any discussion of the unlabeled use of a product or a product under investigational use with the exception of Dr. Laura Malone and Dr. Amanda Morrow's discussion of off label use of medications for managing POTS and chronic headaches since there are no FDA approved medications for POTS management. They will discuss first line options which are approved for other indications. CDC did not accept financial or in kind support from ineligible companies for this continuing education activity.

At the conclusion of this session today, the participant will be able to accomplish the following: Describe symptoms and complications in children and adolescents with post-COVID conditions or PCC. Outline AAPM&R consensus guidance statement recommendations to assess children and adolescents with PCC symptoms. Identify appropriate treatments for PCC related problems in children and adolescents. And highlight accommodations for schools and activities for children and adolescents with PCC.

After the presentation there will be a Q and A session. You may submit questions at any time during today's presentation. To ask a question using Zoom, click the Q and A button at the bottom of your screen. Then type your question in the Q and A box. Please note that we receive many more questions than we can answer during our webinars.

If you are a patient, please refer your question to your healthcare provider. If you are a member of the media, please contact CDC Media Relations at 404-639-3286 or send an email to media@cdc.gov.

I would now like to welcome our presenters for today's COCA Call. We are very pleased to have with us Dr. Tarayn Fairlie who is a medical officer with the Applied Epidemiology Studies Team in the Corona and Other Respiratory Viruses Division at the Centers for Disease Control and Prevention; Dr. Louise Vaz who is an associate professor in the Division of Pediatric Infectious Diseases at Oregon Health and Science University; Dr. Amanda Morrow who is the co-director at the Pediatric Post-COVID-19 Rehabilitation Clinic in the Kennedy Krieger Institute at Johns Hopkins University School of Medicine; and Dr. Laura Malone who is the co-director at the

Pediatric Post-COVID-19 Rehabilitation Clinic in the Kennedy Krieger Institute at the Johns Hopkins University School of Medicine.

I will now turn it over to Dr. Fairlie. Dr. Fairlie, please proceed.

Good afternoon. I'm Tarayn Fairlie. I'm also a practicing pediatrician as well as a medical epidemiologist. And today I'm going to talk about post-COVID conditions in children and adolescents. Next slide.

To begin our discussion, we need to address the variety of terminology in use. Long COVID is the term used by many patients experiencing these problems. Similar terms are long hauler or long haul COVID. Like WHO, CDC uses post-COVID conditions. NIH uses the term post-acute sequelae of SARS-CoV-2 infection or PASC.

This variety of terms does reflect that we are still learning about the longer term consequences of SARS-CoV-2 infection. While there are minor differences in what is meant by each of these terms, they are often used interchangeably. In any discussion of these conditions it's best to start with a description of what is being covered. Next slide.

Post-COVID conditions refers to the wide range of physical and mental health consequences present four or more weeks after SARS-CoV-2 infection. These conditions occur for patients with severe disease and also for patients who had mild or asymptomatic acute infection. Post-COVID conditions include a range of symptoms and conditions following SARS-CoV-2 infection. The patients are medically complex and a variety of processes may be occurring. We are proposing a general framework for describing these processes with the understanding that this is likely to change as we learn more and that these groups are not mutually exclusive.

On the left are conditions that occur as a result of any severe illness, hospitalization, or treatment such as post intensive care syndrome. On the right are processes that are more specific to infection with SARS-CoV-2. These include system specific pathology and clinically significant symptoms with unclear pathology. System specific effects following acute SARS-CoV-2 include new or newly identified neurological conditions, kidney damage or failure, diabetes, cardiovascular damage, and skin conditions. Symptoms with an unclear pathology involve a range of problems that can last for months after first being infected with SARS-CoV-2 or can even first appear weeks after the acute phase of the infection has resolved. This unexplained group has features similar to myalgic encephalomyelitis/chronic fatigue syndrome, dysautonomia, POTS, and other post infectious symptoms. Next slide.

There are multiple mechanisms proposed for post-COVID conditions. As depicted in this graphic, many people who experience acute COVID go on to make a full recovery. Others may experience long COVID. While we are still understanding the risk factors, some include factors that also predispose people to more severe COVID-19 such as age, underlying medical conditions, and vaccination status.

Post-COVID conditions may be explained by viral antigen persistence, systematic and tissue specific inflammation, autoimmunity, microvascular dysfunction, or SARS-CoV-2 specific immune responses. It's unknown if the potential risk factors differ among children. Next slide.

This slide lists the most commonly reported symptoms for post-COVID conditions. As noted by the blue bolded symptoms, dyspnea, fatigue, anosmia, chest pain, headache, and lightheadedness are more commonly reported by children. Next slide.

Children present unique challenges in assessing post-COVID conditions. Younger children particularly may have difficulty verbalizing symptoms and have developmentally different understandings of time so it may be difficult to tease apart frequency, chronicity, or other details of their symptoms. Symptoms may present in different ways in different children. Also there's not one specific symptom or even cluster of symptoms that is exclusive to long COVID.

Importantly, assessment of conditions may be dependent on expected developmental milestones. For example, insomnia or sleep cycle changes might be perceived as developmental or expected sleep regression, especially in very young children. Picky eating can be due to anosmia, dysgeusia, but it may be hard to tell as kids are often picky eaters. There are numerous limitations with current research including that post-COVID conditions may be reported based on differing time points from the acute infection. Many studies lack control groups and many studies include few children. Next slide.

This slide highlights the risk factors and symptoms experienced by children hospitalized with COVID-19. Compared to the youngest children, those ages 6 to 11 years and 12 to 18 years have a higher risk of post-COVID conditions. Children with a history of allergic diseases or [inaudible] such as asthma, allergic rhinitis, [inaudible] food allergy are also more likely to report post-COVID conditions compared to those without such a history. The figure on the right highlights that many of the common symptoms experienced by adults are also experienced by children with fatigue, the green top line on the graph, being the most common followed by sleep problems. Similar to adults, duration of symptoms decreases over time. Next slide.

Non-hospitalized children who experience milder acute infection also report post-COVID conditions, something I've experienced personally as a general pediatrician. These are results from a survey of children in the United Kingdom where long COVID is defined as the presence of ongoing symptoms 12 weeks or longer that impact daily activities in people who tested positive for COVID-19. The percent reporting a positive SARS-CoV-2 test range from 20% in 5 to 11 year olds to 30% in those 11 to 16 years. Among those 16 to 18 years, 7% had ongoing symptoms at 12 weeks. And symptoms were increased with this older age group with up to 4% having symptoms that impacted activities of daily living for 12 weeks or longer. Next slide.

Another study of PCC in children who are not hospitalized found many common ongoing symptoms in symptomatic and asymptomatic children at least one month after a positive SARS-CoV-2 test. This study randomly selected children ages 2 to 16 years with a SARS-CoV-2 PCR test in the first week of January 2021 and randomly selected 1,500 PCR positive cases and 1,500 matched PCR negative controls.

Parents were then asked to complete a questionnaire about the acute illness and pre-specified neurologic, dermatologic, sensory, respiratory, cardiovascular, gastrointestinal, mental health, and other symptoms that were experienced five or more times in the month after the PCR test. Of the 65 ongoing symptoms solicited, five ongoing symptoms were independently associated with symptomatic COVID-19 after multivariable logistic regression was performed and age, sex, ethnicity, socioeconomic status, and comorbidity status were adjusted for. These five symptoms were loss of smell, sadness, having difficulty sleeping at night or getting to sleep, mood swings, and anxiety. Next slide.

Most studies that look at post- COVID conditions occurring after a vaccine breakthrough have focused on adults, but there have been two to date that included adolescents. These found post-COVID conditions and symptoms were less likely to occur 12 to 20 weeks after infection among those who were previously vaccinated compared to those unvaccinated. While we do not know the mechanism by which vaccines may prevent long COVID symptoms, we know that vaccines prevent post-COVID conditions by preventing infection and decreasing transmission. Next slide.

Have our self knowledge check. Which of the following risk factors are associated with an increased occurrence of post-COVID conditions?

A. Allergic disease. B. Older age, greater than age 12. C. Unvaccinated status. D. A and B. Or E. A, B, and C. Next slide.

Correct answer is E. So older age, greater than age 12, unvaccinated status, and allergic diseases [inaudible] are all associated with an increased occurrence of post-COVID conditions. Next slide.

So in summary post-COVID conditions occur among children and adolescents with COVID-19 regardless of acute illness severity, but appear to occur at higher frequency among those hospitalized with more severe illness and in adolescents. They are less likely to occur after vaccine breakthrough.

A number of key questions remain including what is the frequency, severity, and duration of post-COVID conditions? What groups are disproportionately impacted? Whether the association changes with different SARS-CoV-2 variants? And, importantly, how post- COVID conditions impact children and adolescents' daily activities and participation in school? Next slide.

Our contact information for any questions. And I'll hand it over to our next set of presenters.

Thank you, Dr. Fairlie. We are pleased to be sharing the multidisciplinary collaborative consensus guidance statement for the assessment and treatment of PASC in children and adolescents that was recently published this fall of 2022. As Dr. Fairlie mentioned, while we recognize that the terminology of PASC has evolved over these last few years, I do want to call out that we will be talking specifically about the signs and symptoms of what is commonly known as long COVID in this part of our presentation. Other recognized pediatric presentations such as MISC will not be covered today. Next slide, please.

We do have the following disclaimer. Next slide.

Our learning objectives for this part of the talk today are to; one, identify and diagnose symptoms and complication of children and adolescents with PASC.

Next, we want to use the PASC consensus guidance statement recommendations to assess pediatric PASC symptoms. We hope to identify appropriate treatments for PASC related problems and finally to highlight accommodations for schools and activities. Next slide.

The consensus guidance statements that we'll be discussing today is one in a series extending across the breadth of the most prevalent or recognized post-acute sequelae of SARS-CoV-2. The other published consensus guidelines are listed below. As noted, these are only guidelines that are specifically pediatric focused that we'll be discussing today. Next slide.

You may be wondering how did this all begin, and how did we get here with these consensus statements. The American Academy of Physical Medicine and Rehab established the PASC Collaborative to develop expert recommendations and guidance from established PASC centers and other experts with extensive experience in managing patients with PASC. As time went on, there was growing interest in the pediatric population, and thus the PASC Collaborative Pediatric Workgroup as a subgroup was created and composed of approximately 30 pediatric specialists representing eight clinics or institutions from across the United States.

Additionally we had engagement from caregivers to gain the patient perspective in the care process. A modified Delphi approach is depicted here with waves of consensus to ensure the completeness and evidence base of recommendations. Given the specialized expertise of the pediatric workgroup, the second wave is conducted at the work group level as opposed to the full PASC Collaborative level. The pediatric workgroup then referred their consensus based recommendations to the full PASC Collaborative for a final consensus vote in wave three prior to finalization. Next slide, please.

Although there may be overlap with adult presentations and intervention options, pediatric management and rehabilitation of PASC has unique considerations, and adult guidance cannot be systematically transcribed to children. As alluded to in the beginning part of this talk, the approach to the child may differ. Developmentally some children or those with developmental disabilities may have difficulty describing their symptoms. Pediatric histories thus may come from parents, caregivers, teachers, and coaches who are familiar with the child. Compared to adults, children have fewer preexisting chronic health conditions, and some comorbidities and conditions that may increase risk of PASC are less common in pediatrics.

Therefore children may not require the same labs or radiographic tests as adults. From a psychosocial perspective, children are often previously healthy and very active at baseline. Thus the symptoms of PASC can represent a stark departure from what is normal for these children. As a result, their families may present with increased stress or urgency to address their issues, particularly as it affects school and other activities impacting quality of life. Finally there may be overlapping psychosocial aspects related to the pandemic that may manifest in somatic symptoms similar to those seen in PASC. Next slide, please.

We have found that pediatric patients typically present with a cluster of symptoms that cross multiple body symptoms and may overlap. Sometimes, though, patients may present with just one of these symptoms that can persist, wax, or wane. Some of the most common symptoms are listed here. This includes fatigue, pain, orthostatic intolerance and dizziness, prolonged altered smell and taste, palpitations and shortness of breath, cognitive fatigue or brain fog, and mental health concerns such as depression and anxiety. These are similar to those described by adult patients with long COVID. We will be talking about each of these in more detail in the subsequent slides. Next slide.

There are a few centralized pediatric PASC centers here in the United States, and access to these special clinics may be limited. Thus the primary care system is often the first point of contact for patients with PASC and may provide the bulk of therapeutic management.

The evaluation should begin with a thorough history and physical, the goals being to identify and characterize the symptoms the child is having and assess for functional activity limitations. Probing for evidence of a past infection that coincides with PASC is important either through evidence of a prior positive test, distinctive clinical features of COVID-19 without an alternate diagnosis, or a strong epidemiological link to COVID such as a household contact. Finally targeted labs and imaging may be needed to exclude other diagnoses. Next slide, please.

Of note the physical exam and labs of pediatric patients with long COVID are often normal. It's also very important to differentiate PASC from pre-existing or new conditions that may require a different therapeutic approach. Finally PASC is a diagnosis of exclusion. Once a diagnosis is made, targeted interventions may be needed and specialty consultation may be helpful. Irrespective of within a PASC center or within a primary care medical home, a multidisciplinary approach may be needed. Next slide.

While the examined labs may be normal, there may be particular red flags that you may uncover that may lead to alternate diagnosis or require further work up. A few are listed here. From a history perspective, this includes prolonged fevers, significant unprovoked weight loss, vomiting, or headaches at night or early morning, developmental regressions, syncope and chronic cough. On exam, any child with focal neurological defects enlarging lymphadenopathy, hepatosplenomegaly, joint swelling or erythema, or murmurs also requires further work up. Next slide.

Here's a self knowledge check. Common symptoms in children with PASC may include. Fatigue. Abdominal pain. Headaches. Shortness of breath. Or E, all of the above. Next slide, please.

The answer is E, all of the above. Some children may experience a multitude of symptoms after COVID-19.

Common symptoms include fatigue, pain, headaches, abdominal pain, and myalgias as well as cardiovascular symptoms like palpitations and shortness of breath. At this time I would like to turn the talk over to Dr. Morrow. Next slide.

Thank you, Dr. Vaz. I'm now going to transition to talking about some of our general recommendations from our guidance statement, and we separated these in to different symptom categories that we found to be most commonly involved in long COVID in kids. Each symptom category is a table in our paper which we thought would be helpful to reference if a patient is complaining about a specific symptom. The first group of symptoms falls under the systematic or constitutional symptom category and includes fatigue and physical activity or exercise intolerance.

When assessing systematic symptoms it's important to first characterize the fatigue pattern and sleep habits. We also evaluate for something called post exertion malaise which is worsened symptoms that can occur 12 to 48 hours after even mild physical, cognitive, or emotional exertion. Patients often describe this as a crash, and I'm going to come back to this concept in a minute. We also screen for baseline and current physical activity levels, and how much exercise they can tolerate can be assessed by the modified pediatric Borg scale or the OMNI Rating of Perceived Exertion scale. A review of overall nutrition including levels of fluid intake and medication supplements are important as well as screening for substance use in age appropriate populations in order to identify any possible contributors or known medical causes of fatigue that have known treatment options. We also consider whether patients meet criteria for myalgic encephalomyelitis or chronic fatigue syndrome also known as ME/CFS because we're seeing a lot overlaps with this condition. Next slide.

And because we are seeing so many overlaps, I wanted to highlight some proposed diagnostic criteria for ME/CFS as determined by the National Academy Institute of Medicine. Diagnosis requires, number one, a substantial reduction or impairment in the patient's activities that occur for at least six months accompanied by profound fatigue that is not alleviated by rest.

Number two. Post exertion malaise, as I previously defined.

And number three, unrefreshing sleep. The first three symptoms are required plus at least one of the following. Either cognitive impairment or orthostatic intolerance or both. And we will be highlighting both of these conditions later on in the presentation.

The pattern of fatigue in many of our kids with long COVID is similar to the type of fatigue described in ME/CFS, although they may not meet the six months mark as far as duration of symptoms or may not meet full criteria, but this is something to consider as part of the diagnostic work up. Next slide.

As part of the evaluation of systematic constitutional symptoms, we recommend performing a full physical exam including a thorough neuromuscular exam, consideration of additional testing of physical function and endurance such as the six minute walk test, screening with baseline blood work if not already performed, and consideration of a sleep study if there's concern for sleep apnea or sleep disorder contributing to symptoms. As far as treatment, start by treating any known medical causes of fatigue based on screening such as iron supplementation for anemia or treatment of hypothyroidism.

It is important to emphasize lifestyle recommendations as the first step including optimizing nutrition, hydration, emphasizing sleep hygiene as well as structuring a daily routine. Physical activity recommendations are an important piece to highlight as too much activity too quickly can potentially contribute to post exertion malaise, symptom exacerbation or crashing. Physical activity and exercise should be slowly advanced as tolerated with a focus on pacing. And with pacing patients start with a level of physical activity that they can tolerate without experiencing a crash or worsening of symptoms. And this could be for some as little as 5 to 10 minutes. And, if so, that's okay.

They perform this level of activity consistently in an attempt to build by advancing to more time or more exertion. If once they advance to the next level, and experience a crash, they should decrease back to their prior tolerated level and stay there for a little longer before attempting to advance again. For each individual patient the amount they can tolerate, how quickly they can advance, and how much they can advance could be different. So it is often helpful to have a skilled physical therapist work with them to guide and adjust an exercise or activity regimen as tolerated. Because fatigue can be profound and impact multiple aspects of a patient's life, we often find a multidisciplinary approach to be beneficial including pediatric rehabilitation medicine which is my specialty, physical therapy, as mentioned, occupational therapy, especially if activities of daily living are impaired, mental health therapy for coping with chronic symptoms, and others as needed. Complementary therapies can also be helpful for fatigue such as acupuncture, yoga, meditation. And these need to be further studied and explored. Next slide.

Our next symptom category falls under autonomic dysfunction or postural orthostatic tachycardia syndrome also known as POTS. Symptoms include fatigue, lightheadedness or dizziness in upright positions, also known as orthostatic intolerance, brain fog, difficulty with exercise and post exertion malaise can be seen, headaches, upset stomach, palpitations, difficulty with heat and excessive sweating.

In order to meet a diagnostic criteria for POTS, this requires when a patient changes from a supine or lying down position to a standing or upright position, there must be an increase of heart rate of at least 30 beats per minute for adults and at least 40 beats per minute for children and adolescents ages 12 to 19. And this occurs within 10 minutes of standing. There must also be an absence of orthostatic hypotension, frequent orthostatic symptoms, duration of symptoms occurring for at least three months, and an absence of other conditions explaining symptoms. To evaluate for POTS performing bedside orthostatic vital signs are often not enough since you are looking for a sustained change in heart rate. A test to diagnose POTS that can be performed in a clinic setting is the 10 minute passive standing test where blood pressure and heart rate are measured at 1 minute intervals in supine and standing positions.

Symptoms are also recorded throughout the test. We have links and references for how to perform the tests in our guidance statement. Patients can also be referred for formal tilt table testing, if needed, to confirm the diagnosis. And if POTS is suspected, it's important to screen for joint hypermobility with the Beighton scale as Ehlers Danlos Syndrome is a comorbidity that is often seen with POTS. Next slide.

Even if children don't meet full criteria for POTS which is that greater than 40 beats per minute change, if they have orthostatic symptoms or intolerance we still recommend treatment. The first thing to start with is lifestyle interventions. They can be very effective, and we've had some patients with complete resolution of POTS symptoms purely with lifestyle interventions. They should be educated regarding high daily fluid, two to three liters of fluid per day, and salt intake about four to six grams per day as they can help increase blood volume. Exercise has also been shown to be beneficial for POTS, and there are some specific exercise protocols out there for POTS patients.

However again in those patient who also have the post exertion malaise component, they need to be educated on pacing and advancing exercise as tolerated rather than following a strict regimen. For patients with POTS they're often able to tolerate recumbent activity. So exercise should be started in recumbent positions such as using a recumbent bike, and then advancing to more upright positions such as using an upright bike. And then standing activities such as walking, eventually jogging, etcetera. Compression garments, elevating the head of bed at night, and physical counter measure maneuver such as crossing legs and tensing muscles can also be helpful to tolerate upright positions.

There are currently no FDA approved medications for POTS, but some first line medications to consider are beta blockers to lower heart rate, fludrocortisone to expand blood volume, and midodrine to increase vasoconstriction. Next slide, please.

Our next category is for patients complaining of chest pain, palpitations, dizziness, and what needs to be considered from a cardiology perspective to evaluate and rule out cardiac conditions. For those with chest pain and palpitations, physical examination should include complete cardiac and pulmonary exams. Additional recommended testing depends on the history and physical examination findings.

A baseline ECG should be performed in the office for those with any cardiac symptoms as a screener. For those with chest pain, troponin, chest x-ray, and echocardiogram can be helpful to rule out cardiac etiologies. For those with palpitations, Holter or event monitors can be used to help capture any arrhythmias. And for dizziness remember to think of other etiologies of dizziness other than cardiac in your differential. For treatment if there are any concerns for acute ischemia, patient should be sent to the emergency room. Refer to cardiology if there is a concern for a cardiac etiology of symptoms.

So examples of worrisome symptoms include chest pain with exercise, radiation of pain to the neck, jaw, or down the arms, and chest pain accompanied by dizziness and/or loss of consciousness. Many patients complain of palpitations and may have an elevated heart rate, and it is important to differentiate sinus tachycardia from other cardiac arrhythmias. The treatment for sinus tachycardia is to treat the underlying cause. And other cardiac arrhythmias or anatomic abnormalities are best managed by our cardiology colleagues. Next slide, please.

For the next self knowledge check question, we have a 16 year old male had COVID-19 2 months ago. He notes that sometimes he can't keep up with his soccer team like he used to. He is

able to participate in practice, but afterward is so tired he can't get out of bed to go to school the next day.

What is this an example of? A. Exercise intolerance. B. Deconditioning. C. Depression. D. Post exertional malaise. Or E. Hypothyroidism. Next slide.

The best response is D, post exertional malaise. Again post exertional malaise is defined as worsening of symptoms after physical, mental, or emotional exertion, sometimes described as a crash. Symptoms may worsen 12 to 48 hours after the activity and can last for days or even weeks. It is also one of the key features in the diagnostic criteria for ME/CFS for which we are seeing some overlaps in children with long COVID fatigue. So it's important to consider.

And now on to Dr. Malone.

Thank you, Dr. Morrow. So from a respiratory or pulmonology perspective, common symptoms in children can include things like shortness of breath, cough, and sometimes wheezing. It's important to do a diagnostic evaluation to look for alternative etiologies. And a basic diagnostic work up can include things like pulse oximetry, but it's important to do this both at rest and with walking or some sort of activity as there's an exertional component to a lot of symptoms.

Chest x-ray and pre and post bronchodilator spirometry may also be helpful. Now many children that we see don't have severe acute COVID infections, but in those that do additional testing may be warranted. Now most of the symptoms do improve over time and a lot of the diagnostic work up can actually come back looking normal. One exception, though, is that in some patients there is a new diagnosis of reactive airway disease or asthma as diagnosed with pre and post bronchodilator spirometry. And so they may benefit from a trial of bronchodilators.

Initially a referral to ENT or speech language pathology may be beneficial if patients are experiencing symptoms consistent with a vocal cord dysfunction. In particular, this may be described as having difficulty with inspiration or tightness to the throat. Breathing exercises to reduce breathlessness also can be beneficial. Next slide.

From a neurology perspective, there's two main symptoms that we see which are described in the paper, the first of which is cognitive symptoms. This can be similarly described to how adults described it with regards to brain fog, but children sometimes may describe it as attention difficulties, memory problems, or they may just have declining school performance sometimes because of developmental limitations to exactly describe what they are experiencing. There's various tools that can be used to assess symptoms across various domains including mood which are described here and in the paper. And in some patients a neuropsychological evaluation may be warranted. Now not every patient needs a full comprehensive neuropsychological evaluation. Most patients can actually do with a brief targeted exam.

And this may be useful with regards to resource allocation to ensure sort of timely evaluation in patients. In those that have a pre-morbid medical or developmental conditions or if the accommodations are still needed 6 to 12 months after developing long COVID, you may want to think about a more comprehensive evaluation. And we'll talk about accommodations a little bit

later in the talk. Locally an occupational therapist or a speech language pathologist may be able to provide cognitive rehabilitation for patients as well. It's important to think about if there's any red flags, and a referral to neurology may be warranted if there's signs of things like developmental regression, abnormal movements, hallucinations, or an abnormal neurological examination as there may be other diagnoses, things like autoimmune encephalitis which has been seen after COVID as well. Next slide, please.

The other main symptom that we see from a neurology perspective are headaches, and many children will have multiple headache types, meaning that they may not fit completely in to a migraine or a tension headache type of pattern. And, as mentioned previously, there can also be headaches associated with orthostatic intolerance which we see frequently. So it's always important to screen for red flags that would point towards a sinister intracranial process. These are things like headaches that wake a child from sleep or if there's any focal weakness, recurrent vomiting without nausea or worsening visual symptoms.

And neural imaging is warranted in these situations. Whether that's a head CT or a brain MRI MRV depends on the availability in your area. The mainstay of treatment is lifestyle interventions which have been talked about a bit earlier in the presentation. One thing to note, though, is that it's really important to counsel on medication overuse and rebound headaches as we find that sometimes the headaches can be very severe and debilitating. And so children may be taking things like ibuprofen or acetaminophen daily or multiple times a day in order to address the pain from headaches and other types of pain whether that's GI or musculoskeletal.

Vitamin supplementation may be helpful in order to use as a daily preventative to decrease the frequency and severity of headaches over time. And in some cases it may be necessary to think about other medications as a daily preventative medicine. If you were to think about this, it's important to think about the comorbidities in a child and the constellation of other symptoms that they are experiencing in order to guide which medication to choose, and we outline this in the paper a little bit more. Nonpharmacologic therapies are also useful, things like yoga, acupuncture, deep breathing, for example. Next slide.

So from an ENT perspective the most common symptom that is described is alterations to smell and taste. Not every child needs to be referred to an ENT. Those children that have persistence of the symptoms with associated nasal symptoms can be referred to ENT specialists. Imaging may be warranted again if you have loss of smell or taste that is prolonged with either associated nasal symptoms or neurologic symptoms. And fortunately most cases actually self resolve in about three to six months.

But there has been some benefit in individual patients to olfactory retraining. And there's some websites that may be helpful in how to go through this, and there's also a little bit more of a description in the article. In patients that do have loss of taste or smell for more than two weeks with associated nasal symptoms, a short course of intranasal steroids may also help. Next slide.

From a GI perspective, there's many different types of symptoms that children can experience, anything from abdominal pain to nausea, a little less commonly vomiting, things like chronic diarrhea, reflux, or decreased appetite are all described. And these are generally reported to last

about two to three months after their initial COVID infection. So, as always, it's important to screen for red flags and this may be things like weight loss, changes to growth, blood in the stool, or emesis or some sort of family history of GI conditions. Blood work and imaging is based on the individual's symptoms and again is described in the paper. And dyspepsia is a very common symptom that is seen. And so you can think about trialing an acid blocker if this is a concern.

Many children do have symptoms that can be described as like irritable bowel syndrome or functional abdominal pain. And so you may want to think about a trial of probiotics and avoiding any triggers. And sometimes an appetite stimulant like cyproheptadine can be beneficial as well in this population. Next slide.

From a musculoskeletal perspective, pain is very common, and that can occur at the muscle, joint, or just sort of generalized. Commonly we hear, for example, like leg pain is described in many children. It's important to assess for a history of fibromyalgia or a rheumatologic disorder and a full neurologic and musculoskeletal exam with a joint hypermobility exam is important to conduct. The mainstay of treatment is with regards to physical therapy, and in order to minimize regular use of over the counter pain medicines like acetaminophen and ibuprofen you can think about using more topical anti-inflammatories or numbing agents as needed for localized pain. Complementary therapies, acupuncture, yoga, massage, meditation can all be really helpful for pain. And it's important to address the mental health concerns and refer to behavioral psychology for pain coping as again this can be very severe in some patients and represent a huge functional limitation. Next slide, please.

And speaking of mental health, there are some mental health symptoms that are described in children with PASC as well. But it's important to validate the symptoms that they're experiencing and not attribute it to only mental health conditions. On the right-hand side are various skills that can be used based on a patient's age to address these various symptoms. So anxiety is the most common mental health concern that's reported in adults with PASC, and there's emerging evidence that it is the same case in pediatrics as well.

And it is important to monitor closely for school avoidance behaviors. It's important to also look for signs of depression and screen for suicidality as these are also seen in children with long COVID. Next slide.

So PTSD or acute stress disorder has actually been described a lot in adult patients with PASC, and although this is a little less commonly reported in pediatrics, it may be elevated in children that have a history of hospitalization, prolonged periods in the intensive care unit, or history of multiple procedures. And there can be some somatization of symptoms as well, but it is important to think about medical investigation in to any newly emerging physical symptoms for long COVID.

And overall we really do approach things with regards to an interaction between mental health, physical symptoms, and the environment which can all have a significant interplay with one another. Next slide.

So from a school and activity accommodation perspective, you can think about having a meeting with the school or having parents have a meeting with the school to discuss accommodations in order to get them back in to school which can be helpful from a routine perspective and activity perspective. But it's important to obtain collateral from multiple sources as well because patients -- symptoms can vary throughout the day. And so it can be helpful to have this collateral information.

A lot of these accommodations are focused on the idea of pacing both with physical and cognitive activity. So that may be, for example, prioritizing academic demands and limiting non-essential classwork to allowing increased time for assignments or tests or rest breaks during instruction. Other things can be like adjusted school days that are shortened or alternating the days or some sort of adapted PE in order to reduce the demands during physical activity. And it's also really important since the mainstay of treatment is a lot of lifestyle interventions that those are accessible to children at school. So, for example, in those that have orthostatic intolerance or POTS making sure that they have access to water and salty snacks throughout the day is really important. Next slide, please.

And so for our final self knowledge check question, what would be useful in helping children with PASC attend school?

A. A 504 IEP or individualized health plan meeting. B. Talk to the school counselor. C. Obtain feedback from teachers. Or D. All or any of the above. Next slide.

The answer is D, all or any of the above. So developing a plan for accommodations and individualized medical considerations for children with PASC can be helpful. Many times this includes obtaining collateral from multiple sources like school counselors and teachers and a 504 or an IEP plan is designated to ensure children with disabilities and/or physical and mental impairments can attend and make progress in a public school. An individualized health plan may address how to deal with medical conditions experienced at school, but the format or existence may vary from state to state or school. Next slide.

And finally in conclusion pediatric PASC can present with many different symptoms affecting multiple organ systems and is generally a diagnosis of exclusion, although it's not necessarily to complete extensive work up if they fit sort of common symptoms. Children with PASC often have normal labs, imaging, and physical examination. And treatment is generally supportive, targeted to address and alleviate specific symptoms. Pediatric PASC can significantly impact a child's functioning and quality of life and so a multidisciplinary approach to care can be helpful. Next slide.

I just want to thank everybody for listening, and we will open it up for Q and A now. Thank you.

Presenters, thank you for providing this timely information to our audience, and we will now go into our Q and A session. Please remember that to ask a question using Zoom, click the Q and A button at the bottom of your screen. Then type your question, and please note that we receive many more questions than we are able to answer during our webinars.

Our first question asks, "Is there an intake form or questionnaire that CDC uses to evaluate post-COVID conditions in children and adolescents?"

This is Dr. Fairlie. There is not at this time.

Thank you. Our next question. Can you please review the guidance on how to distinguish between long COVID resulting from an asymptomatic case and chronic fatigue syndrome from a non COVID trigger?

Hi. This is Dr. Morrow. So that can be difficult sometimes as far as the timing. When we're thinking about fatigue after long COVID, we do -- or after initial COVID infection, we do try to tease out the history and see if there's a temporal relationship between someone's initial or subsequent COVID infection and development of fatigue symptoms that then persist.

However it is sometimes difficult, but we will still treat patients similarly who are complaining of these types of symptoms because we do think they benefit from these multidisciplinary approaches.

Thank you. Our next question. Can you discuss diagnosing post-COVID conditions in children and adolescents who had an asymptomatic case of COVID-19?

This is Dr. Vaz. Yes. This can be challenging, and sometimes we have to rely on either an epidemiological link meaning that there was another member of the household that had an infection at that time or what circumstances at that time in terms of the timing of a certain wave of a variant that was going through the community at that time. And if it seems to make sense from that. Again oftentimes there is at least a story of at least a family member or another close contact that was helpful in that diagnosis.

Thank you. Our next question asks, "Have the sequelae been studied in other viral diseases or are they only related to COVID-19?"

I can address this. This is Dr. Malone. So there have been similar symptoms that have been described with other viruses as well, although the exact mechanisms and symptoms haven't been as well studied with COVID. There does seem to maybe be something a little bit different about the SARS-CoV-2 virus, but it's still sort of currently unknown.

Thank you. Our next question. Are there any resources or is there an educational toolkit that schools can use?

So this is Dr. Malone again. There is actually some information that is available from our clinic on the Kennedy Krieger website about common school accommodations for children with long COVID or PASC that can be found publicly on the website that could be used by any schools or families as they're trying to navigate this process.

Thank you. Our next question asks, "What is the role of antigen and antibody testing, especially in children with post-COVID symptoms who had not previously been diagnosed with COVID?"

At least now with the current availability of testing, so using an antigen test in correlation with their symptoms, could be one way to demonstrate temporal -- at least the timing of post-COVID symptoms that arise after a recent infection. That may not be the case if a child is presenting with symptoms that have been going on for a long time and prior to the general availability of those specific tests. And I guess the same thing goes to say for a PCR test availability as well. Given the, you know, rates of vaccination, etcetera, we are finding that antibody tests are not helpful in discerning that. And given most of the duration of how long antibodies last, etcetera, it's really more of the history taking about the timing of the presentation of symptoms and then the subsequent post-COVID symptoms that arise that seemingly are the most helpful along with that supportive evidence of either a positive test if you have it like an antigen test and/or a positive epidemiological contact or context.

Thank you. Our next question. What kind of evaluations and therapies can be performed through schools for school-aged children?

I can try to tackle this one. It's Dr. Morrow. So, you know, as we had mentioned, getting the school involved, school counselor, school administrators, to help come up with a school plan with assistance from medical providers as far as what accommodations may be needed, as far as school evaluations from like school-based physical therapists or occupational therapists that would be for very severely impacted children where they're really having a lot of difficulty with day to day activities or mobility. So I think that's much less common where children may need some type of school-based therapy or need an evaluation for those types of supports in school, but absolutely academic accommodations are incredibly helpful for these kids as well as allowing things like rest breaks, frequent water or snack breaks, those types of things.

Thank you. And we have time for one last question. This question is from a physical therapist who's asking, "I am concerned about pacing leading to minimal physical activity. How and when do we seem to be seeing them return to more normal activity?"

This is Dr. Morrow again. So, as I mentioned, I think every child is individual, and I really emphasize pacing because it's not a concept that I think a lot of medical providers are used to recommending, and it's been incredibly important for myself to learn about as we've been treating these kids with long COVID with fatigue and this severe post exertional malaise. However, as I mentioned, we do want to advance as tolerated. So it's kind of a fine balance between allowing for rest, but also trying to have a child challenge themselves and advance to the next level of physical activity.

So we rely on you. We work very closely with our physical therapists to help guide that. So again a balance between pacing versus also advancing activity in order to help them increase their mobility and overall function and the time frame for that does vary among individuals.

Thank you so much, Dr. Morrow and to all of our presenters for answering these questions and for sharing your expertise with us today. All continuing education for COCA calls is issued online through the CDC Training and Continuing Education Online System at tceols.cdc.gov.

Those who participate in today's live COCA Call and wish to receive continuing education, please complete the online evaluation and post test before March 27, 2023, with the course code WC4520-022323. And the access code is COCA022323. Those who will participate in the on demand activity and wish to receive continuing education should complete the online evaluation and post test between March 28, 2023, and March 28, 2025. And use course code WD4520-022323. And the access code is COCA022323.

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A transcript and closed captioned video will be available on demand on the COCA Call web page next week. We invite you to join us this Tuesday February 28, at 2 PM eastern time for our next COCA Call. The topic will be about the epidemiology, testing, and management of extensively drug-resistant shigellosis. You can visit emergency.cdc.gov/coca for more details about this COCA Call and other upcoming COCA Calls.

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Again, thank you for joining us for today's call. Have a great day.