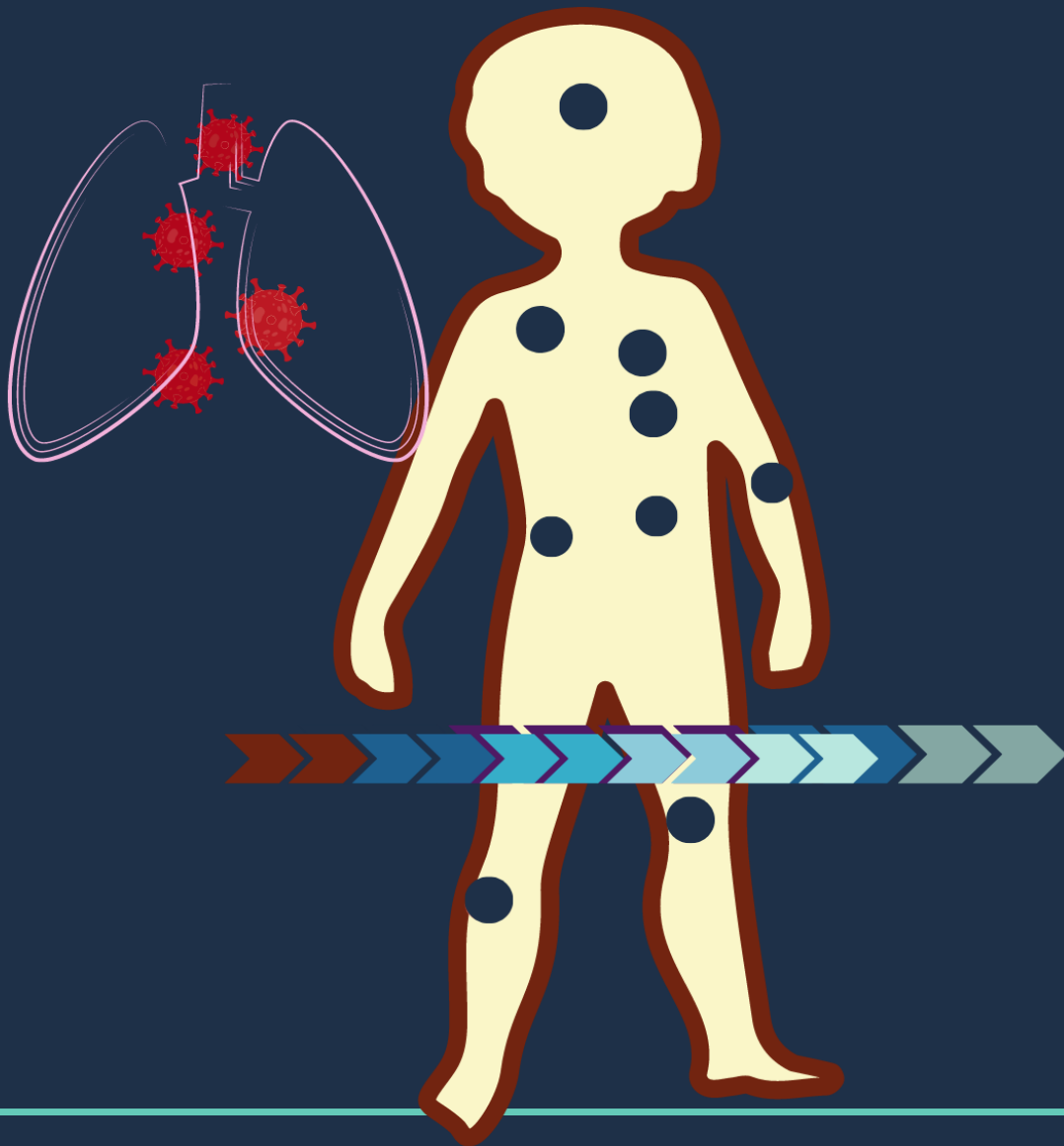




PULMONARY CARE OF LONG COVID IN CHILDREN

Philippine Academy of Pediatric Pulmonologists



February 8 , 2022

PAPP COVID TASK FORCE

Philippine Academy of Pediatric Pulmonologists (PAPP)

FEBRUARY 8, 2022

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THE PAPP PULMONARY CARE OF LONG COVID IN CHILDREN

EXECUTIVE SUMMARY

There have been several reports on long-term sequelae from COVID in adults but with paucity in children. The PAPP COVID-19 Task Force was tasked to probe on this concern and reflected these findings in the Systematic Review on Post-Acute Sequelae of Covid-19 (PASCI) in Pediatric Patients reported last December 7, 2021.¹ The data from the systematic review alongside available studies on PASCI or Long COVID gave way to the formulation of this guidance.

This document focuses on pulmonary care of Long COVID in children has been created to be an aid to clinical practice. The many other facets of Long COVID which needs a multidisciplinary approach is highly suggested but will not be discussed in detail in this document. This guidance will serve as a foundation for optimized respiratory supportive care for children with Long COVID. The purpose of this document is to complement with the World Health Organization (WHO), National Institute for Health and Care Excellence (NICE), American Academy of Pediatrics (AAP) and the other subspecialty guidelines in providing respiratory care for children with prolonged respiratory symptoms as part and parcel of Long COVID manifestations reported in children and adolescents.

This is the first local document on the pulmonary care of children and adolescents with LONG COVID. The members of the committee declare no conflict of interest in the formulation of this manuscript. This is intended for clinicians involved in the care of pediatric patients with suspected or confirmed to have COVID-19. Collection of several related studies and reports on long haul COVID-19 in children was started in September 2021.

METHODOLOGY

Literature search included new guidelines and systematic reviews in pediatric Long COVID. The bibliographic databases and concepts were defined with search terms that include both medical subject headings (MeSH) and text words. We also searched following websites: the WHO (<https://www.who.int/>)², National Institute for Health and Care Excellence (NICE) COVID-19 rapid guideline: managing the long-term effects of COVID-19 (<https://www.nice.org.uk/guidance/ng188>)³, the American Academy of Pediatrics (<https://www.aap.org>)⁴ and from other international society guidelines providing specific updates on the respiratory management and monitoring whose prolonged post-acute COVID infection were significant respiratory in character. Data collected for this manuscript version included significant articles available until January 24, 2022.

Draft of the proposed scope and list of potential priority topics was performed. This was subsequently refined to the list of priority topics and identifying relevant issues on clinical diagnostic monitoring, management guidance and re-integration to usual daily activities for the pediatric patient was identified. Incorporation of the recently gathered data from the Systematic Review on PASC1 in Children done by the PAPP COVID-19 Task Force Working Group was done in the making of this guideline. In addition, we have an independent literature searching team to search available indirect evidence from systematic reviews and/or RCTs (randomized controlled trials), of the existing evidence. If there is a lack of higher-level quality evidence, our panel considered observational studies and case series.

We accorded to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) basic approaches and rules and particularly considered experts' evidence to assess the quality of a body of evidence to make recommendations.

The quality of evidence reflects whether the extent to which our confidence estimating the effect is adequate to support a particular recommendation. The level of evidence was categorized as "high quality", "moderate quality", "low quality", or "very low quality". The domains of the risk of bias, imprecision, inconsistency, indirectness and publication bias will constitute the decreasing level of certainty of the evidence and will be considered in the rating of evidence included.

The recommendations were classified as "strong" or "weak." In specific recommendations, we used "should" or "strongly recommend" for **strong** recommendations; whereas, "suggest" or "consider" was used for **weak ones**.

The evidence is rapidly changing and this guidance will be updated to reflect the same as evidence becomes available. Please take note that this interim guideline will have to undergo revisions and editing as new evidence will set in before it will be published in the final form. The final articles registered in this document were those that were warranted valid enough for citation (systematic reviews and meta-analyses) in Pediatric Long COVID were prioritized among other articles as they grant the most accurate findings) available during the period of literature search.

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Introduction

In January 03, 2022 about 306 million individuals were confirmed to have COVID-19 globally. There has been an alarming increase to 373 million cases in January 24, 2022 as seen in the World Health Organization dashboard.⁵

A proportion of those infected with SARS-CoV-2 experience long-term symptoms. The proposed nomenclature of these spectrum of prolonged symptoms has evolved including terms – Long COVID, long-haul COVID or the WHO-recommended post COVID-19 condition.^{2,3,4} Post-acute Sequelae of COVID-19 Infection (PASC) a synonymous term referring to a prolonged heterogeneous condition which can also occur in children after COVID-19 infection.^{1,6}

The signs and symptoms of “Long COVID” are highly variable among individuals, and are usually non-specific. Long COVID is highly prevalent in the adult population, but a systematic review showed that it significantly affects the pediatric population^{1,7}

Definition of Terms

Acute COVID-19

Signs and symptoms of COVID-19 for up to 4 weeks.³

Ongoing symptomatic COVID-19

Signs and symptoms of COVID-19 from 4 weeks up to 12 weeks.³

Post COVID-19 Condition

Occurs in individuals with **a history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis.**²

Long COVID

Is commonly used to describe signs and symptoms that continue or develop after acute COVID-19. It includes both ongoing symptomatic COVID-19 (from 4 to 12 weeks) and post -COVID-19 syndrome (12 weeks or more).³

A clinical case definition of post COVID-19 condition is based on existing evidence objectively assessed by means of the Delphi methodology by the WHO International Classification of Diseases (ICD)- ICD-10U09 which is also in agreement with the NICE guidelines.³ The American Academy of Pediatrics uses the 3 months or the 12 week time table post-acute infection⁴; however, since more research is still being done and with a relatively lower prevalence as compared to adults, uniform definitions for children have yet to be given.

Identifying Clinical Symptoms

Presently the exact definition of “Long COVID” in children reported in a systematic review showed that the common symptoms of long COVID in children and adolescents include the following – fatigue, weakness/asthenia, fever, poor appetite, weight loss.¹

These common symptoms have an impact on the daily functioning of the patient. Reports states that these may be new onset from the acute COVID-19 episode or persistent from the acute illness which may be relapsing or fluctuating in character.²

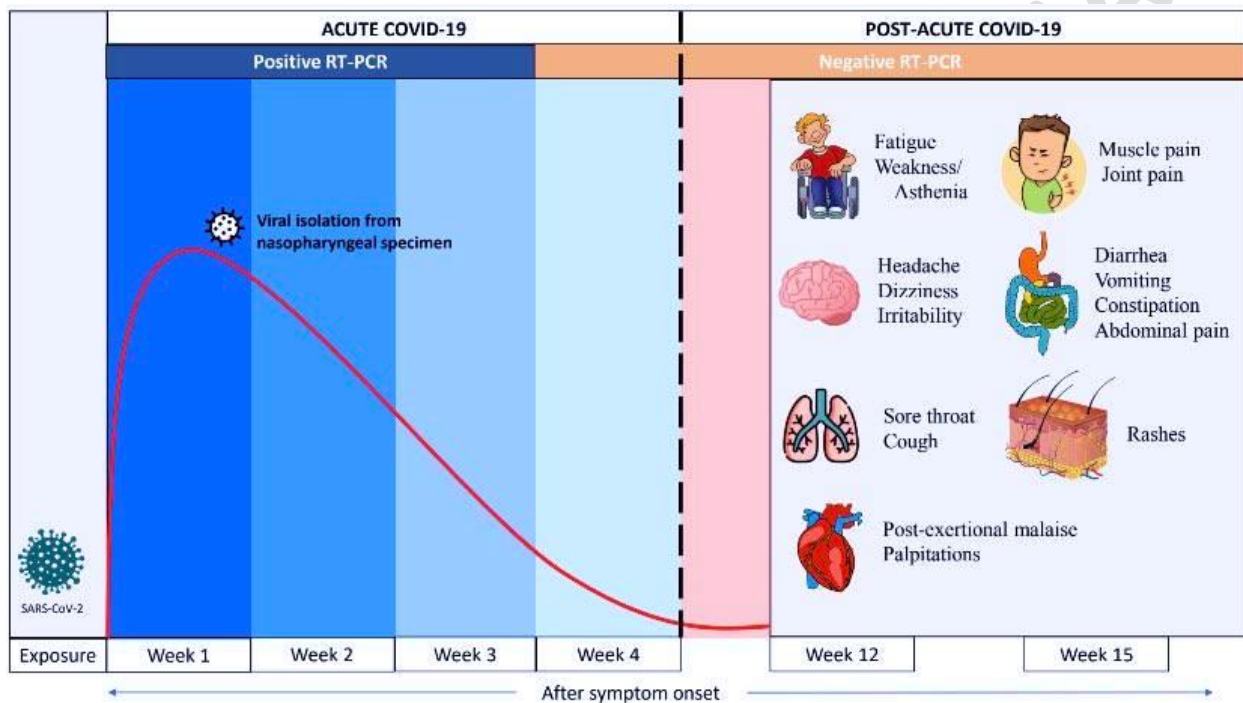


Figure 1. Timetable and symptoms of post-acute COVID-19 in children. Acute COVID-19 infection usually lasts up to 4 weeks after symptom onset. By then, infectious SARS-CoV2 virus from the upper respiratory tract may not be detected. Post-acute COVID-19 is defined as persistence and/or development of symptoms after the acute illness that have continued for more than 12 weeks. It may affect different organ systems in the body and present with various symptoms. Frequently observed symptoms in post-acute COVID-19 in children are summarized.¹

Children and young people were reported to have difficulty doing everyday tasks about ≥ 4 weeks (4 weeks or more) after acute COVID-19 illness. Expert witnesses and the NICE panel overwhelmingly agreed that poor performance or absenteeism at education, work, or training was a “red flag” for both children and adults.³ Recognition of these symptoms could signify systemic sequelae of the acute SAR-CoV2 infection and warrants evaluation and possible referral to multidisciplinary team.

Family members and caregivers of children and adolescents need good discharge advise after acute COVID-19. Information on what to expect and when to seek medical advice should be given especially if common symptoms of Long COVID are present.

Pediatric Assessment

Recommendation 1

In children and adolescents with Long COVID-19, it is suggested that they be evaluated clinically in an in person/face-to face basis at the time of reporting. They should be monitored and managed on a symptom- based approach by a multidisciplinary team.^{3,4}

(Low quality evidence, Weak recommendation)

Rationale

Pediatric patients with long COVID characteristics are to be managed symptomatically, with emphasis on a holistic support while avoiding over-investigations.⁸ Management of long COVID is a multidisciplinary undertaking , and covers the full range of physical and mental health concerns. The extent of follow-up and monitoring should be individualized, and should include plans for the treatment of fatigue and respiratory symptoms.

Assessment may be conducted face-to-face or virtually, depending on healthcare resources and patient preference. A detailed clinical history is emphasized, focusing on the symptoms, and what is important to the patient. It is recommended that assessment ideally BE done face to face, to facilitate early recognition and management of post-COVID-19 sequelae. If consultation is face-to-face, the clinician may identify concerns that the patient may not even be aware of which would not have reported had virtual consultation been done.⁹

Laboratory Assessment

After a thorough history and physical examination, laboratory tests may be selectively requested for specific clinical indications. These laboratory tests or diagnostic examinations may help identify underlying conditions and exclude other diagnoses.^{6,8}

Recommendation 2

In children and adolescents with Long COVID-19 who have significant exercise intolerance and respiratory illness, it is suggested that they should be evaluated by a specialist and undergo the following laboratory tests parameters at 4-6 weeks after discharge from acute COVID -19 illness

1. Pulse Oximetry
2. Chest Xray
3. Pulmonary Function Test /Spirometry
4. 6-minute walk test

Children with Long COVID-19 with progressive and persistent symptoms after initial evaluation should undergo a follow up Chest x ray at 12 weeks .⁶

(Low quality evidence, Weak recommendation)

The British Thoracic Society recommends that Covid-19 patients who have had significant respiratory illness should have a follow-up chest x-ray at 12 weeks for new, persistent, or progressive symptoms.⁶ Based on a systematic review, Dobkin recorded pediatric patients with PASC as to having opacities on chest x-ray¹⁰, although a more specific description of the opacities were not mentioned. A study last 2020 reported that only 15/119 (13%) of people had evidence of COVID-related lung disease at 4-6 weeks after hospital discharge. The investigators concluded that a chest X-ray is a poor marker of recovery, as there were notable abnormalities in other investigations, regardless of a normal chest X-ray.⁹

Most studies stated that a number of patients were still experiencing significant breathlessness at follow-up after acute COVID-19. In the evaluation of these patients, pulmonary function test (spirometry) and exercise test (6 minute walk test) were commonly used.⁸ The 6-minute Walk Test (6MWT) measures the distance that a patient can quickly walk on a flat, hard surface (typically a 100-ft hallway) within a 6-minute time period.¹¹

In prospective analysis of children with persistent symptoms, 45% of patients who underwent pulmonary function test due to cardiorespiratory symptoms had abnormal findings; such as mild obstruction with low FEV1 on spirometry and air trapping on lung volume studies. In this analysis, despite mild radiographic and spirometric findings, these were observed in a significant number of patients, emphasizing the importance of pulmonary function evaluation.¹²

The NICE panel considered that baseline diagnostic examinations, such as blood tests, chest X-rays and exercise tolerance tests may be useful and should be performed for most patients. The panel emphasized the importance of clinical judgment and that specific tests should only serve as an adjunct for the holistic assessment for further management.³

SPECIAL CONDITIONS IN PEDIATRIC LONG COVID

In children and adolescents with Long COVID-19 who have persistent symptoms involving other organ systems, a multidisciplinary approach to management is highly suggested.

Specific referral to a specialist for further management is recommended. Patients and their caregivers must at all times be fully informed of the management plan.

The following are the recommended diagnostic tests used to monitor children and adolescents with on going symptoms of Long COVID as well as those who may need urgent referral:

- Complete blood count (CBC)
- Kidney and liver function tests
- C-reactive protein
- Ferritin
- B-type natriuretic peptide (BNP)

Other diagnostic evaluation tools relevant to the cognitive, psychological and psychiatric domains may be performed. Other less critical physical findings found in the evaluation, that if considered together, may pose as a problem which may then warrant further investigation.

MANAGEMENT OF RESPIRATORY SYMPTOMS AND WELL-BEING

Recommendation 3

Established symptomatic treatments for managing the common symptoms of Long COVID-19 can be given. These should include, but are not limited to, treatment of specific complications and control of co-morbidities such as asthma and atopy. However, there lack of evidence for any specific pharmacologic-intervention to treat the condition (Long COVID-19) itself.

(Low quality evidence; Strong recommendation)

Table 1: Management of Respiratory Symptoms and General Well-being

Non-pharmacologic	Pharmacologic
Supported self-management and monitoring	Symptomatic treatment
Breathing exercises and techniques	Control of co-morbidities
Pulmonary rehabilitation	Treatment of specific complications
Emotional and Mental Health Support	Individualized treatment plans

Currently, there is lack of evidence for any pharmacologic intervention to specifically treat Long COVID-19, despite a substantial population experiencing prolonged symptoms after COVID-19 infection. Post-acute COVID-19 symptoms vary widely.¹ Among the most common complaints are fatigue, headache, musculoskeletal pain, irritability and dizziness.¹

The management of patients with Long COVID-19 address these symptoms and should be individualized. Self-assessment and monitoring is encouraged. Referrals to specialists made if warranted. The specialist's evaluation and management should be based on current clinical practice guidelines.

Although radiographic and spirometric findings were mild in some studies⁶, they were observed in majority of the patients. These findings supported the importance of pulmonary evaluation and the potential benefits of bronchodilators and inhaled corticosteroids on a case-to-case basis.

The NICE panel³ noted the lack of evidence for pharmacological treatments for Long COVID-19. The panel also expressed concern over the use of interventions to manage short term symptoms that might cause harm in the longer term, hence the need to advise caution over such interventions, including over the counter medicines. This is where referrals to specialists are of utmost importance.

Majority of the patients will recover in time, however recovery is usually slow. Self-management involves emphasis on general health, rest and recreation, and gradual increase in activity. A pulse oximeter and diary, for home monitoring may be useful in the evaluation of patients with persistent dyspnea.⁶ Recognized non-pharmacological strategies for managing dyspnea include breathing exercises, pulmonary rehabilitation and maintaining optimal body positioning for postural relief.

Cough, dyspnea and exercise intolerance are common respiratory symptoms of Long COVID-19.¹ These symptoms are best managed with breathing exercises. The aim of breathing exercise strategies is to normalize breathing and to increase the efficiency of the respiratory muscles, leading to less energy expenditure, less airway irritation, less fatigue, and improve breathlessness.⁸

Deep Breathing Exercises

There are no specific deep breathing exercises specifically designed to assist in the recovery from COVID-19 or during long COVID. However, literature suggests engaging in deep breathing exercises reconditions the muscles of respiration, restores/improves vital capacity, and can serve as an adjunct for the treatment of anxiety.¹³ Ideally, deep breathing exercises should be done for about 5-10 minutes per session with frequency depending on the patient's tolerance. Patients may begin with one session a day and progress to more sessions as improvement ensues.

Deep breathing exercises for Adolescents

Pursed Lip Breathing

This type of breathing exercise reduces the number of breaths that the patient takes and keeps his/her airways open longer.

1. To perform this exercise, the patient is asked to breathe slowly and deeply through his/her nose over a period of 3-4 seconds.
2. Instruct the patient to hold the breath for another 3-4 seconds before exhaling twice as long from the mouth with pursed lips.
3. The process may be repeated as many times as tolerated.

Diaphragmatic Breathing

1. Instruct the patient to breathe in slowly and deeply through his/her nose over a period of 3-4 seconds.
2. Instruct the patient to be mindful of how his/her abdomen rises during inspiration and falls during expiration by placing his/her hand over the abdomen.
3. With relaxed shoulders and neck, exhale out through the mouth at least two to three times as long as the inhalation.
4. The process may be repeated as many times as tolerated.

Deep breathing exercises for Younger Children

Deep breathing exercises can be performed even by younger patients. The following are activities that can help in facilitating the performance of deep breathing exercises in the young.

Playing with Bubbles

A great way to help encourage deep breathing is by playing with bubbles. This can be done individually or as a tandem activity with an adult or older child. A *bubble toy loop* and detergent solution is needed before starting the activity.

1. Ask the child to take a big breath in, with his/her abdomen pushing out, holding the breath for 3-4 seconds
2. Ask the child to blow out slowly and gently with pursed lips through the bubble toy loop to create bubbles.
3. The child can repeat the entire process as many times as tolerated.

Blowing out birthday candles

A variation of playing bubbles is *blowing out birthday candles*. This involves more child imagination.

1. Ask the child to imagine that he/she will be blowing out birthday candles on a cake.
2. Instruct him/her to breathe in as deep as he/she can and hold the breath for 3-4 seconds.
3. Breathe out as strong as he/she can to blow out the birthday candles.
4. Ask the child to repeat this as many times as he/she can.

RETURN TO USUAL ACTIVITIES AFTER ACUTE COVID-19

RECOMMENDATION 4

Children and adolescents recovering from COVID-19 illness may return to play or activity after a DOH prescribed completed isolation period and a minimum of 10 days without symptoms. The child should have no cardiorespiratory symptoms when performing normal daily activities, and activities should progress gradually, based on tolerance. ^{14,16}

(*High quality evidence; Strong recommendation*)

Children should return to play once all of the following criteria are met:

1. Completed Department of Health (DOH) prescribed isolation period at time of diagnosis
2. The minimum amount of symptom-free time has passed from symptom onset
3. Can perform all activities of daily life expected for age
4. No signs/symptoms of illness reported by caregiver or upon evaluation
5. Physician clearance has been given, *if indicated*

As of this time of writing , there is no evidence- based approach to the guidance given for resumption of physical activity after a COVID-19 illness. One recommendation is the gradual resumption of physical activity guided by one's physical tolerance. Seven symptom free days is considered reasonable time after which physical activities may be resumed with an initial two weeks of minimal exertion. ^{14, 15}

The American Academy of Pediatrics (AAP) provided an algorithm presenting the recommendations for children and adolescents returning to sports and regular activities after an acute COVID-19 infection. Once cleared by a physician, children under 12 can return to sports and physical education classes as their own tolerance allows. More specific steps are laid out for those who are 12 and older. ¹⁶ (See *Figure 2 below*)

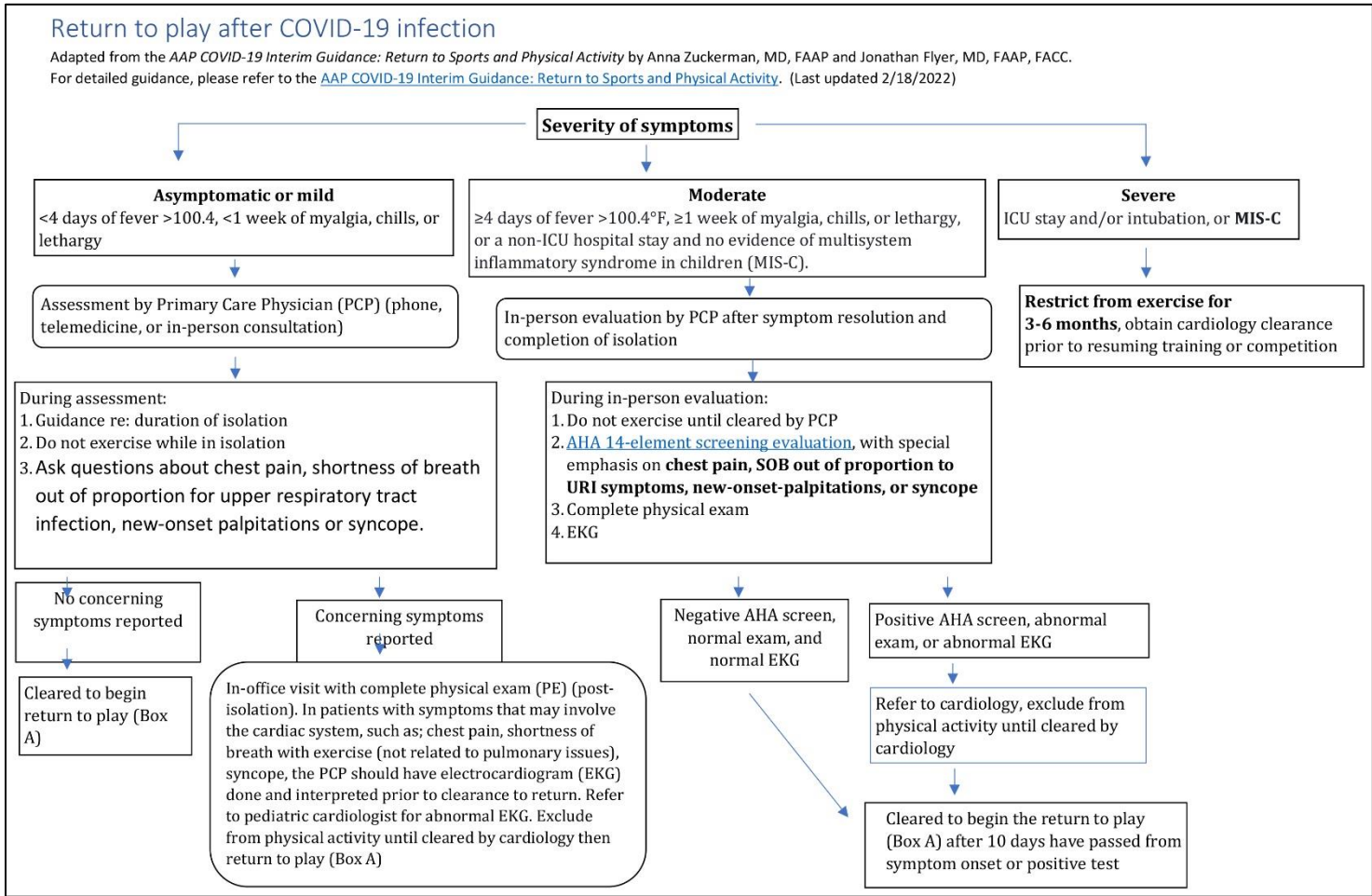


Figure 2. Adapted from the American Academy of Pediatrics. COVID-19 Interim Guidance: Return to Sports and Physical Activity (January 28,2022) ¹⁶.

*See **Appendix B** for the AHA 14-element screening evaluation

COPY

Return to play after COVID-19 infection

Adapted from the AAP COVID-19 Interim Guidance: Return to Sports and Physical Activity by Anna Zuckerman, MD, FAAP and Jonathan Flyer, MD, FAAP, FACC. For detailed guidance, please refer to the [AAP COVID-19 Interim Guidance: Return to Sports and Physical Activity](#). (Last updated 2/18/2022)

BOX A: Additional Guidance on Returning to Play (Note: if the patient has already advanced back to physical activity on their own and is without abnormal cardiovascular signs/symptoms, then no further evaluation is necessary. COVID19 disease history should be documented.)

When should children and adolescents return to play?

- 1) Completed isolation and minimum amount of symptom free time has passed
- 2) Can perform all activities of daily living
- 3) No concerning signs/symptoms
- 4) Physician clearance has been given, if indicated

At what pace should children and adolescents return to play?

- 5) <12yo: progress according to own tolerance
- 6) 12+: gradual return to physical activity
 - Asymptomatic / Mild symptoms: Minimum 1 day symptom free (excluding loss of taste / smell), 2 days of increase in physical activity (i.e. one light practice, one normal practice), no games before day 3. A mask is required for ALL physical activity, including games or scrimmages, until 10 full days from + test or symptom onset have passed.
 - Moderate symptoms: Minimum 1 day symptom free (excluding loss of taste / smell), and a minimum of 4 days of gradual increase in physical activity (one light cardio workout on own, two light practices, one full practice), no games before day 5. A mask is required for ALL physical activity, including games or scrimmages, until 10 full days from + test or symptom onset have passed.

When should children and adolescents pause return to play?

- If patient develops any chest pain, SOB out of proportion to URI infection, new-onset palpitations, or syncope when returning to exercise, immediately stop and go to PCP for in-person exam and consider referral to Pediatric Cardiology

Figure 3. Adapted from the American Academy of Pediatrics. COVID-19 Interim Guidance: Return to Sports and Physical Activity (January 28,2022) ¹⁶

RECOMMENDATION 5

Athletes recovering from COVID-19 illness should have a specialist consultation with appropriate evaluation before resuming intense physical activity or training. A gradual return to physical activity is recommended.

(High quality evidence; Strong recommendation)

There are no evidence-based guidelines available on athletes returning to sports activity after COVID-19 infection. Sequelae of COVID-19 illness that may affect an athlete's sports performance include pulmonary compromise, cardiovascular complications, and neuromuscular or cognitive dysfunction.^{17, 18} It is recommended that a specialist consultation be done to assess the athlete's medical fitness to resume training.¹⁹

A return to sports activity may be started after an asymptomatic period of at least 7 days. The English and Scottish Institute of Sports Guidance recommends that the athlete should be able to walk 500m on the flat without feeling excessive fatigue or breathlessness before re-starting strenuous physical activities.²⁰ A gradual increase in exercise is recommended. The gradual increase in exercise is prioritized in the sequential order of an increase in exercise frequency, duration then intensity.¹⁴

Recovering patients who have symptoms of severe breathlessness or chest pain, and symptoms suggestive of myocardial injury warrant a thorough physical examination and investigations such as 12-lead ECG. In the event of abnormal findings, a cardiology consult is recommended and additional work-ups may include 2D echocardiography and serum troponin levels. Among those who had severe COVID-19 with documented myocarditis, both European and US guidelines recommend exercise restrictions for 3 to 6 months.^{15, 16, 21, 22}

Athletes returning to activity after a COVID-19 illness progress through five stages. A minimum of 1 to 2 days is recommended for each stage, and may be adjusted according to the patient's age, comorbidities, or severity of COVID illness. The athlete will be monitored closely, and the clinician should be in communication with the athlete throughout the different stages.¹⁴

A suggested pre-evaluation form adapted from the American Academy of Pediatrics may be used for young athletes recovering from acute COVID-19 if deemed applicable in the local setting (**Please see Appendix C**). It is best to teach patients and their parents to monitor for chest pain, shortness of breath, new palpitations or syncope . If these occurs physical activity should be stopped at once and immediate consult with a pediatrician or specialist in an in-person/face-to face basis be done.

Gaps in Knowledge in Pediatric Long COVID-19

Since the start of the pandemic, studies on the clinical presentation and outcomes have largely involved adult patients, as the older population is more frequently and severely affected by SARS-COV-2 infection. Similarly, studies on long COVID-19 are now more frequently reported among adults compared to children.

- **Epidemiologic data are lacking on long-term COVID-19 in children across all disease severities (mild to critical COVID-10).** A promising new study on the long-term physical and mental health effects of COVID-19 in children was spearheaded by the US National Institutes of Health. The study which is part of the Researching COVID to enhance Recovery (RECOVER) Initiative recently commenced recruitment.²³
- A prolonged inflammatory response has been postulated to be the underlying pathophysiology of COVID-19²⁴, however the **exact pathophysiology of long COVID-19 in the pediatric age group** remains to be a subject of research interest.
- Furthermore, gaps remain on the **long-term effects of SARS-CoV-2 infection on pulmonary function in infants and children**, and this aspect may be systematically reviewed.
- There is a **significant heterogeneity in the outcome of interest resulting in difficulty to obtain standardized patient's long-term symptoms from COVID-19**²⁵ especially on the **correlation based on the severity of their acute COVID-19 infection.**
- Moreover, there is **lack of studies to determine the specific risk factors for long-covid in children** and that more studies are needed as well on long-term COVID-19 symptoms in both vaccinated and unvaccinated children to obtain stronger conclusions.
- Specific data on the **correlation of respiratory symptoms with diagnostic findings and respiratory exercise testing in children** is lacking especially in a specific time interval from symptoms.
- Among those children with pre-existing comorbidity such as bronchial asthma, there is **lack of published data on pulmonary function test among known asthmatic children versus non asthmatics with Long COVID.**

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APPENDIX

Appendix A

Six-Minute Walk Test

Brief Description

The 6-minute Walk Test (6MWT) measures the distance that a patient can quickly walk on a flat, hard surface (typically a 100-ft hallway) within a 6-minute time period.¹¹

Indications for the Six-Minute Walk Test

The indications for performing this test include the following:

- (1) to measure the response to medical interventions in patients with moderate to severe heart or lung disease
- (2) to measure the functional status of patients or functional exercise level for daily physical activities
- (3) to provide pretreatment and post-treatment comparisons and serve as a predictor of morbidity and mortality among patients with different health conditions or those undergoing surgical procedures. It is absolutely contraindicated among patients with unstable angina or myocardial infarction during the previous month.

As there are potential safety issues with the 6-minute walk test, testing should be performed in a suitable and well-equipped location. Emergency provisions should include oxygen, sublingual nitroglycerine, aspirin, and B-2 agonists, and the technician should be adept in handling emergencies. It should be ideally performed in a pulmonary diagnostic center.

The 6MWT may be performed indoors or outdoors. Based on the American Thoracic Society(ATS) guidelines, the technical aspects include a 30-meter walking course with the length of the corridor marked every 3 meters. A cone should mark the turnaround points and a starting line marks the beginning and end of each 60-m lap.¹¹

Preparations for the Exercise Proper

Comfortable clothing and appropriate shoes should be worn. Habitual walking aids (walker, cane etc), regular maintenance medication or oxygen supplementation may be continued to be used during the test. Recommendations before the test such as a light meal avoiding active exercise within 2 hours of the test is advised.

Interpretation

The 6MWT is a reliable measure of the functional status of patients with at least moderately severe impairment. In cases of interpreting the results as single measurements, document the age, height, weight, and sex which independently affects the 6MWD in healthy children and adolescents. It is also used to determine the response to therapeutic interventions for pulmonary and cardiac disease.

The American Thoracic Society recommends that a change in 6MWD is expressed as an absolute value. When the 6MWD is decreased, it may be prudent to do pulmonary function studies, cardiac function tests, and measurements of ankle-arm index and muscle strength, as well as assessments on the nutritional status, orthopedic function, and cognitive function.

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Appendix B

The ACC/AHA Recommendations for Congenital and Genetic Heart Disease Screenings in Youth *

The 14-Element Cardiovascular Screening Checklist for Congenital and Genetic Heart Disease:

Personal history:

1. Chest pain/discomfort/tightness/pressure related to exertion
2. Unexplained syncope/near-syncope*
3. Excessive exertional and unexplained dyspnea/fatigue or palpitations, associated with exercise
4. Prior recognition of a heart murmur
5. Elevated systemic blood pressure
6. Prior restriction from participation in sports
7. Prior testing for the heart, ordered by a physician

Family history:

8. Premature death (sudden and unexpected, or otherwise) before age 50 attributable to heart disease in ≥ 1 relative
9. Disability from heart disease in close relative < 50 y of age
10. Hypertrophic or dilated cardiomyopathy, long-QT syndrome, or other ion channelopathies, Marfan syndrome, or clinically significant arrhythmias; specific knowledge of certain cardiac conditions in family members

Physical examination:

11. Heart murmur**
12. Femoral pulses to exclude aortic coarctation
13. Physical stigmata of Marfan syndrome
14. Brachial artery blood pressure (sitting position)***

*Judged not to be of neurocardiogenic (vasovagal) origin; of particular concern when occurring during or after physical exertion.

**Refers to heart murmurs judged likely to be organic and unlikely to be innocent; auscultation should be performed with the patient in both the supine and standing positions (or with Valsalva maneuver), specifically to identify murmurs of dynamic left ventricular outflow tract obstruction.

***Preferably taken in both arms.

Source: Maron, B. J., Friedman, R. A., Kligfield, P., Levine, B. D., Viskin, S., Chaitman, B. R., Okin, P. M., Saul, J. P., Salberg, L., Van Hare, G. F., Soliman, E. Z., Chen, J., Matherne, G. P., Bolling, S. F., Mitten, M. J., Caplan, A., Balady, G. J., Thompson, P. D., & American Heart Association Council on Clinical Cardiology, Advocacy Coordinating Committee, Council on Cardiovascular Disease in the Young, Council on Cardiovascular Surgery and Anesthesia, Council on Epidemiology and Prevention, Council on Functional Genomics and Translational Biology, Council on Quality of Care and Outcomes Research, and American College of Cardiology (2014). Assessment of the 12-lead ECG as a screening test for detection of cardiovascular disease in healthy general populations of young people (12-25 Years of Age): a scientific statement from the American Heart Association and the American College of Cardiology. *Circulation*, 130(15), 1303–1334. <https://doi.org/10.1161/CIR.0000000000000025>

Appendix C

Suggested Pre-Participation Evaluation Forms for Young Athletes

B.1 The American Academy of Pediatrics Preparticipation Evaluation Forms (History Form)

This form should be placed into the athlete's medical file and should **not** be shared with schools or sports organizations. The Medical Eligibility Form is the only form that should be submitted to a school or sports organization.
Disclaimer: Athletes who have a current Preparticipation Physical Evaluation (per state and local guidance) on file should not need to complete another History Form.

■ PREPARTICIPATION PHYSICAL EVALUATION (Interim Guidance)

HISTORY FORM

Note: Complete and sign this form (with your parents if younger than 18) before your appointment.

Name: _____ Date of birth: _____

Date of examination: _____ Sport(s): _____

Sex assigned at birth (F, M, or intersex): _____ How do you identify your gender? (F, M, or other): _____

Have you had COVID-19? (check one): Y N
 Have you been immunized for COVID-19? (check one): Y N If yes, have you had: One shot Two shots
 List past and current medical conditions. _____

 Have you ever had surgery? If yes, list all past surgical procedures. _____

 Medicines and supplements: List all current prescriptions, over-the-counter medicines, and supplements (herbal and nutritional).

 Do you have any allergies? If yes, please list all your allergies (ie, medicines, pollens, food, stinging insects).

Patient Health Questionnaire Version 4 (PHQ-4)
 Over the last 2 weeks, how often have you been bothered by any of the following problems? (Circle response.)

	Not at all	Several days	Over half the days	Nearly every day
Feeling nervous, anxious, or on edge	0	1	2	3
Not being able to stop or control worrying	0	1	2	3
Little interest or pleasure in doing things	0	1	2	3
Feeling down, depressed, or hopeless	0	1	2	3

(A sum of ≥ 3 is considered positive on either subscale [questions 1 and 2, or questions 3 and 4] for screening purposes.)

GENERAL QUESTIONS (Explain "Yes" answers at the end of this form. Circle questions if you don't know the answer.)	Yes	No
1. Do you have any concerns that you would like to discuss with your provider?		
2. Has a provider ever denied or restricted your participation in sports for any reason?		
3. Do you have any ongoing medical issues or recent illness?		
HEART HEALTH QUESTIONS ABOUT YOU	Yes	No
4. Have you ever passed out or nearly passed out during or after exercise?		
5. Have you ever had discomfort, pain, tightness, or pressure in your chest during exercise?		
6. Does your heart ever race, flutter in your chest, or skip beats (irregular beats) during exercise?		
7. Has a doctor ever told you that you have any heart problems?		
8. Has a doctor ever requested a test for your heart? For example, electrocardiography (ECG) or echocardiography.		

HEART HEALTH QUESTIONS ABOUT YOU (CONTINUED)	Yes	No
9. Do you get light-headed or feel shorter of breath than your friends during exercise?		
10. Have you ever had a seizure?		
HEART HEALTH QUESTIONS ABOUT YOUR FAMILY	Yes	No
11. Has any family member or relative died of heart problems or had an unexpected or unexplained sudden death before age 35 years (including drowning or unexplained car crash)?		
12. Does anyone in your family have a genetic heart problem such as hypertrophic cardiomyopathy (HCM), Marfan syndrome, arrhythmogenic right ventricular cardiomyopathy (ARVC), long QT syndrome (LQTS), short QT syndrome (SQTS), Brugada syndrome, or catecholaminergic polymorphic ventricular tachycardia (CPVT)?		
13. Has anyone in your family had a pacemaker or an implanted defibrillator before age 35?		

Source: AAP Website (https://downloads.aap.org/AAP/PDF/PPE_History-form-7-30-21.pdf)

B.1 The Preparticipation Evaluation Forms (History Form) (continued)

BONE AND JOINT QUESTIONS	Yes	No
14. Have you ever had a stress fracture or an injury to a bone, muscle, ligament, joint, or tendon that caused you to miss a practice or game?		
15. Do you have a bone, muscle, ligament, or joint injury that bothers you?		
MEDICAL QUESTIONS	Yes	No
16. Do you cough, wheeze, or have difficulty breathing during or after exercise?		
17. Are you missing a kidney, an eye, a testicle (males), your spleen, or any other organ?		
18. Do you have groin or testicle pain or a painful bulge or hernia in the groin area?		
19. Do you have any recurring skin rashes or rashes that come and go, including herpes or methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)?		
20. Have you had a concussion or head injury that caused confusion, a prolonged headache, or memory problems?		
21. Have you ever had numbness, had tingling, had weakness in your arms or legs, or been unable to move your arms or legs after being hit or falling?		
22. Have you ever become ill while exercising in the heat?		
23. Do you or does someone in your family have sickle cell trait or disease?		
24. Have you ever had or do you have any problems with your eyes or vision?		

MEDICAL QUESTIONS (CONTINUED)	Yes	No
25. Do you worry about your weight?		
26. Are you trying to or has anyone recommended that you gain or lose weight?		
27. Are you on a special diet or do you avoid certain types of foods or food groups?		
28. Have you ever had an eating disorder?		
FEMALES ONLY	Yes	No
29. Have you ever had a menstrual period?		
30. How old were you when you had your first menstrual period?		
31. When was your most recent menstrual period?		
32. How many periods have you had in the past 12 months?		

Explain "Yes" answers here.

I hereby state that, to the best of my knowledge, my answers to the questions on this form are complete and correct.

Signature of athlete: _____

Signature of parent or guardian: _____

Date: _____

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B.1 The Preparticipation Evaluation Forms (Physical Examination Form)

This form should be placed into the athlete's medical file and should **not** be shared with schools or sports organizations. The Medical Eligibility Form is the only form that should be submitted to a school or sports organization.

Disclaimer: Athletes who have a current Preparticipation Physical Evaluation (per state and local guidance) on file should not need to complete another examination.

■ PREPARTICIPATION PHYSICAL EVALUATION (Interim Guidance)

PHYSICAL EXAMINATION FORM

Name: _____ Date of birth: _____

PHYSICIAN REMINDERS

- Consider additional questions on more-sensitive issues.
 - Do you feel stressed out or under a lot of pressure?
 - Do you ever feel sad, hopeless, depressed, or anxious?
 - Do you feel safe at your home or residence?
 - Have you ever tried cigarettes, e-cigarettes, chewing tobacco, snuff, or dip?
 - During the past 30 days, did you use chewing tobacco, snuff, or dip?
 - Do you drink alcohol or use any other drugs?
 - Have you ever taken anabolic steroids or used any other performance-enhancing supplement?
 - Have you ever taken any supplements to help you gain or lose weight or improve your performance?
 - Do you wear a seat belt, use a helmet, and use condoms?
- Consider reviewing questions on cardiovascular symptoms (Q4–Q13 of History Form).

EXAMINATION		
Height: _____	Weight: _____	
BP: _____ / _____ (_____ / _____)	Pulse: _____	Vision: R 20/ _____ L 20/ _____ Corrected: <input type="checkbox"/> Y <input type="checkbox"/> N
COVID-19 VACCINE		
Previously received COVID-19 vaccine: <input type="checkbox"/> Y <input type="checkbox"/> N		
Administered COVID-19 vaccine at this visit: <input type="checkbox"/> Y <input type="checkbox"/> N If yes: <input type="checkbox"/> First dose <input type="checkbox"/> Second dose		
MEDICAL	NORMAL	ABNORMAL FINDINGS
Appearance <ul style="list-style-type: none"> Marfan stigmata (kyphoscoliosis, high-arched palate, pectus excavatum, arachnodactyly, hyperlaxity, myopia, mitral valve prolapse [MVP], and aortic insufficiency) 		
Eyes, ears, nose, and throat <ul style="list-style-type: none"> Pupils equal Hearing 		
Lymph nodes		
Heart ^o <ul style="list-style-type: none"> Murmurs (auscultation standing, auscultation supine, and ± Valsalva maneuver) 		
Lungs		
Abdomen		
Skin <ul style="list-style-type: none"> Herpes simplex virus (HSV), lesions suggestive of methicillin-resistant <i>Staphylococcus aureus</i> (MRSA), or tinea corporis 		
Neurological		
MUSCULOSKELETAL	NORMAL	ABNORMAL FINDINGS
Neck		
Back		
Shoulder and arm		
Elbow and forearm		
Wrist, hand, and fingers		
Hip and thigh		
Knee		
Leg and ankle		
Foot and toes		
Functional <ul style="list-style-type: none"> Double-leg squat test, single-leg squat test, and box drop or step drop test 		

^o Consider electrocardiography (ECG), echocardiography, referral to a cardiologist for abnormal cardiac history or examination findings, or a combination of those.

Name of health care professional (print or type): _____ Date: _____

Address: _____ Phone: _____

Signature of health care professional: _____, MD, DO, NP, or PA

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Source: AAP Website (https://downloads.aap.org/AAP/PDF/PPE_Physical-Exam-7-30-21.pdf)