Congenital Heart Center

COVID-19 Pre-Participation Cardiac Clearance Clinic – May 21, 0800

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*Highlight denotes new content Document Reviewed: 5.21.21

Pre-Participation Sports Cardiac Clearance Clinic (PPCCC) within the Congenital Heart Center, Spectrum Health Helen DeVos Children's Hospital, is required for comprehensive screening of adolescent and college athletes prior to participation in organized sporting programs.

Background

As of 2015, 50 states require a pre-participation physical evaluation (PPE) to screen for potentially life- threatening conditions or conditions that may put an athlete at risk for injury or illness.[1] The American Academy of Pediatrics and 5 other organizations: American Academy of Family Physicians, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopedic Society for Sports Medicine, and the American Osteopathic Academy of Sports Medicine developed a 5th Edition Monograph that offers a standardized approach to PPE. [2]

Assessment

The current COVID-19 pandemic increases the urgency for the PPCCC due to the various cardiovascular injuries cause by the SARS-CoV-2 viral infection. These include myocarditis, myocardial infarction and myocardial dysfunction.[3] In addition, the impact on the cardiovascular system from multisystem inflammatory syndrome in children (MIS-C) has been noted to be more prominent than in children or young adults and thus will require more comprehensive cardiovascular assessment.[4] Myocarditis and myocardial injury put athletes at increased risk of arrhythmia and sudden death. As such a robust system for PPE is required with the reopening of schools, and gyms in the State of Michigan.

Establishment of the PPCCC will enable utilization of existing algorithms for approaching and evaluating student athletes who are recovering from COVID-19 infection with various degree of symptoms and initial presentations. Most importantly a comprehensive and guideline driven approach will help guide the student athletes and their team physicians in returning to participate in sports and physical activity in a safe and timely manner. A streamlined process can be implemented by the PPCCC for screening patients with a history of COVID-19 infection who want to return to sports participation and physical activity, based on age and level of the intensity of the sports (Figure 1, 2).

Implementation

Establish the PPCCC within the Congenital Heart Center. The clinic is staffed with the support from cardiologists within the Congenital Heart Center.

- Walk-in EKG services Monday - Friday
- Echocardiogram only appointments Monday - Friday
- Dr. Sihong Huang will support echocardiogram and cardiac magnetic resonance (CMR) based screening and evaluation, and continue to update HDVCH PPCCC pathway / algorithm base on updated available literature
- Dr. Stanley Sedore will support ECG and exercise stress test-based screening and clinical evaluation.

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Return to Play After COVID-19 Infection in Pediatric Patients Participating in Recreational Sports

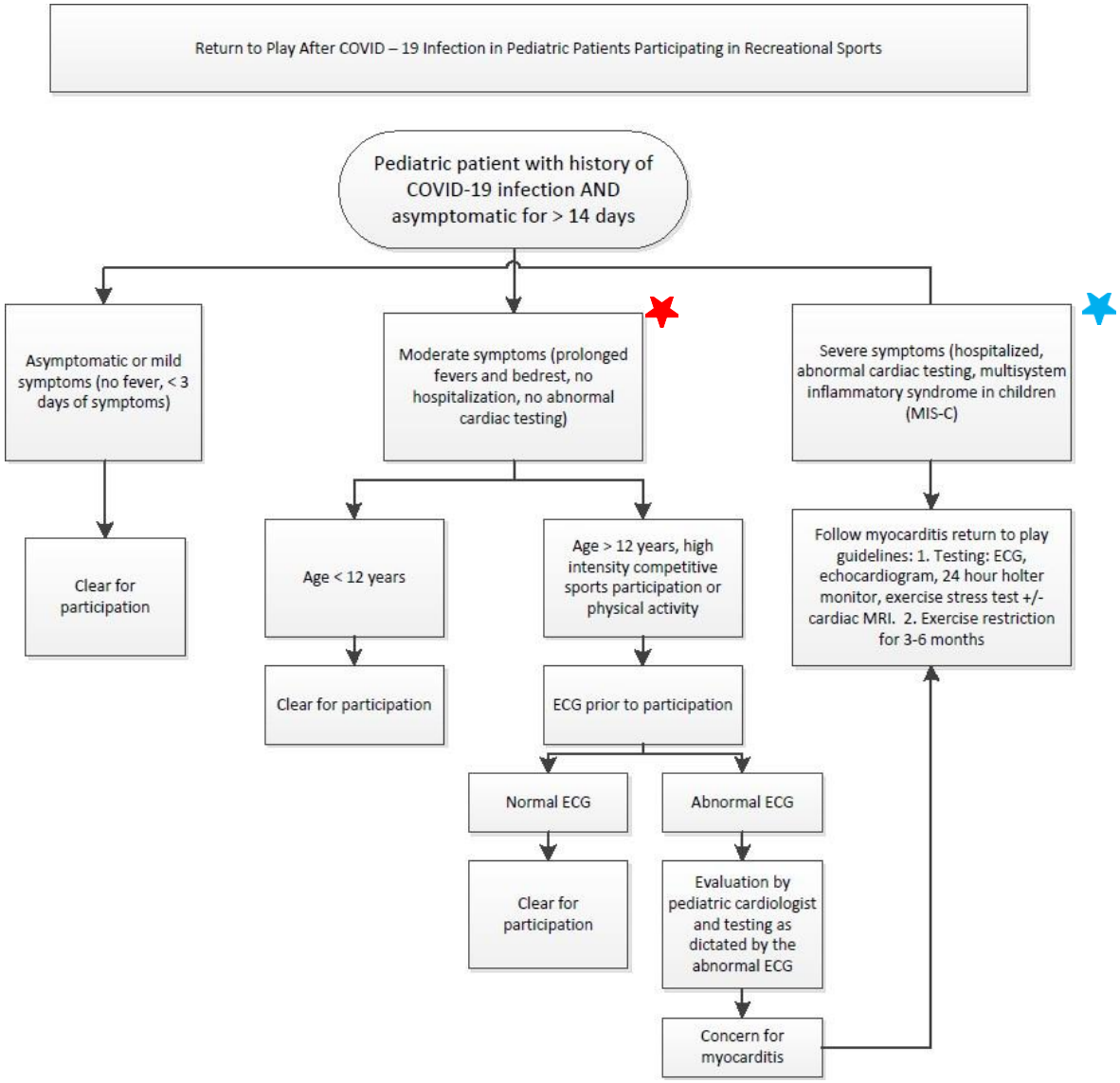

Figure 1. Algorithm for approaching pediatric patients with a history of a COVID-19 infection who want to return to sports participation and physical activity by American College of Cardiology
https://www.acc.org/latest-in-cardiology/articles/2020/07/13/13/37/returning-to-play-after-coronavirus-infection

***Depending on the patient's age and level of sports participation intensity, it would also be reasonable to follow the recent adult recommendations (see below) for return to play in this population.**

Recent American Academy of Pediatrics recommend for an ECG and cardiology consult for those with moderate symptoms after symptoms resolution and a minimum of 10 days past the date of the positive test result. The cardiologist may consider ordering additional test including an echocardiogram at the time of the acute infection[5]. https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical-guidance/covid-19-interim-guidance-return- to-sports/

See myocarditis guideline at the end of the document

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Symptoms Classification According to American Academic of Pediatrics

Asymptomatic or **mild symptoms** of COVID019: less than 4 days of fever >100.4°F, short duration of myalgia, chills, and lethargy), there are limited data available and recommendations are based on expert opinion. Individuals who test positive for COVID-19 should not exercise until they are cleared by a physician. It is suggested they visit with their primary care physician (PCP) who will review the local 14-point preparticipation screening evaluation with special emphasis on cardiac symptoms including **chest pain, shortness of breath out of proportion for upper respiratory tract infection, new-onset palpitations, or syncope** and perform a complete physical examination. If the preparticipation screening evaluation and examination are normal, no further testing is warranted and the patient may begin a gradual return to play after 10 days have passed from date of the positive test result and a minimum of 24 hours symptom free off-fever reducing medications. If the **PCP identifies any new or concerning history or physical examination findings** at this visit, an ECG should be performed, and referral should be made to a pediatric cardiologist for evaluation and further testing.

Moderate symptoms of COVID019: 4 days or great of fever >100.4°F, myalgia, chills, or lethargy or those who had a non-ICU hospital stay and no evidence of MIS-C), an ECG and cardiology consult is currently recommended after symptom resolution, and at a minimum of 10 days past the date of the positive test result. Individuals who test positive for SARS-CoV-2 **should not exercise until they are cleared by a physician.** The cardiologist may consider ordering a troponin test and an echocardiogram at the time of acute infection. Depending on the patient's symptoms and their duration, and additional testing including a Holter monitor, exercise stress testing, or cardiac magnetic resonance imaging (MRI) may be considered. If cardiac workup is negative, gradual return to physical activity may be allowed after 10 days have passed from the date of the positive test result, and a minimum of 10 days of symptom resolution has occurred off fever-reducing medicine.

Severe COVID-19 symptoms: history of ICU stay and/or intubation or **multisystem inflammatory syndrome in children (MIS-C),** it is recommended they be restricted from exercise for a minimum of 3 to 6 months and require cardiology clearance prior to resuming training or competition. Coordination of follow-up cardiology care should be arranged prior to hospital discharge. Extensive cardiac testing should include but is not limited to: troponin tests, echocardiogram, and cardiac MRI.

A graduated return-to-play protocol can begin once an athlete has been cleared by a physician (cardiologist for **moderate** to **severe** COVID-19 symptoms) and is asymptomatic when performing normal activities of daily living. The progression should be performed over the course of a 7-day minimum. Consideration for extending the progression should be given to athletes who experienced moderate COVID-19 symptoms as outlined above.

The 14-point guideline includes the following assessment: chest pain or pressure related to exertion; unexplained syncope or presyncope; dyspnea, fatigue, or palpitations related to exercise; history of a heart murmur; elevated blood pressure; previous restrictions from sports; previous cardiac testing; family history of premature death; family history of disability from heart disease; family history of hypertrophic or dilated cardiomyopathy, long-QT syndrome, or other ion channelopathies, Marfan syndrome, significant arrhythmias, or specific genetic cardiac conditions; heart murmur on examination; femoral pulses for aortic coarctation; physical examination findings consistent with Marfan syndrome; and brachial artery blood pressure. The use of 12-lead ECG or echocardiography should not be limited to competitive athletes and may be considered as part of screening in smaller cohorts of young (12 to 25 years of age) healthy persons, with the physician closely involved and quality control measures in place.

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Suggestive Progression of Gradual Return to Play for Patient with History of Moderate Symptomatic COVID-19 Infection

The following progression was adapted from Elliott N, et al, infographic, *British Journal of Sports Medicine*, 2020:

Stage 1: Day 1 and Day 2 - (2 Days Minimum) - 15 minutes or less: Light activity (walking, jogging, stationary bike), intensity no greater than 70% of maximum heart rate. NO resistance training.

Stage 2: Day 3 - (1 Day Minimum) - 30 minutes or less: Add simple movement activities (eg. running drills) - intensity no greater than 80% of maximum heart rate.

Stage 3: Day 4 - (1 Day Minimum) - 45 minutes or less- Progress to more complex training - intensity no greater than 80% maximum heart rate. May add light resistance training.

Stage 4: Day 5 and Day 6 - (2 Days Minimum) - 60 minutes -Normal training activity - intensity no greater than 80% maximum heart rate.

Stage 5: Day 7 - Return to full activity/participation (ie, - Contests/competitions).

https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical- guidance/covid-19-interim-guidance-return-to-sports/

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Return to Play After COVID-19 Infection in Highly Competitive Athlete and Highly Active Adults [6]

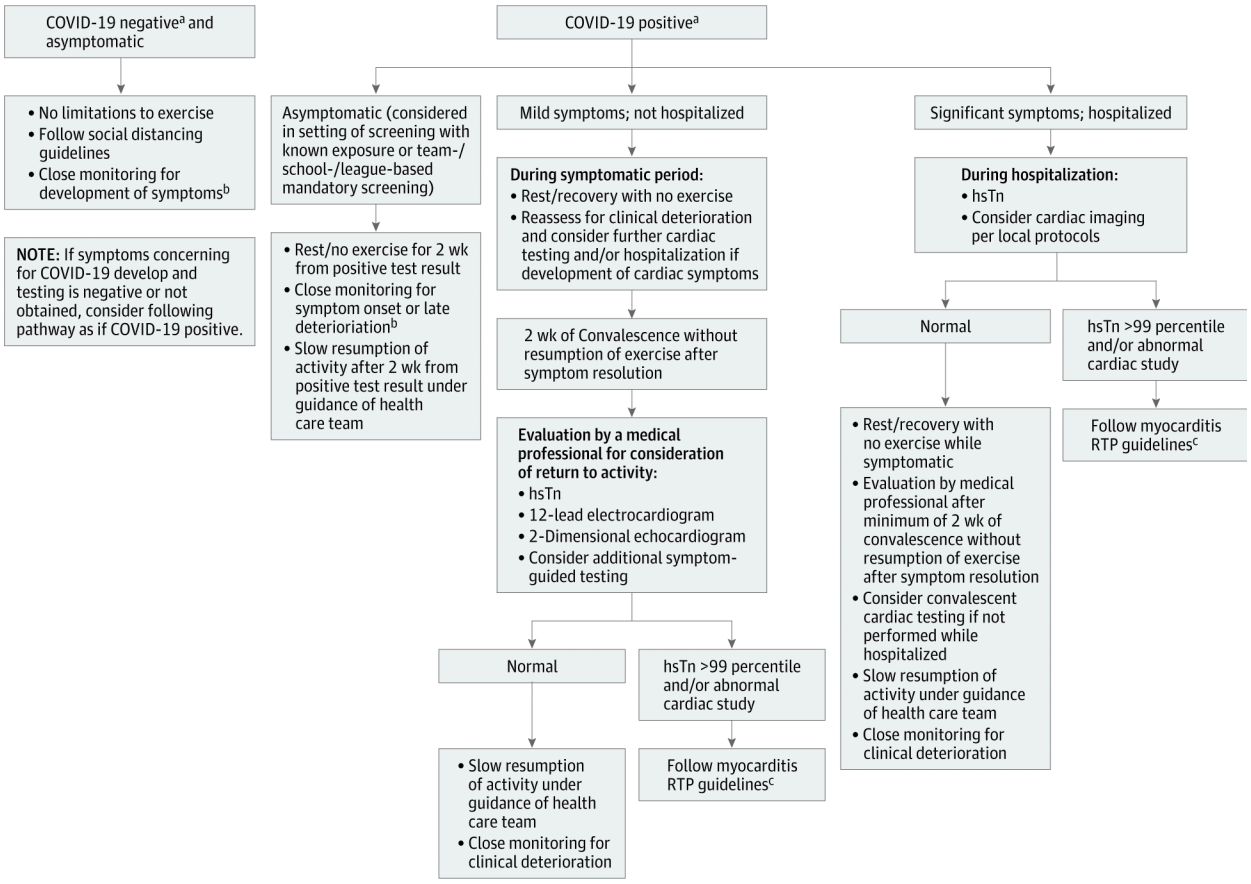

Figure 2. Algorithm for Return-to-Play for Highly Competitive Athletes and Highly Active Adults

COVID-19 indicates coronavirus disease 2019; hsTn, high-sensitivity troponin I; RTP, return to play.

[a]Typical testing obtained via a nasopharyngeal swab. All athletes with positive testing should be isolated for 2 weeks regardless of symptoms.

[b]If clinical and/or cardiac symptoms develop, follow appropriate clinical pathway.

[c]Given lack of clean pathophysiology, we recommend American College of Cardiology/American Heart Association athlete myocarditis guidelines.

* Note:

1. COVID-19 symptoms include fatigue, cough, chest pain, palpitations, dyspnea, nausea, vomiting, altered sense of smell or taste.
2. Consider obtaining supporting laboratory studies such as CRP, ESR with hsTn in those with clinical symptoms suggesting possible myocarditis or pericarditis.
3. Additional symptom-guided cardiac testing include: Holter monitoring, Zio patch monitoring, CPET, or cardiac magnetic imaging (CMR).
4. Cardiac imaging include transthoracic echocardiogram or CMR per local protocols, and should be obtained at the discretion of the consulting cardiologist who is caring for the patient.

Diagnosis of Myocarditis and Return to Play Guideline Following Myocarditis.[7]

Current noninvasive diagnostic criteria to guide recommendations for athletic participation, probable acute myocarditis is diagnosed when both of the following criteria are met:

1. A clinical syndrome that includes acute heart failure, angina-type chest pain, or myopericarditis of <3 months duration.
2. An otherwise unexplained elevation in serum troponin; electrocardiographic features of cardiac ischemia; otherwise unexplained high-degree AV block or arrhythmias; wall motion abnormalities; pericardial effusion on echocardiography or CMR imaging. Additional CMR findings that suggest myocarditis in the acute clinical setting include characteristic alterations in tissue signal on T2- or T1-weighted images and the presence of late gadolinium enhancement (LGE)

Recommendations:

1. Before returning to competitive sports, athletes who initially present with an acute clinical syndrome consistent with myocarditis should undergo a resting echocardiogram, 24-hour Holter monitoring, and an exercise ECG no less than 3 to 6 months after the initial illness *(Class I; Level of Evidence C)*.
2. It is reasonable that athletes resume training and competition if all the following criteria are met *(Class IIa; Level of Evidence C):*
    - Ventricular systolic function has returned to the normal range.
    - Serum markers of myocardial injury, inflammation, and heart failure have normalized.
    - Clinically relevant arrhythmias such as frequent or complex repetitive forms of ventricular or supraventricular ectopic activity are absent on Holter monitor and graded exercise ECGs.

    At present, it is unresolved whether resolution of myocarditis-related LGE should be required to permit return to competitive sports.

    Shared decision making with athlete (without or without family depending on the age of the patient), sports medicine director and the school's athletics' director is recommended.

3. Athletes with probable or definite myocarditis should not participate in competitive sports while active inflammation is present. This recommendation is independent of age, gender, and LV function *(Class III; Level of Evidence C)*.

[1] Caswell SV, Cortes N, Chabolla M, Ambegaonkar JP, Caswell AM, Brenner JS. State-specific differences in school sports preparticipation physical evaluation policies. Pediatrics 2015;135:26-32. doi:10.1542/peds.2014-1451
[2] Bernhardt DT, Roberts WO [Eds.] for American Academy of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medicine. "Preparticipation Physical Evaluation". 5th Ed. McGraw Hill Healthcare Information, 2019.
[3] Driggin E, Madhavan MV, Bikdeli B, et al. Cardiovascular considerations for patients, health care workers, and health systems during the COVID-19 pandemic. J Am Coll Cardiol 2020;75:2353-71. doi:10.1016/j.jacc.2020.03.031
[4] Belhadjer Z, Méot M, Bajolle F, et al. Acute heart failure in multisystem inflammatory syndrome in children (MIS-C) in the context of global SARS-CoV-2 pandemic. Circulation 2020;May 17 [Epub ahead of print]. doi:10.1161/CIRCULATIONAHA.120.048360
[5] Elliott N, Martin R, Heron N, et al. Infographic. Graduated return to play guidance following COVID-19 infection. Br J Sports Med 2020; 54:1174-1175
[6] Phelan D, Kim, JH, Chung EH. A Game Plan for the Resumption of Sport and Exercise After Coronavirus Disease 2019 (COVID-19) Infection. JAMA Cardiol. 2020; May 13. doi:10.1001/jamacardio.2020.2136.
[7] Maron BJ, Udelson JE, Bonow RO, et al. Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 3: Hypertrophic Cardiomyopathy, Arrhythmogenic Right Ventricular Cardiomyopathy and Other Cardiomyopathies, and Myocarditis A Scientific Statement From the American Heart Association and American College of Cardiology. Circulation 2015; Nov 2. Circulation. 2015;132:e273–e280. doi.org/10.1161/CIR.0000000000000239