



# Updates in Sports Pre- Participation Examinations (PPE) for the Primary Care Setting

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# Disclosures

- I, Anne Marie Zeller, have no financial disclosures

# Objectives

1. Identify new evidence-based practices for sports pre-participation examinations.
2. Recognize when to restrict athlete from sports and refer to appropriate specialist.
3. Learn about the current debate of primary care provider PPE versus mass physical events.

# Background

- Approx 60 million children and adolescents participate in sports
- 7.9 million high school students
- 37% of physicians/providers were aware of the AAP/AAFP PPE monograph updated in 2019
- Small evidence base to suggest any efficacy for improving health of young athletes
- 10% of athletes have significant findings to warrant further referral
- 1-2 % of athletes are medically disqualified

# Consensus Statement



- General physical and psychological health
- Evaluating for lift-threatening or disability conditions
  - Risk of sudden cardiac arrest
  - Predispose athlete to illness or injury
- Entry point into health care system
- Physicians' office over group setting
- Cardiovascular, musculoskeletal and neurologic structured exam
- Screening for depression, anxiety, and AD/HD
- Recognize findings of relative energy deficiency (RED-S)
- Consider needs for transgender athletes and athletes with physical and intellectual disabilities.



# Controversies and Concerns

- Effectiveness for detecting conditions?
- Without large event physicals = barrier to sports for socioeconomically or medically disadvantaged communities
- Billing for PPE as health maintenance exam may preclude other health maintenance coverage in calendar year
- Time to do a PPE AND routine wellness visit
- Gaps in physician/provider knowledge to appropriate question

## PPE PREPARTICIPATION PHYSICAL EVALUATION

5th Edition

*American Academy of Family Physicians*

*American Academy of Pediatrics*

*American College of Sports Medicine*

*American Medical Society for Sports Medicine*

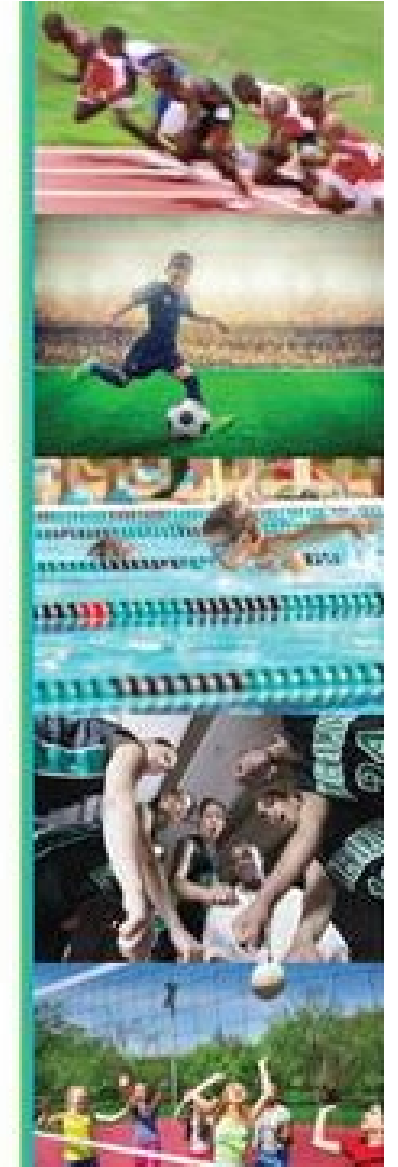
*American Orthopaedic Society for Sports Medicine*

*American Osteopathic Academy of Sports Medicine*

American Academy  
of Pediatrics



DEDICATED TO THE HEALTH OF ALL CHILDREN



# Mass PPE Event Controversy

- Limited privacy
- Discourages disclosure of potentially embarrassing concerns
- Too noisy for good cardiovascular exam
- Prior medical records no available or incomplete
- Coordinated medical team approach is acceptable alternative led by team physician and sports medicine staff



## SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	Evidence rating	Comments
The preparticipation physical evaluation should take place in the athlete's primary care medical home, during an office visit and not in a group setting. <sup>4,12</sup>	C	Expert opinion
The cardiovascular portion of the preparticipation physical evaluation should focus on identifying concerning findings such as pathologic heart murmurs or the stigmata of Marfan syndrome. <sup>19</sup>	C	Expert opinion and consensus guidelines
If a condition is identified that may restrict an athlete's medical eligibility for participating in a certain sport, shared decision-making should occur, including discussion among the athlete, the athlete's family, and an interdisciplinary health care team about the risks and benefits of participation. It may be appropriate to consider an alternative activity in which the athlete could participate. <sup>19</sup>	C	Expert opinion and consensus guidelines

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <https://www.aafp.org/afpsort>.



# Medical History

- History ALONE
  - Up to 88% of general medical conditions
  - 67-75% of musculoskeletal conditions
  - 19% of high school athletes filled out form in concordance with parents'
- CV symptoms
- FH of sudden death or serious heart conditions before 50 years
- Ideally mental health, substance use, and high-risk behavior asked alone

Spinal injuries

Brachial plexus injuries (i.e. stingers, burners)

Concussions

Neurologic disorders

Diabetes Mellitus

Loss of paired organ (i.e. kidney)

Asthma or EIB

MSK injuries

Seizures

Sickle Cell Trait

# Diabetes

- Aerobic exercise and strength training is beneficial
- Poor glycemic control and poor understanding how insulin and carbohydrate needs change during exercises increased risk of hypoglycemia
- Recommend discussing sports with diabetes specialist
- Coaches and athletic trainers need to be involved in understanding care of this athlete, glucagon
- Sport limitations scuba diving, ski diving, rock climbing are high risk

# Allergies

- History of severe allergic reaction or anaphylaxis needs an emergency plan
- Required to have injectable epinephrine
- Coaches and medical staff should be educated on how to detect and treat with epinephrine

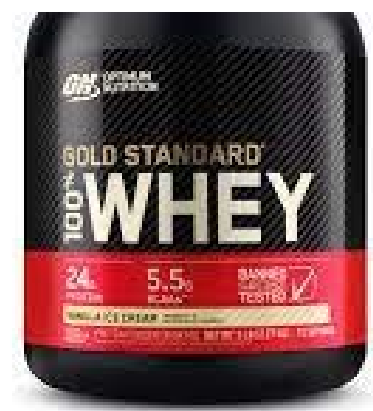
# Sickle Cell Trait (SCT) and Disease (SCD)

- SCT- acute exertional rhabdomyolysis
- SCT- safe to participate in most sports
  - HIGH RISK- intense exertional activity in hot, humid, or high altitude
- NCAA mandates screening
- SCT- Practices need to modified is hot, humid or high altitude.
- SCD- research limited
- SCD- need to exercise for health
- SCD athletes- encouraged to limit exposure, gradual acclimatizing
- SCD- UNRESTRICTED ACCESS TO WATER

# Paired Organs

- Absence of a paired organ does not disqualify a patient from athletic participation BUT may affect what sport they play
- Testicle
  - Protective cup- high impact-collision
- Kidney
  - Flak jacket- high impact-collision
- Eye
  - Full goggles with strap with polycarbonate lenses- ALL SPORTS
  - NO standard eyeglasses

# Supplements





# Physical Examination and Testing

- Vitals
- Cardiovascular exam-
  - Seating
  - Supine
  - Standing
  - Valsalva/Squat
- Identifying Marfan's like features
- Lungs
- Neuro
- Gross joint range of motion and strength testing (limited sensitivity)
- Focus exam to areas of previous injury or surgery
- GI/GU?
- SCAT5 or IMPACT?

# Hypertension in Pediatric Athletes

- MUST be taken correctly- seated 5 mins, cuff size, feet on floor, not talking, arm at heart level
- 6.4% athletes in routine PPE have elevated BP
- “Hypertension is defined as average systolic BP and/or diastolic BP that is >95<sup>th</sup> percentile for gender, age and height on ≥ 3 occasions”

**Table 1**

## BP Categories and Stages in Children Aged 1-13 years

Normal BP	<90th percentile
Elevated BP	≥90th percentile to <95th percentile OR 120/80 mm Hg to <95th percentile (whichever is lower)
Stage 1 HTN	≥95th percentile to <95th percentile + 12 mm Hg, OR 130/80 to 139/89 mm Hg (whichever is lower)
Stage 2 HTN	≥95th percentile + 12 mm Hg, or ≥140/90 mm Hg (whichever is lower)

BP: blood pressure. HTN: hypertension. Source: Reference 3.

**Table 2**

## BP Categories and Stages in Adolescents Aged ≥13 years

Normal BP	<120/<80 mm Hg
Elevated BP	120/<80 to 129/<80 mm Hg
Stage 1 HTN	130 to 139 mm Hg (systolic) or 80 to 89 mm Hg (diastolic)
Stage 2 HTN	≥140 (systolic) or ≥90 mm Hg (diastolic)

BP: blood pressure. HTN: hypertension. Source: Reference 4.

# Does Hypertension in Pediatric Athlete Limit Sports Participation?

- PREHYPERTENSION- No limitations, follow-up BP every 6 months
- STAGE 1 (SYMPTOM FREE)- No limitations BUT need to be seen by pediatric specialist to evaluate for left ventricular hypertrophy (LVH) or concomitant heart disease
- STAGE 2 (SYMPTOM FREE)- RESTRICTION from high-static sports (i.e. weightlifting and gymnastics) until BP controlled, urgent 1 week referral to cardiologist, symptoms = ASAP
- MUST discussed caffeine, drugs, tobacco, stimulates

# Hypertension in Adult Athletes

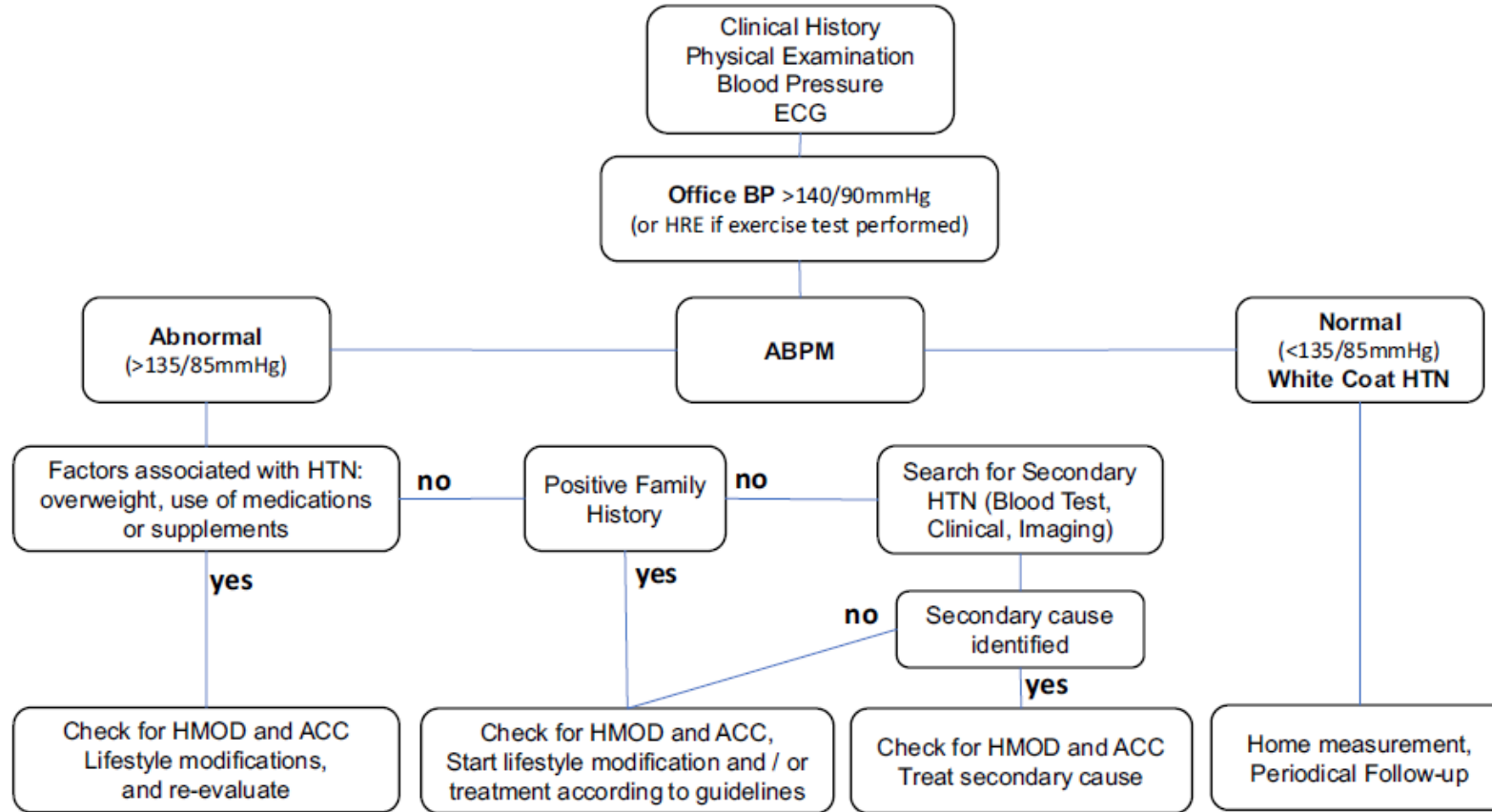
- 3% prevalence hypertension in competitive athletes
- Male >Female
- BP correlates with BMI, height and training per week
- 8.8- 25.6% Power sports athletes (weightlifting, rowing, American football)
  - Higher BMI, chronic abuse of illicit drugs, supplements, or NSAIDS
- 5% of female athletes developed hypertension over 5 years
- European Society of Cardiology (ESC) have developed DIFFERENT guidelines for athlete population
- BENEFITS OF EXERCISE OUTWEIGH THE RISK OF CV EVENT IN LOW-RISK PATIENTS

**Table 1** Recommended values as stated by the ESC, while the ACC/AHA guidelines stages values  $> 130$  as hypertension

<b>Classification</b>	<b>Systolic (mm Hg)</b>	<b>Diastolic (mm Hg)</b>
Optimal	$< 120$	And $< 80$
Normal	120–129	Or 80–84/and $< 80$
High normal	130–139	Or 85–89/and 80–89
Stage 1 hypertension	140–159	Or 90–99
Stage 2 hypertension	$\geq 160$	Or $\geq 100$
Isolated systolic hypertension	$\geq 140$	And $< 80$

Adapted from 2018 ESC Hypertension Guidelines

## Diagnosis of Hypertension in Athletes



**Fig.1** Preparticipation evaluation of athletes with hypertension (HTN). The first steps include family history, clinical examination, BP measurements, and ECG. In case the blood pressure (BP) is elevated when measured in the office, ambulatory BP measurement

(ABPM) should be suggested, and further testing should be performed based on the results. HMOD, hypertension-mediated organ damage; ACC, associated clinical conditions



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## **HMODs**

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LV hypertrophy (not considered as athletes heart)

Diastolic dysfunction

Ultrasound evidence of arterial wall thickening or atherosclerotic plaque

Hypertensive retinopathy

Increase in serum creatinine (1.3–1.5 mg/dL in men or, 1.2–1.4 mg/dL in women) and/or microalbuminuria

### **Associated clinical conditions**

Atrial fibrillation

Heart failure

CVD (cerebrovascular disease, peripheral artery disease, or coronary artery disease)

Advanced retinopathy

Renal impairment

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Adapted from 2018 ESC Hypertension Guidelines and the EAPC recommendations for participation in competitive sports of athletes with arterial hypertension

# Does Hypertension in Adult Athlete Limit Sports Participation?

PREHYPERTENSION- No limitations, follow-up BP every 6 months

STAGE 1 (SYMPTOM FREE)- No limitations

STAGE 2 (SYMPTOM FREE)- RESTRICTION from high-static sports (i.e. weightlifting, boxing, wrestling and gymnastics) until BP controlled

MUST discussed caffeine, drugs, tobacco, stimulates

# 16-year-old high school student dies after 'medical emergency' during flag football game



Officials in Las Vegas say a high school student died after a “medical emergency” during an athletic event. (Source: KVVU)

By [Caitlin Lilly](#) and [Emily Van de Riet](#)

Published: Jan. 6, 2023 at 12:37 PM EST



# Best Practices in Preventive Medicine- Cardiac Screening

Choosing Wisely Campaign

*“Do NOT order annual electrocardiography or any other cardiac screening for low-risk patients.”*

American Heart Association

*Recommends 14 element cardiac history and exam over EKG.*

## Recommendations for Preparticipation Cardiovascular Screening of Competitive Athletes

### Medical history\*

#### Personal

1. Chest pain, discomfort, tightness, or pressure related to exertion
2. Unexplained syncope or near syncope†
3. Excessive 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

8. Premature death (sudden and unexpected, or otherwise) before 50 years of age attributable to heart disease in one or more relatives
9. Disability from heart disease in close relative younger than 50 years
10. Hypertrophic or dilated cardiomyopathy, long QT syndrome, or other ion channelopathies, Marfan syndrome, or clinically significant arrhythmias; specific knowledge of genetic cardiac conditions in family members

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### Physical examination

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



# ATHLETE HEART EKG FINDINGS

## Normal ECG Findings

- Increased QRS voltage for LVH or RVH
- Incomplete RBBB
- Early repolarization/ST segment elevation
- ST elevation followed by T wave inversion V1-V4 in black athletes
- T wave inversion V1-V3  $\leq$  age 16 years old
- Sinus bradycardia or arrhythmia
- Ectopic atrial or junctional rhythm
- 1° AV block
- Mobitz Type I 2° AV block

## Borderline ECG Findings

- Left axis deviation
- Left atrial enlargement
- Right axis deviation
- Right atrial enlargement
- Complete RBBB

## Abnormal ECG Findings

- T wave inversion
- ST segment depression
- Pathologic Q waves
- Complete LBBB
- QRS  $\geq$  140 ms duration
- Epsilon wave
- Ventricular pre-excitation
- Prolonged QT interval
- Brugada Type 1 pattern
- Profound sinus bradycardia  $<$  30 bpm
- PR interval  $\geq$  400 ms
- Mobitz Type II 2° AV block
- 3° AV block
- $\geq$  2 PVCs
- Atrial tachyarrhythmias
- Ventricular arrhythmias

**No further evaluation required**  
in asymptomatic athletes with no family history of inherited cardiac disease or SCD

In isolation

2 or more

**Further evaluation required**  
to investigate for pathologic cardiovascular disorders associated with SCD in athletes



# Mental Health Screening

- Can identify bullying, hazing, sexual abuse, and sleep disorders
- Patient Health Questionnaire-9 (PHQ-9)
- Generalized Anxiety Disorder- 7 (GAD-7)
- Illness and sports-related injury can cause psychological stress
  - Independent risk factor injury?
- Depression risk factor for suicide
  - 2<sup>nd</sup> leading cause of death in college students
  - 4<sup>th</sup> leading cause of death in college athletes
- Depression, anxiety, AD/HD in the absence of suicidal and homicidal ideation should not preclude from sports participation
  - NCAA and Elite level most likely need therapeutic exemption for medications

# Substance Abuse Screening

## CRAFFT Screening (12-21 years old)

- C** Have you ever ridden in a *car* driven by someone (including yourself) who was “high” or had been using alcohol or drugs?
- R** Do you ever use alcohol or drugs to *relax*, feel better about yourself, or fit in?
- A** Do you ever use alcohol or drugs while you are by yourself, *alone*?
- F** Do you ever *forget* things you did while using alcohol or drugs?
- F** Do your family or *friends* ever tell you that you should cut down on your drinking or drug use?
- T** Have you ever gotten into *trouble* while you were using alcohol or drugs?

**Figure 1.** The CRAFFT questions.

# Special Considerations- Female Athlete Triad and Relative Energy Deficiency in Sport

- Occurs when energy expenditure is disproportionately high relative to caloric intake

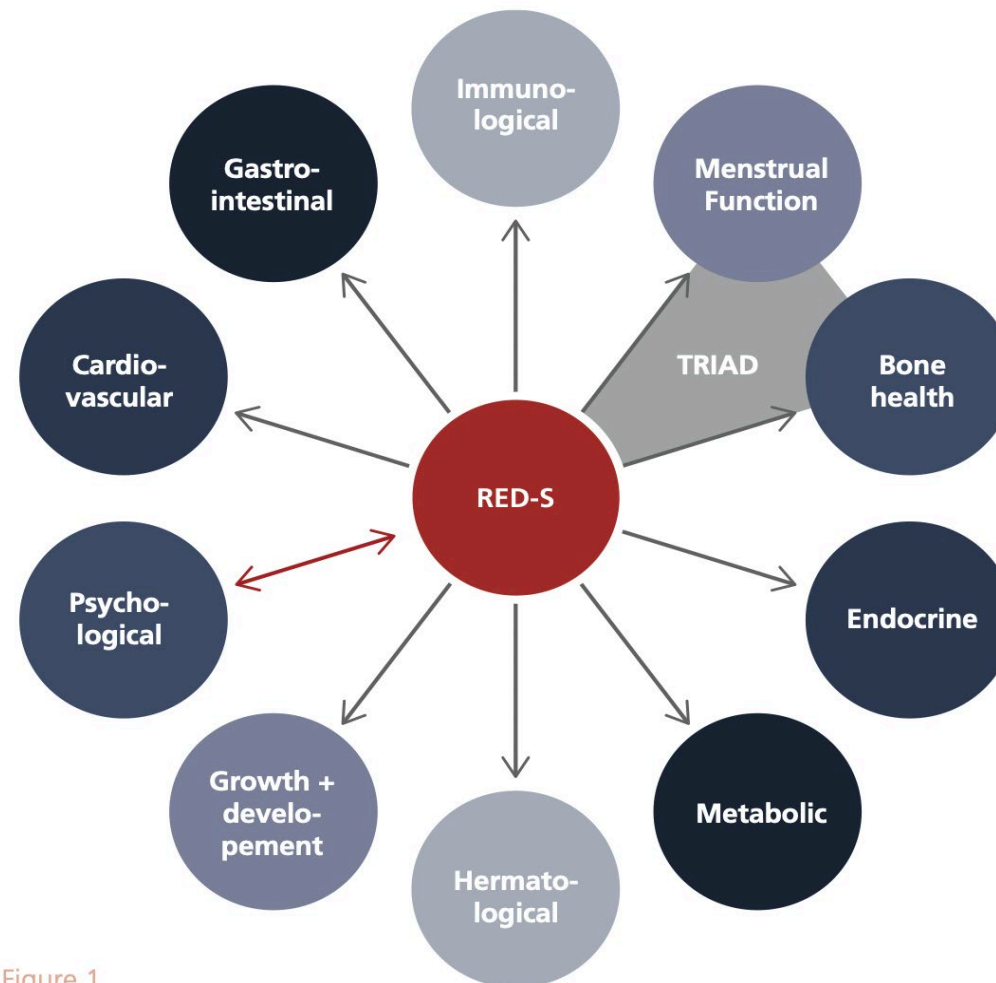
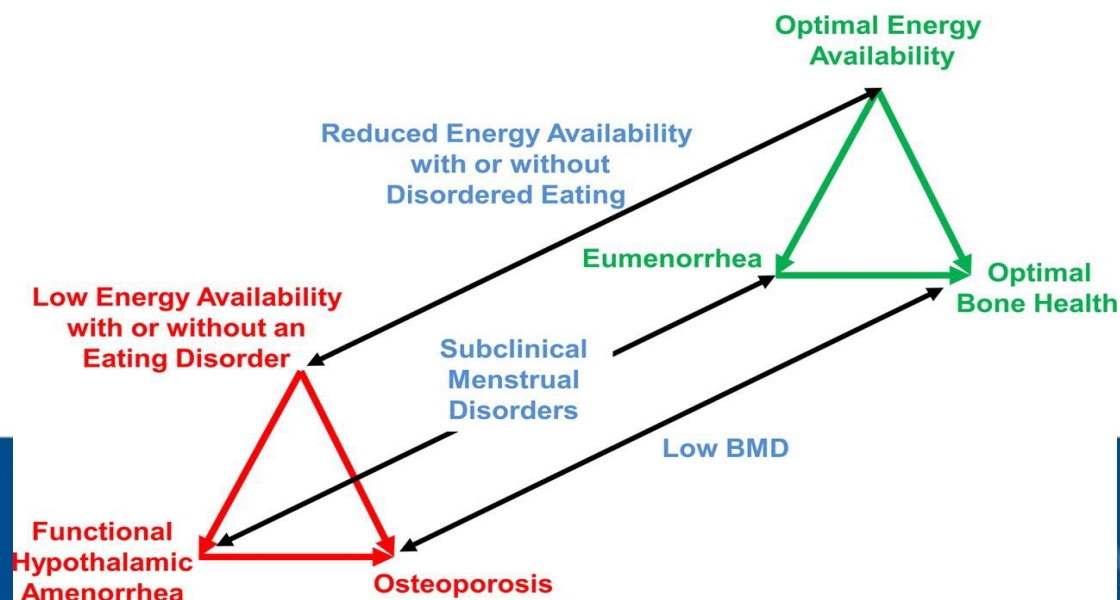


Figure 1

# Risk Factors

## AESTHETIC/LEANNESS SPORTS

Sports that emphasize appearance, and are often subjectively judged.



- Diving
- Gymnastics
- Ice skating
- Dance

## WEIGHT CLASS SPORTS

Sports that require an athlete to be at a specific weight to compete.



- Wrestling
- Boxing
- Rowing

## GRAVITATIONAL SPORTS

Sports in which weighing less is advantageous for success.



- Running
- High jump
- Pole vault
- Cycling
- Ski jump

# Special Considerations- Transgender Athletes

- Policy on sports participation by transgender athletes is very controversial
- Ask preferred pronouns on intake form or during history
- Transgender athletes have higher rates of quitting sports, depression, anxiety, and suicide
- Understand the regulations in your area

# Special Considerations- Athlete with a Disability

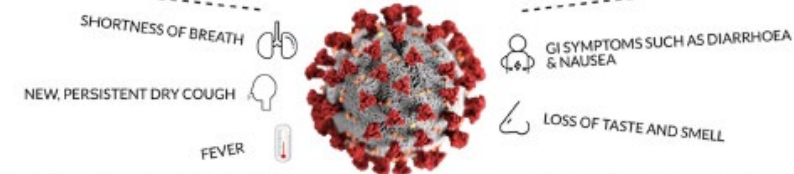
- Growing number of participant in sports
- Requires specific focus on examine
  - Ocular function
  - CV exam- Down syndrome, Hypertrophic cardiomyopathy, congenital heart issues
  - Dermatologic- wheel chair athletes, prosthesis



# Special Considerations - COVID-19

## COVID-19 GRADUATED RETURN TO PLAY FOR PERFORMANCE ATHLETES: GUIDANCE FOR MEDICAL PROFESSIONALS

### INDICATORS OF COVID-19 INFECTION



THIS GUIDANCE IS AIMED AT ATHLETES WITH MILD TO MODERATE SYMPTOMS OF COVID-19. ATHLETES SHOULD FOLLOW LOCAL GOVERNMENT GUIDELINES OF COUNTRY OF RESIDENCE FOR MANAGEMENT OF SYMPTOMS INCLUDING ISOLATION AND TESTING PROCESSES. ATHLETES WHO HAVE MORE COMPLICATED INFECTIONS, OR REQUIRED HOSPITAL SUPPORT SHOULD HAVE A MEDICAL ASSESSMENT BEFORE COMMENCING GRTP. ASSESSMENT MAY INCLUDE:



### GRADUATED RETURN TO PLAY PROTOCOL

UNDER MEDICAL SUPERVISION

	STAGE 1 30 DAYS MINIMUM	STAGE 2 7 DAYS MINIMUM	STAGE 3A 1 DAY MINIMUM	STAGE 3B 1 DAY MINIMUM	STAGE 4 3 DAYS MINIMUM	STAGE 5 EARLIEST DAY 12	STAGE 6
ACTIVITY DESCRIPTION	MINIMUM REST PERIOD	LIGHT ACTIVITY	FREQUENCY OF TRAINING INCREASES	DURATION OF TRAINING INCREASES	INTENSITY OF TRAINING INCREASES	RESUME NORMAL TRAINING PROGRESSIONS	RETURN TO COMPETITION IN SPORT SPECIFIC TIMELINES
EXERCISE ALLOWED	WALKING, LIGHT ACTIVITIES OF DAILY LIVING	WALKING, LIGHT JOGGING, STATIONARY CYCLE, NO RESISTANCE TRAINING	SIMPLE MOVEMENT ACTIVITIES E.G. RUNNING DRILLS	PROGRESSION TO MORE COMPLEX TRAINING ACTIVITIES	NORMAL TRAINING ACTIVITIES	RESUME NORMAL TRAINING PROGRESSIONS	
% HEART RATE MAX		<70%	<80%	<80%	<80%	RESUME NORMAL TRAINING PROGRESSIONS	
DURATION	30 DAYS	+15 MINS	+30 MINS	+45 MINS	+60 MINS	RESUME NORMAL TRAINING PROGRESSIONS	
OBJECTIVE	ALLOW RECOVERY TIME, PROTECT CARDIO-RESPIRATORY SYSTEM	INCREASE HEART RATE	INCREASE LOAD GRADUALLY, MANAGE ANY POST VIRAL FATIGUE SYMPTOMS	EXERCISE COORDINATION AND SKILLS/TACTICS	RESTORE CONFIDENCE AND ASSESS FUNCTIONAL SKILLS	RESUME NORMAL TRAINING PROGRESSIONS	
MONITORING	SUBJECTIVE SYMPTOMS, RESTING HR, I-PPRS	SUBJECTIVE SYMPTOMS, RESTING HR, I-PPRS, RPE	SUBJECTIVE SYMPTOMS, RESTING HR, I-PPRS, RPE	SUBJECTIVE SYMPTOMS, RESTING HR, I-PPRS, RPE	SUBJECTIVE SYMPTOMS, RESTING HR, I-PPRS, RPE	SUBJECTIVE SYMPTOMS, RESTING HR, I-PPRS, RPE	

ACRONYMS: I-PPRS (IN)JURY - PSYCHOLOGICAL READINESS TO RETURN TO SPORT; RPE (RATED PERCEIVED EXERTION SCALE)  
NOTE: THIS GUIDANCE IS SPECIFIC TO SPORTS WITH AN AEROBIC COMPONENT



INFOGRAPHIC CREATED BY UK HOME COUNTRIES INSTITUTES OF SPORT; ELLIOTT, N., ELLIOTT, J., BISWAS, A., MARTIN, R., HERON, N.

## CASES

A 13-year-old boy is brought to the clinic for his yearly physical examination. His family history is negative for early cardiac deaths in family members. On physical examination you note a harsh, early systolic murmur best heard over the right upper sternal border that increases in intensity on standing. Pulses are normal and equal in all 4 extremities. Which of the following is the next best step in management in this patient?

- A. Clear him for all sports and order an EKG to be performed in the future at the family's convenience.
- B. Clear him for all sports and reassure the family that this is a benign heart murmur.
- C. Clear him for low-intensity sports, no further evaluation is indicated.
- D. No clearance for sports and follow up on the murmur in 1 year.
- E. No clearance for sports. Reevaluate after an EKG, echocardiogram, and cardiology clearance are completed.

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- E. No clearance for sports. Reevaluate after an EKG, echocardiogram, and cardiology clearance are completed.**

## CASES

- A 13-year-old female gymnast is brought to your office for her yearly physical examination and clearance for sports. The mother reports that the patient does not eat much, watches her calories very closely, and obsesses over her weight. Since the last time you saw her, she appears skinny and is less than the 5th percentile for weight. Menarche occurred at 11 years of age. Which of the following additional historical findings is most likely to suggest an increased risk of the female athlete triad in this patient?

- A. Chronic throbbing headaches associated with exercise.
- B. High energy level as evidenced by overexercising.
- C. Hypertension triggered by exercise.
- D. Maintaining a constant body weight across 12 months.
- E. Menstrual dysfunction in the past 12 months, such as irregular menses or amenorrhea.



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# CASES

- You are seeing a 12-year-old African American boy for a yearly physical and sports preparticipation clearance. You notice that he has sickle cell trait as listed on his problem list diagnosed by newborn screen. The rest of his history and physical examination findings are normal. Which of the following is the most appropriate sport participation clearance recommendation for this patient?

- A. Clear him and recommend adequate breaks, hydration, conditioning, and avoidance of/acclimatization to high altitudes.
- B. Clear him for all sports with no special recommendations because he can be treated the same as a healthy 12-year-old.
- C. Clear him for only low-intensity sports with no special recommendations.
- D. Exclude him from sport participation to prevent sickling, dehydration, and rhabdomyolysis.
- E. Limit his exercise to early morning or late in the day when the temperature is cooler to avoid overheating.

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**QUESTIONS????**



